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Johnson Space Center Procedural Requirements

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JSC SAFETY AND HEALTH HANDBOOK

Change 2 – May 2016

Responsible Office: **Safety and Mission Assurance Directorate**

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Change Record Log

Revision	Date	Originator	Description of Changes
Baseline, Revision G	8/1/1996	D. L. Clem, extension 34272	Change log was not maintained before Revision G
Change 1 to Rev G	11/14/1997	D. L. Clem, extension 34272	Adds process for reporting international mishaps, Chapter 106 Removes requirement for bicycle helmets, Chapter 203 Updates lifting requirements, Chapter 505
Administrative Changes	7/10/1998	D. L. Clem, extension 34272	Revises JSC Safety Policy per ESC direction
Change 2 to Rev G	8/6/1998	D. L. Clem, extension 34272	Updates safety committee structure, Changes time to serve on committees and allows for volunteer members, Chapter 114

Revision H	2/3/1999	D. L. Clem, extension 34272	Includes upgrades from comparing JPG 1700.1 with NASA requirements Includes upgrades from comparing JPG 1700.1 with 29 CFR 1960 requirements Includes upgrades from comparing JPG 1700.1 with VPP and PEP requirements Includes other changes suggested by various JSC organizations
Change 1 to Rev H	3/1/1999	D. L. Clem, extension 34272	Update URL to on- line version and paragraph 5 Include JSC Safety Policy and rearrange chapter Update cross references Clarify “enough time” to “3 - 5 days before TRR”
Administrative Changes	7/1/2000	D. L. Clem, extension 34272	Changed “Job Safety Analysis” to “Job Hazard Analysis” to be consistent with Chapter 111.
Revision I	7/1/2002	D. L. Clem, extension 34272	Reorganizes program requirements around VPP elements. New Lockout/Tagout and Chemical alarm chapters. Updates to other chapters.
Change 1 to Rev I	11/7/2002	D. L. Clem, extension 34272	Changes to medical exam requirements, Chapter 3.6. Clarifies storage requirements, Chapter 5.1. Clarifies requirements for space heaters, Chapter 5.2 New safe work practices and design requirements, Chapter 6.8. Added responsibility for radiation equipment, Chapter 7.3. Changed Oxygen Enriched Atmosphere definition. Clarifies emergency number for the Sonny Carter Training Facility.
Change 2 to Rev I	5/11/2004	D. L. Clem, extension 34272	Changes to accommodate new Part 12, Chapter 5.7 Adds new Part 12, “Asbestos Control Requirements.” This is a revision of the Asbestos Control Manual
Change 3 to Rev I	6/2/2005	D. L. Clem, extension 34272	Changed number to JPR 1700.1 New chapter on Weather Safety, Chapter 5.9 Updates emergency eyewash & shower requirements, Chapter 6.1 Updates emergency eyewash & shower requirements, Chapter 6.5 Updates emergency eyewash & shower requirements, Chapter 6.8 New chapter on breathing gases, Chapter 6.13

			Adds inspection program for forklifts & slings, eliminates duplicate requirements, Chapter 8.5, Appendix 8B Adds inspection program for power tools, Chapter 8.6 Adds inspection program for ladders, Chapter 8.7 Updates several hazardous material requirements, Chapter 9.1 Updates several hazardous material requirements, Chapter 9.2 Updates emergency eyewash & shower requirements, Chapter 10.1 Clarifies applicability to JSC field sites, Part 12 Removes advisory language and updates organizational titles & document numbers in several other chapters, Part 12
Change 4 to Rev I	9/25/2006	D. L. Clem, extension 34272	Adds reference to NASA Facility System Safety Guidebook, Chapter 2.4 Updates mishap investigation products to reference NASA mishap reporting and investigation requirements, Chapter 2.7 Adds requirement not to wear jewelry during maintenance or troubleshooting on any electrical or mechanical system, Chapter 5.2 Revises processes for handling and disposing of batteries, Chapter 6.1 Revises food safety requirements, Chapter 6.4 Adds a requirement to test oxygen and oxygen enriched gas systems with oxygen or oxygen-enriched gas before introducing a human into the loop, Chapter 6.11 Adds requirement to allow the Safety and Test Operations Division to waive cleanliness requirements, Chapter 6.13 Adds construction safety requirements as a result of a mishap investigation and updates requirements for construction barriers, Chapter 10.1 Adds provisions for a less-rigorous Use Readiness Review, Chapter 10.3 Adds requirements for construction contracts as a result of a mishap investigation, Chapter 11.2

			Updates the definition of “oxygen enriched” consistent with the changes to Chapter 6.11, Glossary Updates title of the Occupational Health Branch, several chapters
Change 5 to Rev I	11/2/2007	D. L. Clem, extension 34272	Temporary change via JSC Announcement to update Lockout/Tagout requirements in Chapter 8.2, pending a complete revision of JPR 1700.1. Also deletes Attachment 8.2A and revises Attachment 8.2B of Appendix 8B.
Revision J	4/16/2008	D. L. Clem, extension 34272	Complete revision to several chapters
Change 1 to Rev J	6/1/2010	D. L. Clem, extension 34272	Update process for getting prescription safety glasses. Updates to laser safety consistent with higher level requirements. Make physical exam requirements consistent with Chapter 3.6. Update to gas cylinder requirements
Change 2 to Rev J	6/9/2011	D. L. Clem, extension 34272	Change process for waivers and changing the handbook to be consistent with revised higher-level requirements, Chapter 1.4 Revised list of required hazard analyses. Added clarification on verification methods. Clarified JHA content. Added list of approvals for hazard analyses. Clarified RAC criteria, Chapter 2.4 Added reference to NPR 8705.6 for Headquarters audits, Chapter 2.5 Added requirement to notify Headquarters of injury reports to OSHA, per NPR 8621.1 Made mishap levels consistent w/NPR 8621.1, Chapter 2.7 Mishap levels consistent w/NPR 8621.1, Attachment 2.7D Added clarification to ensure feet are clear of floor obstacles and to contact Logistics for help with furniture, Chapter 5.2 Updates to be consistent with NPR 8715.3. Includes hard requirement for written tests, adding SCBA certification, clarification of training for category III jobs, and clarification of work shift limitations, Chapter 5.8

			New chapter describing JSC Automatic External Defibrillator program, Chapter 5.10 Removed requirement for eyewash & shower for cryogenic areas. Chapter 6.5 Assigned responsibility for annual audits to the Safety & Test Operations Division. Changed Med Ops Branch to Space Medicine Division, removed redundant requirements, Chapter 6.6 Clarified requirements for operating procedures. Clarified that tests may proceed after TRR action item are complete. Revised time frame for submitting test documentation to Safety. Clarified mishap reporting requirements. Removed requirements for safety to sign detailed test procedures and to monitor physiological training. Added requirement for biosafety. Added reference to paragraph 1.14.2.b of NPR 8715.3 for offsite tests. Updated organizational titles and document numbers, Chapter 6.9 Added requirements for controlled areas. Clarified defining of JSC space. Added other clarifications, Chapter 6.10 Added clarification for commercial off-the-shelf flex hoses. Added clarification to requirements for gas cylinders, Chapter 6.11 Added JSC Form 1023, Appendix 6A Clarified LO/TO exception for plug and cord electrical equipment, Chapter 8.2 Removed reference to JPD 8719.1, Chapter 8.5 Added requirement for training in the manufacturer's instructions, Chapter 8.6 Added clarification that fall protection is not required for small jobs from ladders, Chapter 8.7 Added URL for JSC list of restricted and prohibited chemicals, Chapter 9.1 Deleted due to on-line list, Attachment 9.1A Updated document references, Chapter 9.5 Clarified coverage of URRs and ORIs. Added flowchart for criteria on URRs and ORIs. Added other clarifications, Chapter 10.3 Added clarification that Center-wide data is an acceptable means of maintaining facility baseline documentation, provided access methods are

			included in general operating procedures. Moved list in Attachment 10.4Ato web page, Chapter 10.4 Clarified protective clothing for asbestos work, Chapter 12.5 Clarified definition of and added qualifications for a “competent person,” Chapter 12.7 Added requirements for negative pressure enclosures, Chapter 12.9 Reclassified some spot removal of asbestos. Added requirements for removing plaster or sheetrock ceilings below ceiling plenum, Chapter 12.15 Updated to be consistent with requirements changes in asbestos chapters, Attachment 12A, 12B, 12D, 12E Replaced “Variance” with “Waiver.” Added definition of Test Equipment,” Revised mishap levels to be consistent with NPR 8621, Glossary
Administrative Changes	11/13/2011	D. L. Clem, extension 34272	Updated URL in paragraph 3.a.4 & made grammatical correction, Chapter 12.15
Administrative Changes	3/6/2012	D. L. Clem, extension 34272	Replace appendix forms with JSC form numbers, Chapter 5.9, Appendix 5A & 5B
Administrative Changes	4/25/2012	D. L. Clem, extension 34272	Replace obsolete Ellington Field emergency number (x44444) with new emergency number (x33333) to match the emergency number at JSC and SCTF, Chapters 2.7, 3.6, 3.8, 5.8, 5.10, 5.10, 6.1, 6.5, 6.8, 6.10, 7.4, 8.1, 9.1, 9.3, 9.5, 10.1, 12.3, 12.14, Appendix 2B & 3B
Change 3 to Rev J	4/26/2012	D. L. Clem, extension 34272	Corrected outdated references, Preface Added policy paragraph for commercial activities, Chapter 1.0 Added option for use readiness review and reference to checklists, Chapter 2.3 Updated process for investigation boards and added references to checklists, Chapter 2.7 Updated office titles, updated emergency numbers, revised requirement for medical exams, Chapter 3.6 Clarified SATERN record of evacuation drills and JF 2150, Chapter 4.4 Added considerations for procedures and clarified certification card requirements. Removed limits to suited hard vacuum, Chapter 5.8

			Changed “chest pains” to “heart attack symptoms, updated organization names and training requirements, Chapter 5.10 Updated inspection schedules, Chapter 6.4 Added considerations for handling process and references to checklists, Chapter 6.7 Added visiting product vendors and requests for evaluation of radiation, Chapter 7.3 Changed “Biosafety Control Board” to “Biosafety Review Board” and added requirements for the Board, Chapter 7.4 Defined elements of JSC electrical safety program per NFPA 70E to address IFO audit findings. Added other references to NFPA 70E, Chapter 8.1 Added “operational control” concept for non-LO/TO and referenced appendix. Added clarifications for tagout only, removing locks, group lockout, and training per IFO audit findings. Added provision for orange locks with red shrink wrap for high voltage, Chapter 8.2 Clarified process for issuing locks and added attachment for Operational Control. Added prohibition against transporting hazardous materials in POVs or taking them into the office. Clarified transfer of hazardous materials. Added requirements for updating MSDSs and MSDS databases. Updated training requirements. Clarified responsibility for providing information, Appendix 8B Added requirement to ventilate pesticide areas for 10 minutes before entering, Chapter 9.3 Changed Uniform Building Code to International Building Code. Clarified a “qualified electrical worker, Chapter 10.1 Updated planning and conduct of asbestos operations, Chapter 12.1 Added project design, Chapter 12.2 Updated sampling requirements, Chapter 12.3 Deleted incorrect document reference, Chapter 12.4 Updated training requirements, to include offsite contractors, Chapter 12.5 Added project design requirements, Chapter 12.6

			Added requirements for Class III & Class VI competent persons, Chapter 12.7 Updated sampling requirements and CFR references, Chapter 12.8 Updated barrier requirements, Chapter 12.9 Updated disposal instructions, Chapter 12.13 Updated contact information for emergencies, Chapter 12.14 Added project design. Updated Job Performance Requirements, Chapter 12.15 Updated Job Performance Requirements. Added Attachment 12H for Custodial Work, Appendix 12B
Administrative Changes	5/31/2012	D. L. Clem, extension 34272	Updated document number of the JSC Emergency Preparedness Plan, Chapters 2.7, 3.8, 6.12, Appendix 1 Updated asbestos definitions, Appendix 12B
Revision K	11/25/2013	D. L. Clem, extension 34272	Revised entire document Distributed chapter 1.0 among JPD 1700.3, chapter 1.1, and chapter 1.6 Combined chapters 1.2 and 1.5 into chapter 1.1 Combined chapters 1.3 and 1.6 into chapter 1.2 Combined chapters 2.1 and 2.3 into chapter 2.1 Combined chapters 4.2, 4.3, and 4.6 into chapter 4.1 Added requirement for safety review of educational products in chapter 2.1. Added new chapter 8.8, “JSC’s Fall Protection Program” Added new chapter 9.6, “Reproductive and Developmental Hazards” Added new chapter 9.7, “Working Safely with Nanotoxicology”
Change 1 to Rev K	4/18/2014	D. L. Clem, extension 34272	Chapter 3.8 – Revised responsibilities and measurements for Emergency Action Plans. Chapter 6.1 – Rewritten to conform with current best practices.
Administrative Changes	11/21/14	D. L. Clem, extension 34272	Chapter 2.1 – Updated links to checklists Chapter 2.4 – Added link to inspection checklists

			Chapter 2.6 – Updated links to checklists and corrected cross references Chapter 3.5 – Corrected cross reference Chapter 6.2 – Corrected reference to NPR 8715.3 Chapter 6.5 – Corrected cross reference Chapter 6.7 – Updated link to checklists Chapter 6.13 – Corrected cross reference & deleted outdated document reference Chapter 8.8 – Updated links to checklists Appendix A – Corrected mishap definitions to conform to NPR 8621.1 Appendix F – Updated link to checklists in Attachement 2.6C
Change 2 to Rev K	5/26/16	D. L. Clem, extension 34272	Chapter 1.3 – Added requirement for the Director, Health and Human Performance to concur on health-related requirements and health-related waivers. Combined chapters 11.1 and 11.2 into chapter 1.5; Moved “how-to” material to a guidance document. Chapter 1.7 – Clarified JSC, SCTF, and Ellington Field as separate sites under OSHA VPP. Added responsibility for annual report to OSHA and NPR references. Chapter 2.6 – Added clarification on classifying mishaps; Changed reference to JF 1627. Chapter 3.4 – Removed audit requirement. Chapter 3.5 – Removed audit requirement. Chapter 5.2 – Clarified that power strips are only designed for use with a high concentration of low-powered loads. 6.10 – Added refrence to OSHA construction requirements (29 CFR 1926, Subpart AA). 8.2 – Added requirement to test test equipment for proper operation immediately before and immediately after testing a circuit. 8.8 – Added clarifications on fall protection equipment, training, and rescue. 9.5 – Added exceptions to hazardous operations permits. Added requirements for inventory, compliance audits, unserviceable pyrotechnics, transportation, and certification. Added

			responsibilities for WSTF and pyrotechnic safety officers, and clarified other responsibilities. 10.4 – Provided flexibility by requiring a readiness review (ORI or URR) to determine the baseline documentation necessary for the facility. Changed “Baseline” to “Safety Management Process.” Chapters 11.1 & 11.2 – Marked reserved. Chapter 12.1 – Clarified asbestos activities; Updated cross-references; Updated link to JSC Asbestos Tool; Updated pickup information. Chapter 12.3 – Updated cross-references. Chapter 12.5 – Updated training requirements, Added requirement for JSC Specific training for Class I, II, & III asbestos work on site. Chapter 12.6 – Updated cross-references. Chapter 12.7 – Clarified requirements for JSC specific training; Updated cross-references. Chapter 12.8 – Updated cross-references. Chapter 12.13 – Updated the disposal process. Chapter 12.14 – Updated emergency contacts. Chapter 12.15 – Updated cross-references and links. Moved Job-Specific Performance Requirements from attachments 12A – 12G, Appendix F to new chapter 12.16. Attachments deleted from Appendix F. Appendix A – Added definitions for JSC Team Member, Line Manager, Line Organization, Supervisor. Appendix F, Attachment 8.2B – Removed audit requirement. Deleted Attachment 11.1A from Appendix F.

PREFACE

Title: JSC Safety and Health Handbook

P.1 PURPOSE

This document defines JSC's Safety and Health Program and provides basic safety and health requirements for the Johnson Space Center (JSC) and for other locations under JSC's jurisdiction. It is important that you follow the safety and health requirements that apply to your job.

P.2 APPLICABILITY

This handbook applies to anyone at JSC or JSC field sites, unless exempted in a specific chapter. For this handbook, "JSC" includes all JSC sites in the Houston area such as Ellington Field and the Sonny Carter Training Facility. "JSC field sites" are sites under JSC control outside the Houston area, such as the White Sands Test Facility and El Paso Forward Operating Location. The handbook applies to operations involving JSC personnel or equipment at non-JSC locations, including foreign countries. See Chapter 1.3, paragraph 6, for more information on following standards at non-JSC locations. This handbook applies to other contractors, grant recipients, or parties to agreements only to the extent specified or referenced in the appropriate contracts, grants, or agreements

a. In this handbook, all mandatory actions (i.e., requirements) are denoted by statements containing the term "shall." The terms: "may" or "can" denote discretionary privilege or permission, "should" denotes a good practice and is recommended, but not required, "will" denotes expected outcome, and "are/is" denotes descriptive material.
b. In this handbook, all document citations are assumed to be the latest version unless otherwise noted.
c. The following table tells you who must follow this handbook.

If you . . .	*Then you shall follow . . .*
Are a NASA civil service employee	This handbook unless you work at a site that involves unique military equipment and operations
Are a contractor at JSC	This handbook as called out in your contract. Prime contractors must flow down these requirements to subcontractors
Work at a JSC field site as a civil service employee or contractor employee	All chapters that don't exempt you and local requirements that meet the intent of any chapter that exempts you If a chapter exempts you, develop your own requirements that meet the intent of that chapter The local Safety and Mission Assurance Office or equivalent carries out the responsibilities of the Safety and Test Operations Division at your site
Are a non-NASA or non-contract employee	This handbook while you are on JSC property

d. If you are a federal employee working in a private employer's facility, you are covered by the JSC safety and health program. Although NASA may not have the authority to correct hazardous conditions in a private sector workplace, NASA makes sure your working conditions are safe and healthful. NASA does this by administrative controls or personal protective equipment, or your withdrawal from the private employer's facility.
e. If you are a private employer, neither Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees," nor this handbook relieves you or your employees of any rights or responsibilities under the Occupational Safety and Health Administration (OSHA).
f. This Handbook takes precedence over all other JSC documentation in safety and health, except for more stringent requirements that individual JSC organizations develop. The following requirements apply:
   (1) If your organization has more stringent requirements than are in this Handbook, you shall follow them.
   (2) In the case of differences between the requirements of this Handbook and other NASA, federal, state, or local requirements, you shall follow the more stringent requirements.
   (3) If you find any less stringent JSC requirements than are in this Handbook, or any differences between the requirements of this Handbook and other NASA, federal, state, or local requirements, bring them to the immediate attention of the JSC Director, the Safety and Mission Assurance Directorate, or the Human Health and Performance Directorate.
g. You don't need to read this entire Handbook. You need to be familiar with the elements of JSC's safety and health program, and the requirements that apply to your job. Use the Handbook to find specific requirements, as you need them. This Handbook contains several features to help you find the requirements you need:
   (1) Table of contents
   (2) Subject index
   (3) Chapter titles
   (4) Chapter introductions that tell you who has to follow that chapter
   (5) The table below tells you which parts apply to what jobs:

If your job or facility operations involve . . .	*Then you shall follow . . .*
Any work at JSC or JSC field sites	Part 5, Safety and health practices for everyone
Working with batteries Working with lasers Working in warehouses Preparing or serving food Working with cryogenic liquids or gases Handling new or unique hardware Working in chemical or research laboratories Doing test operations Entering confined spaces or controlled areas Working with compressed gases or breathing gases Use chemical alarms in your work area	Part 6, Safety and health requirements for certain hazardous tasks
Working in noisy areas Wearing a respirator Working with ionizing or nonionizing radiation Coming in contact with biohazards, blood, or body fluids	Part 7, Health protection practices
Working in machine shops Working with electricity Welding, cutting, or brazing Lifting materials Working with hand or power tools Working on ladders, scaffolds, or elevated platforms Working where fall protection is required	Part 8, Safety and health practices for manufacturing, installation, repair, and maintenance
Working with or transporting hazardous materials	Part 9, Safety and health practices for hazardous materials
Designing or constructing JSC facilities Operating hazardous or complex facilities	Part 10, Safety and health practices for JSC facilities and facility systems
Overseeing contracts or grants at JSC Participating on a Source Evaluation Board	Part 11, Safety and health requirements for JSC contracts and purchases
Working near or with asbestos-containing materials	Part 12, Asbestos Control Requirements

P.3 AUTHORITY

JPD 1700.3, "JSC Safety and Health Policy"

P.4 APPLICABLE DOCUMENTS AND FORMS

The numerous references cited throughout the Handbook are listed found in Appendix C. The numerous forms referenced are listed in Appendix D.

P.5 MEASUREMENT/VERIFICATION:

Measurements of various items addressed in the Handbook are listed in individual chapters.

P.6 CANCELLATION:

This handbook replaces JPR 1700.1J.

Approved:
Original Signed by

_____

William S. McArthur
Director, Safety and Mission Assurance

Distribution:
JDMS

Chapter 1.3 Written Safety and Health Program

1.3.1 Applicability of this chapter

1.3.1.1 You are required to follow this chapter if you:

a. Need guidance on safety and health requirements or standards

b. Need a waiver to any safety and health requirement

c. Need to recommend changes to Center-level safety and health requirements

d. Maintain Center safety and health requirements

1.3.2 Description of Sub-element 1.3

This Handbook contains JSC's written safety and health program. Parts 1–4 cover all major elements of VPP and their sub-elements. Our program also meets the requirements in 29 CFR 1960 and all federal and NASA safety and health policies and requirements. Parts 5–12 include safety and health requirements for specific tasks or situations. The Handbook is available on-line through the JSC Safety Health Homepage. It is a controlled document, and the on-line version is the official version. Check the on-line version to verify that you are using the current requirements. This chapter further defines the standards we follow and processes for waivers and changes.

1.3.3 OSHA, federal, NASA, and other standards to follow

1.3.3.1 JSC shall follow safety and health standards issued under the Occupational Safety and Health Act and other federal regulations. This includes the following standards:

a. *OSHA standards.* JSC shall follow safety and health standards issued by OSHA under Section 6 of the Occupational Safety and Health Act. JSC may follow alternate or supplementary standards that NASA Headquarters and the Secretary of Labor approve as described in 29 CFR 1960.17, "Basic Program Elements for Federal Employees OSHA." This Handbook references alternate or supplementary NASA standards in the appropriate chapters.

b. JSC shall follow these *other federal standards:*

   (1) Federal Aviation Administration standards applicable to public aircraft, since NASA operates its aircraft as public aircraft

   (2) Department of Transportation standards for shipping and handling hazardous materials

   (3) Environmental Protection Agency standards for recovering, controlling, and disposing of hazardous wastes

   (4) Nuclear Regulatory Commission standards for handling radioactive sources

   (5) The American Disabilities Act requirements for disabled employees

c. JSC shall follow any *consensus standards* referenced in this Handbook.

d. JSC shall follow NASA Headquarters safety and health requirements and standards referenced in this Handbook to include policy directives, procedural requirements, and standards and manage Agency requirements as required in NASA-STD-8709.20,

"Management Of Safety And Mission Assurance Technical Authority (SMA TA) Requirements,".

1.3.4 Standards for JSC civil service employees working at another site

a. Follow local requirements and standards if another NASA center or federal agency oversees the site.

b. Follow JSC or local requirements and standards at non-NASA and non-federal sites (including foreign countries), whichever is more stringent.

c. Notify your management if the requirements or standards at another federal agency's requirements conflict with OSHA, NASA, or JSC standards, and:

(1) Follow the most stringent standards until the conflict is resolved.

(2) If the conflict involves NASA standards, your management shall notify the NASA-designated safety and health official of the conflict.

(3) If the conflict involves OSHA standards, the NASA-designated safety and health official notifies the Secretary of Labor and the other federal agency of the conflict so that it can be resolved.

1.3.5 Waivers to safety and health requirements and standards

1.3.5.1 Waivers are a means to get authorization to take a different approach to meet the intent of the requirements, rather than to ignore requirements. NASA does not have the authority to waive federal, state, or local requirements, but may waive NASA requirements. To get a waiver to NASA or JSC requirements, you shall:

a. Follow the process in paragraph 4.2, JPR 1410.2, "JSC Directives Procedural Requirements," for waivers to JSC-level requirements.
NOTE: Concurrence from the Director, Human Health and Performance Directorate is required for waivers to health and medical requirements.

b. Follow the process in paragraph 1.13, NPR 8715.3, "NASA General Safety Program Requirements," and NASA-STD-8709.20, "Management Of Safety And Mission Assurance Technical Authority (SMA TA) Requirements," for relief from Agency-level Safety and Mission Assurance requirements, as well as paragraph 4.2.2 of JPR 1410.2. Follow paragraph 1.2 of NPR 1800.1 for waivers to Agency-level health and medical requirements.

1.3.6 Changing this Handbook

This Handbook may change due to changes in higher-level requirements or due to better ways of doing business. To suggest changes to this Handbook, follow the Center-wide process for updating existing JSC directives in paragraph 4.4, JPR 1410.2, "JSC Directives Procedural Requirements." The Director, Human Health and Performance Directorate shall concur on changes to health and medical requirements.

1.3.7 Responsibilities

a. The JSC Safety and Test Operations Division (NS) is responsible for maintaining this Handbook in coordination with the Space Medicine Operations Division and posting changes to the Safety and Health Homepage. This includes coordinating with major stakeholders for the chapters involved.

b. The Human Health and Performance Directorate is responsible for evaluating and concurring on changes to health and medical requirements.

NOTE: A list of chapters showing primary responsibility and major stakeholders can be found at URL: http://jschandbook.jsc.nasa.gov/docs/revK/JPR1700-1RevK-ChptResp.pdf.

1.3.8 Safety and health records and documentation for maintaining JSC's written safety and health program

a. Center-level records:

(1) Current JPR 1700.1

(2) Change records to JPR 1700.1

(3) Waiver documentation.

NOTE: See Appendix F, Attachment 1.1A for details on records and documentation required by this Chapter.

Chapter 1.5 Contract Worker Coverage

1.5.1 Applicability of this chapter

1.5.1.1 You are required to follow this chapter if you:

a. Are involved with selecting contractors.

b. Oversee existing contracts at JSC.

1.5.2 JSC's basic safety and health requirements for contractors

1.5.2.1 JSC will accomplish the following general objectives:

a. Ensure on-site contractor employees are provided effective safety and health protection by enforcing JSC's safety and health requirements for each contract.

b. Promptly control any hazards that contractors don't control.

c. Consider company safety and health records and programs when selecting contractors.

d. Collect injury and illness data and hours for contractors who work a total of 1,000 hours or more in any calendar quarter.

e. Monitor and evaluate contractor safety and health programs. Impose penalties for not following JSC safety and health requirements. Penalties could include terminating a contract for willful or repeated violations of JSC requirements.

NOTE: You can find guidance on selecting safety and health requirements for contracts at URL: http://www9.jsc.nasa.gov/safety/Requirements/docs/NS-TMP-006-SH-Guidelines-Proc.docx.

1.5.3 Requirements to cite in contracts

Procurement development teams shall cite JPR 1700.1, "JSC Safety and Health Handbook," current version in JSC contracts, was well as Federal, NASA, state, local,requirements and consensus standards that apply to the work on the contract. See URL: http://www9.jsc.nasa.gov/safety/Requirements/docs/NS-TMP-006-SH-Guidelines-Proc.docx for guidance on applicable requirements.

1.5.4 Requirements for service contracts

1.5.4.1 Service contracts shall:

a. Include DRD SA-1-1, "Safety and Health Plan," and JSC Form 288, "Statistical Information - Contractor Safety and Health Program," unless the contract meets the exception in the note below.

b. Include safety and health text in the Statement of Work and evaluation criteria for solicitations and Section C for contracts as found at URL: http://www6.jsc.nasa.gov/safety/Requirements/index.htm.

c. Include a safety and health clause in the solicitation or contract if a safety and health plan is required. The Safety and Test Operations Division and the Space Medicine Operations

Divisionshall approve any changes to a safety and health clause. The clause shall be one of the following:

(1) NFS 1852.223-70, “Safety and Health,” as described in NFS 1823.7001, “NASA Contract Clauses,” subparagraph a, if the plan will be submitted for NASA approval 45 days after contract start date

(2) NFS 1852.223-73 as described in NFS 1823.7001(c), if the plan will be part of the proposal and used for source selection

(3) Alternate I to NFS 1852.223-73 as prescribed in NFS 1823.7001(d) if you will negotiate the plan before contract award

NOTE: A safety and health plan may not be required if a contractor meets the criteria of NFS 1823.7001(b). Approval from the Safety and Test Operations Division and the Space Medicine Operations Division is required for any exceptions to the requirement for a safety and health plan. Usually, this will be the case if:

- The contract value is less than $5M.
- No hazardous operations or flight hardware are involved; The contract will include the Service Contract Act of 1965, which includes adequate safety and health provisions.
- The contract will require that work totaling less than 1000 hours in a quarter be performed on site at JSC, Ellington Field, Sonny Carter Training Facility or the White Sands Test Facility.

1.5.5 Requirements for construction contracts

a. Contracting officers shall make sure solicitations for bid and construction contracts require the contractor to:

(1) Follow 29 CFR 1926, “Occupational Safety and Health Standards, Construction Industry.”

(2) Follow JPR 1700.1, “JSC Safety and Health Handbook and specifically Chapter 10.1, “Safety and Health Requirements For Facility Design, Construction and Operations.”

(3) Follow other safety and health provisions required by law or contract clauses.

(4) Submit a safety and health plan enough in advance of the scheduled start of construction to allow the Safety and Test Operations Division and the Space Medicine Operations Division to review the plan and submit comments. The plan needs to thoroughly address the specific hazards and OSHA standards associated with the project. The Contracting Officer in coordination with the Contract Officer’s Representative (COR) shall approve the plan before any construction may begin.

(5) Submit a hazard analysis for the project that explicitly addresses specific hazards associated with the project. The contractor may submit the analysis in phases, but the Safety and Test Operations Division shall approve the hazard analysis for each phase before work on that phase may start.

(6) Submit a site-specific steel erection plan if the project will involve steel erection. The plan shall meet the guidelines in 29 CFR 1926, Subpart R, Appendix A.

(7) Ensure requirements are set in place that will allow the contractor project safety officers and site supervisors to take the 10- or 30-hour OSHA Construction Outreach Training before starting work. The contractor shall provide training records for project safety officers, site supervisors, and foremen before beginning work on the project.

b. CORs shall make sure the contractor follows its safety and health plan and any other safety and health requirements in the contract.

NOTE: The Safety and Test Operations Division and the Space Medicine Operations Division will periodically inspect the job site. Consult with the Facilities Management and Operations Division on additional requirements for managing construction contracts

1.5.6 Requirements for grants

1.5.6.1 If a grant involves working in a JSC facility or with JSC equipment, the grantee:

a. Shall submit a hazard assessment of the work to the Administrative Grants Officer. Follow paragraph 9.7 of NPR 8715.3 when awarding grants.

b. If the risk is significant, the grantee shall:

(1) Submit a safety and health plan to the Administrative Grants Officer or designee for approval or include safety and health provisions in the grant agreement.

(2) Report and investigate any mishaps as required by Chapter 2.6, “Mishap and Incident Investigation,” of this Handbook.

1.5.7 Requirements for contracts involving hazardous materials

1.5.7.1 The following requirements apply to solicitations or contracts that involve hazardous materials or items designated as potentially hazardous:

a. The contractor and any subcontractors shall deliver material safety data as described in the safety and health plan.

b. If the contractor acquires hazardous materials or potentially hazardous items from or through another government agency (see FAR Part 8, “Required Sources of Supplies and Services,” and FAR Subpart 17.5, “Interagency Acquisitions Under the Economy Act”), the contractor shall make sure the responsible agency provides the data required by FAR Subpart 23.3 and the clause at FAR 52.223-3, “Hazardous Material Identification and Material Safety Data.”

c. Contract involving hazardous materials shall include the clause at FAR 52.223-3. See Federal Standard No. 313, “Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities,” as revised, and the transportation requirements chapter 9.1 of this handbook. The contractor shall submit hazardous material data on the following:

(1) All items in, or ordinarily cataloged under, the Federal Supply Classes listed in Table I of Appendix 8A of Federal Standard No. 313, as revised

(2) Items having hazardous characteristics in the Federal Supply Classes listed in Table II of Appendix 8A of Federal Standard No. 313, as revised

(3) Any other material designated by a government technical representative as potentially hazardous and requiring safety and health controls

d. If the contract will involve potentially hazardous items:

(1) See FAR 23.3, “Hazardous Material Identification and Material Safety Data,” for more requirements.

(2) The solicitation or contract shall list the potentiall hazardous items.

(3) The contractor shall maintain the list of potentially hazardous items as described in its safety and health plan.

1.5.8 Requirements for off-the-shelf purchases

1.5.8.1 If you are involved in purchases of off-the-shelf products, you shall:

a. Ensure that supplies, equipment, services, and material purchased directly from vendors meet any federal safety and health laws and regulations that apply.

b. Require suppliers to:

(1) Provide Safety Data Sheets (SDSs) for hazardous materials (see Chapter 9.1)

(2) Ensure that all hazardous items delivered to the government include enough information to ensure the safe use, operation, or servicing of those items

(3) Meet the requirements for system safety in Chapter 2.3, “Hazard Analysis,” for major hardware and software acquisitions

c. Communicate to the contracting officer and the Safety and Test Operations Division findings about defective or unsafe products or materials you discover that may require recall. Sources of findings include, but are not limited to:

(1) Internal sources, such as mishap report findings, inspection reports, or complaints of defective materials and equipment

(2) External sources, such as notices from vendors, product safety bulletins, or information systems such as the Government-Industry Data Exchange Program

1.5.9 Responsibilities

a. ***JSC Contractors*** are responsible for:

(1) Providing for the safety and health of their employees and subcontractors no matter where they work (such as in JSC-owned or -leased facilities, with government equipment, or together with government employees).

(2) Maintaining an effective safety and health program, and follow all safety and health requirements that apply to the contract.

(3) Protecting JSC team members and members of the public who may visit or work in areas where their employees or subcontractors work.

(4) Providing JSC safety data on JSC Form 288.

(5) Providing a safety and health line item in their budgets.

(6) Notifying their Contracting Officer, COR, and the Safety and Test Operations Division of safety and health concerns per their safety and health plan.

(7) Providing products, equipment, and services that meet OSHA, NASA, and JSC safety and health requirements in design and operations.

(8) Making sure their subcontractors (if any) follow OSHA, NASA, and JSC safety and health requirements and documenting this “flow down” of safety and health responsibility.

(9) Allowing their contracting officer, COR, JSC safety or health personnel, and state or federal OSHA personnel access to their operations for safety or health inspections or investigations.

NOTE: These responsbilities may be tailored to individual contracts at the discretion of the Contracting Officer and the Safety and Test Operations Division.

b. ***Customer organizations that contract for goods or services*** are responsible for:

(1) Making sure safety requirements are included in purchase requests, solicitations, or contracts by means such as Statement of Work clauses or data requirements

(2) Making sure that funding is available for the contractor’s safety and health program.

(3) Directing the contractor to perform necessary safety tasks

(4) Monitoring the contractor’s safety performance under the contract to ensure the contractor follows its safety and health plan

(5) Supporting safety program audits and surveys as required by the JSC Safety and Mission Assurance Directorate

(6) Allowing JSC safety personnel to review the proposed procurements for safety requirements on request. JSC safety review is mandatory for any procurement that involves flight hardware, costs more than $1M, or is a high risk to personnel or property. Contact the Safety and Test Operations Division.

(7) Supporting the contracting officer in making sure the contractor follows the safety requirements and delivers required safety products.

(8) Coordinating all changes to safety requirements and deliverables with Safety and Test Operations Division before issuing a contract change.

(9) Fulfilling the responsibilities in paragraph 9.3.1 of NPR 8715.3.

c. ***Contracting Officers*** are responsible for:

(1) Ensuring that the Safety and Test Operations Division and the Space Medicine Operations Division have concurred with all safety and health aspects before issuing any solicitation or contract for goods or services, including any changes to the safety aspects of the contract work. See JPR 1281.6, “Procurement,” for details.

(2) Identifying safety and health risks with the procurement in consultation with the Safety and Test Operations Division and the Space Medicine Operations Division.

(3) Including the appropriate safety-related clauses and requirements required by the FAR, including NASA and JSC supplements into all contracts.

(4) Following up on contractor mishap investigations.

d. The ***Safety and Test Operations Division and the Space Medicine Operations Division*** are responsible for helping contracting officers and their CORs evaluate the risks and hazards of the products and services procured, such as:

(1) Advising technical representatives and JSC organizations on identifying and tailoring safety and health requirements from the beginning of any procurement activity

(2) Helping to draft, select, and verify specific safety and health provisions

(3) Coordinating the review of purchase requests as described in JPR 1281.6, "Procurement," and identifying safety and health requirements before issuing purchase orders

(4) Coordinating with the contracting officers the form and language of safety and health requirements to be included in solicitations and contracts, including changes

(5) Monitoring contractor performance as required

(6) Evaluating the contractor's safety-related products, deliverables, and performance, including safety and health plans and hazard analyses

(7) Coordinating with the Procurement Quality Assurance Group of the Quality and Flight Equipment Division on procurement matters

(8) Providing safety and health briefings to JSC contractors.

1.5.10 Safety and health records for contract worker coverage

1.5.10.1 The Office of Procurement shall keep Center-level records on JSC contractors as required by the contract or other JSC requirements to include:

a. Contractor OSHA 300 logs ("OSHA Log and Summary of Occupational Injuries and Illnesses") and supporting information.
b. Documentation on contractor selection that shows safety and health was considered in selecting the contractor.
c. Documentation showing contractor evaluation that includes safety and health.
d. Disciplinary action taken on a contractor because of safety and health reasons.
e. Any other safety and health documentation required by an individual contract, such as safety and health plans.

NOTE: See Appendix F, Attachment 1.1A for details on records required by this Chapter.

Chapter 1.7 Safety and Health Program Evaluation

1.7.1 Applicability of this chapter

You are required to follow this chapter if you are involved in preparing JSC's annual safety and health program evaluation. This is mostly the responsibility of safety and health professionals, though line organizations may provide information for the evaluation on request.

1.7.2 Description of Sub-element 1.7

1.7.2.1 JSC shall have a system for evaluating the operation of its safety and health program each year. This system evaluates our success in meeting our safety and health goals and objectives, and will help us determine needed changes to continually improve worker safety and health protection. The evaluation shall:

a. Be a written narrative report with recommendations for timely improvements, assigning responsibility for those improvements, and documenting timely, adequate follow-up actions or the reason no actions were taken.

b. Assess the effectiveness of all elements in JSC's safety and health program.

c. Be done by competent JSC, NASA, or other private sector persons who are trained or experienced in evaluating safety and health programs.

d. Follow the format specified by OSHA VPP Region VI and paragraph 1.8 of NPR 8715.3.

NOTE: OSHA considers JSC Main, Sonny Carter Training Facility, Ellington Field, and White Sands Test Facility as separate sites for VPP purposes. These sites may submit separate reports or combine reports.

1.7.3 Evaluate previous year's report

1.7.3.1 The process shall start by evaluating the previous year's report by reviewing:

a. Parts 1–4 of this Handbook to make sure you are familiar with the requirements.

b. The status of all actions listed in the previous year's report, including any closure documentation.

1.7.4 Evaluate current year's safety and health performance

1.7.4.1 Evaluate this year's performance by carrying out the following steps:

a. Assess the current status of program elements through any of the following:

(1) Interviews with subject matter experts

(2) Self-audits and inspections, to include Directorate Safety and Health Program Reviews

(3) Results of any relevant surveys

(4) Any available leading metrics

(5) Investigation and trend data.

(6) Any other methods available.

b. Provide detailed descriptions and evaluations for each VPP element based on the assessments in subparagraph a above. The report shall follow the format required by the OSHA VPP Region VI VPP Manager.

c. Determine actions needed to improve health and safety at JSC.

d. Document responsible parties, closure criteria, status, and estimated closure dates for each recommended action in subparagraph c above.

1.7.5 Publish the Annual Safety and Health Self-Evaluation Report

1.7.5.1 To publish the self-evaluation report:

a. Make sure all Center directorates have input, and opportunity, to comment on the report.

b. Get approval signatures from:

(1) Chief, Safety and Test Operations Division

(2) Chief, Space Medicine Operations Division

(3) President, American Federation of Government Employees

(4) JSC Safety Action Team Chair

(5) Designated Safety and Health Official

c. Send original signed report to the OSHA VPP Region VI Manager. NS and SD will each keep a copy.

d. Post report on the JSC Safety and Health homepage.

1.7.6 Responsibilities for safety and health program evaluation

a. The ***Safety and Test Operations Division*** is responsible for:

(1) Developing the evaluation report jointly with the Space Medicine Operations Division. The Safety and Test Operations Division has the final authority over the report.

(2) Publishing the final report.

(3) Providing information, jointly with the Space Medicine Operations Division, for NASA's annual report to OSHA as required in paragraph 1.6 of NPR 8715.1.

b. The ***Space Medicine Operations Division*** is responsible for developing the evaluation report and providing information for NASA's OSHA report jointly with the Safety and Test Operations Division.

1.7.7 Safety and health records for safety and health program evaluation

1.7.7.1 The Safety and Test Operations Division keeps the following Center-level records to document JSC's safety and health program evaluation:

a. A copy of each year's program evaluation.

b. Documentation on tracking self-evaluation actions to closure.

NOTE: See Appendix F, Attachment 1.1A for details on records and documentation required by this Chapter.

1.7.8 Measurement

a. Meeting the February 15 deadline for submitting the VPP Self-Assessment to OSHA.

b. Progress on, and completion of, the actions assigned by the program evaluation.

Chapter 2.6 Mishap and Incident Investigation

2.6.1 Applicability of this chapter

2.6.1.1 You are required to follow this chapter if you:

a. Work at JSC or a JSC field site as a civil servant or contractor.

b. Are a line manager, facility manager, contractor safety representative, director, or temporary official in charge of a mishap scene. Paragraph 2.6.20 of this chapter lists your responsibilities. Paragraph 2.6.20 of this chapter also lists the responsibilities of JSC's Center Director and the Director, Safety and Mission Assurance.

c. Paragraph 2.6.21 of this chapter lists the responsibilities of the Safety and Test Operations Division, the Space Medicine Operations Division, the Security Branch, the Legal Office, the Public Affairs Office, the Information Systems Directorate, contracting officers, and technical representatives.

2.6.2 Description of Sub-element 2.6

2.6.2.1 JSC shall have a system to investigate mishaps and incidents that:

a. Includes written procedures or guidance.

b. Trains investigators.

c. Produces written reports of findings.

d. Tracks hazard elimination or controls to completion.

e. Seeks the underlying causes of the mishap or event to prevent recurrence and avoids blaming the employee.

f. Covers "close call" incidents.

g. Provides feedback and lessons learned to employees.

2.6.3 What this chapter excludes

2.6.3.1 This chapter covers how to report and investigate mishaps during JSC ground operations. It excludes the following:

a. Emergency response to a mishap. You can find those requirements in Chapter 3.8.

b. Liability, disciplinary action, or program direction.

c. Response to spaceflight mission failures.

2.6.4 Actions if a mishap or close call occurs

2.6.4.1 If a mishap occurs in your area, you shall follow these steps (see also Attachment 2.6A, Appendix F, for more information):

a. Call your emergency number if the mishap is an emergency. Emergencies include:

(1) Mishaps that cause major injuries to one or more persons or major property damage

(2) Mishaps that result in a condition that is immediately dangerous to life or health

(3) Any unplanned or uncontrolled hazardous material spills or releases

(4) Any unplanned fire or explosion

(5) Mishaps that require prompt emergency response

Remember, your emergency numbers are: x33333 or (281) 483-3333 at JSC, Sonny Carter Training Facility, and Ellington Field, 9-1-1 at any off-site location, and x5911 at White Sands Test Facility.

b. Prevent further injury, damage, or environmental spill or release.

c. Secure the mishap scene.

d. Safeguard mishap evidence.

e. Report the mishap or close call as described in paragraph 2.6.5 or 2.6.6 of this chapter.

f. If you think the mishap could involve death, permanent disability, hospitalization of three or more persons, or damage greater than or equal to $500,000, contact the Safety and Test Operations Division, the Safety and Mission Assurance Directorate, or the Center Director's Office immediately. NASA Headquarters and OSHA require JSC to report these mishaps immediately.

g. Refer news media inquiries to the JSC Public Affairs Office.

The Director of Public Affairs is the only person allowed to coordinate releases of information to the news media.

2.6.5 Reporting close calls

Report close call events where no injury, property damage, or environmental spill, release, noncompliance, or nonconformance occurred on JSC Form 1257. See Chapter 2.5 for more information; the investigation will follow this chapter. At JSC, a *close call* is an event that could have caused injury, property damage, or environmental release, spill, noncompliance, or nonconformance, but didn't. For example, someone falls from a ladder and is not injured, someone almost gets cut because a machine guard is missing, or a spill almost occurs because a lid is missing from a waste containment drum. Close calls may result from hazards or unsafe acts. The Safety and Test Operations Division will assign an RAC for close call-reports as described in Chapter 3.2, "Hazard Elimination And Control," paragraphs 3.2.3–3.2.5, of this Handbook. Report actual damage and environmental remediation costs under $1,000 on JSC Form 1627, even though NASA Headquarters defines it as a "close call."

2.6.6 Reporting a mishap

2.6.6.1 A mishap is an event that causes unplanned or unexpected injury, property damage, or impact to the environment; e.g., death or injury to a test subject and irreparable damage or impact to natural or cultural resources are mishaps. Failure of a test object isn't a mishap if you expected the failure to occur as a result of the test. The supervisor of the injured employee or the manager in charge of the area where damage or a hazardous material release or spill occurred is responsible for making sure the mishap is reported. However, anyone who witnesses the mishap

may report it. You shall report all mishaps except those excluded by paragraph 1.2.2 of NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping." JSC classifies mishaps as described in paragraph 1.3 of NPR 8621.1. To report a mishap:

a. You shall fill out an initial written report within one working day on JSC Form 1627 (Part A only) and send it to the Safety and Test Operations Division. For injuries or illnesses, sending an injured or ill employee to the JSC Clinic will automatically initiate an injury report (JSC Form 340). There is no need to fill out an initial report if the injured employee goes to the JSC Clinic. Then, complete any additional information requested by the Safety and Test Operations Division within one working day. This includes a JSC Form 1627, which is based on the JSC Form 340. (You can find the form at: https://forms.neacc.nasa.gov/documents/11002/480322/JF1627.pdf.

b. You shall follow up with your investigation results within 2 weeks.

c. You shall also report the mishap to your facility manager as soon as possible.

d. You may report the mishap immediately to the Safety and Test Operations Division by telephone.

e. You shall report at least the following mishaps (civil service or contractor) to your higher management and, ultimately, to the Center Director, who notifies NASA Headquarters:

(1) Any Type A or B mishap involving damage, injury, or death. Immediately call the Center Director, Deputy Director, or Director, Safety and Mission Assurance. JSC shall notify Headquarters within 1 hour.

(2) Any injury or illness involving lost work days. Notify the Center Director to allow Headquarters notification within 24 hours.

(3) Any non-occupational fatality on site, such as one due to a heart attack. These cases won't be recorded, but the Center Director shall notify Headquarters within 24 hours.

(4) Any serious injury or illness off the job. Reporting is voluntary on the part of the employee or family. These cases won't be recorded.

f. You shall report mishaps that occur in foreign locations as described in paragraphs 2.6.7, 2.6.8, and 2.6.9 of this chapter.

2.6.7 Close calls and mishaps at international locations

2.6.7.1 You shall report:

a. Any injury or occupational illness to JSC civil service or contractor personnel.

b. Any damage to JSC equipment.

c. Close calls where JSC personnel could have been injured or JSC equipment could have been damaged.

2.6.8 How to report a close call or mishap at an international location

2.6.8.1 If a mishap occurs, follow the reporting process in this chapter as closely as your situation will allow. Call the JSC Safety and Test Operations Division at x32084 during normal JSC duty hours (Central Time) or the JSC Emergency Operations Center at x34658 outside of normal JSC duty hours to report the mishap. You shall:

a. Report the mishap to JSC via telephone within 1 hour if it involves death, serious injury, or property damage exceeding $500,000.

b. Report the mishap via telephone within 24 hours if it involves other injuries or property damage less than $500,000, or if it's a close call.

c. Report the mishap or close call to your Directorate management as soon as possible.

d. Fax a mishap report (JSC Form 1627) to the Safety and Test Operations Division within 24 hours at x40983 for mishaps that involve injury or property damage.

e. Fax a close call report (JSC Form 1257) to the Safety and Test Operations Division within 24 hours at x40983 for close calls.

2.6.9 What to do if you are injured at work while on foreign travel

You shall report to the JSC Clinic on your first business day after returning to work at JSC. This will allow the clinic personnel to make sure you have recovered or will recover, and to update your medical records.

2.6.10 Investigating mishaps in foreign countries

Your organization and the Safety and Test Operations Division will make sure the mishap is investigated under NASA requirements and international agreements.

2.6.11 How to investigate a mishap as an individual or member of a small team

2.6.11.1 All mishaps require an investigation. The Environmental Office takes the lead for mishap investigations that are strictly environmental, and will help line management with other investigations that involve environmental issues. Line managers or facility managers may delegate an investigation to employees or employee teams. The investigation results, to include an action plan or rationale why no action is necessary, are due within 2 weeks of the mishap unless you request an extension through the Safety and Test Operations Division. To investigate a mishap you shall:

a. Start your investigation as soon as all emergencies are under control. You may ask the Safety and Test Operations Division for help. A Safety and Test Operations Division representative may already be on the way to the scene. Providing medical help to injured persons and preventing further injury or damage take priority over the steps listed below. After a mishap, you shall first:

(1) Identify potential witnesses and get statements from them.

(2) Secure the mishap scene and protect it from being disturbed.

(3) Safeguard evidence such as samples and photographs.

(4) Secure all records, such as checklists, videos, and electronic data.

JSC's Center Director may appoint a mishap investigation board to investigate your mishap. If he or she appoints a board, you shall stop your investigation, keep the mishap scene and evidence secure, and cooperate with the board.
If you think a mishap investigation board should investigate your mishap, contact the Safety and Test Operations Division.

b. Refer any news media personnel that ask about the mishap to the Public Affairs Office.

The Director of Public Affairs is the only person who is allowed to coordinate releases of mishap information to the news media.

c. Consult any experts you need to sample the mishap scene or analyze the data.

d. Interview witnesses. You shall keep witness statements confidential. Guidelines for witness interviews are available at URL: http://www6.jsc.nasa.gov/safety/mishaps/docs/MIB/MIB_Witness_Guidelines.pdf.

e. Examine all evidence and analyze all mishap data to the appropriate investigation level described in paragraph 2.6.12 below. You may also use the current version of the checklists at http://www6.jsc.nasa.gov/safety/Mishaps/docs/general/NS-MI-CH01-MishapInvestigationChecklist.docx and http://www6.jsc.nasa.gov/safety/Mishaps/docs/MIB/NS-MI-CH02-MishapInvestigationBoardChecklist.docx as guidelines.

f. Document the results of your investigation and action plan or actions taken. Submit the results to the Safety and Test Operations Division as follows:

(1) Provide the required products for the mishap type listed in Figure 5 and paragraph 1.7 of NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping."

(2) Document the results of mishap investigations, where there is an injury or any damage, on an electronic investigation form you receive via electronic mail, JSC Form 1627. Include any additional documentation required in NPR 8621.1.

(3) Document the results of a close call investigation (no injury or damage) on the close call response form provided when the investigation is assigned.

g. The investigator's supervisor shall review and concur with the results of mishap investigations. The close call reporter will have an opportunity to review and comment on the results of close call investigations.

h. Have the facility manager concur on the proposed action if the mishap involved a building or hazardous materials.

i. Document lessons learned as described in paragraph 2.6.16 of this chapter.

j. Work the action plan and track it to closure as described in paragraph 2.6.13 of this chapter.

Don't use your investigation to find fault, determine disciplinary action, or defend JSC from lawsuits. Your investigation is only to prevent the mishap from happening again.

2.6.12 Investigation levels for mishaps and close calls

2.6.12.1 When you investigate a mishap or close call, you shall find the cause(s) of the mishap or close call and decide what actions you will take to eliminate or control the hazard. The basic process for investigating Type C or D and "Close Call" mishaps is in Attachment 2.6B, Appendix F. See Attachment 2.6D of Appendix F for more details on OSHA and NASA mishap categories. Contact the Environmental Office for mishaps that are strictly environmental. Take the following steps to investigate a mishap or close call:

a. For Type C mishaps – Lost time injuries (including restricted duty injuries), damage greater than or equal to $50,000 and less than $500,000:

   (1) Do a full root cause analysis using an established root cause method. The cause may be simple, but try to look beyond the obvious. Perhaps the hazard was caused by some deficiency in the management system. Perhaps it was caused by human error, which resulted from deficiency in the management system. As a minimum, you shall use the Mishap Investigation Checklist in Attachment 2.6C, Appendix F. You may use other root cause methods and provide documentation in a standard Microsoft Office or PDF format.

   (2) Evaluate the root causes and determine which ones you need to fix to prevent injuries or future hazards.

   (3) Develop an action plan to change, control, or prevent those root causes from causing injuries or future hazards. The plan may involve one item or many. Remember to turn in work requests, if necessary. If your investigation shows that no action is necessary, you shall provide rationale.

   (4) Provide the products required for Type C mishaps listed in Figure 5 and paragraph 1.7 of NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping," in a commonly available electronic format, such as PDF or Microsoft Office software.

b. For other injuries and damage cases, RAC 1 and 2 close calls, and RAC 3 and 4 close calls that involve an event (as opposed to merely reporting a hazard):

   (1) Determine the root cause(s). Avoid blaming the employee without looking into the cause. The obvious cause may be that the employee didn't follow procedures. However, this may have happened because there were no procedures or because management didn't train the employee in the procedures. As a minimum, you shall use the Mishap Investigation Checklist in Attachment 2.6C, Appendix F. You may use other root cause methods and provide documentation in a standard Microsoft Office or PDF format.

   (2) Develop an action plan to address the causes. Your action plan may involve one item or many. Remember to turn in work requests, if necessary. If your investigation shows that no action is necessary, you shall provide rationale.

   (3) Provide the products required for Type D mishaps and close calls listed in Figure 5 and paragraph 1.7 of NPR 8621.1, "NASA Procedural Requirements for Mishap and Close Call Reporting, Investigating, and Recordkeeping," in a commonly available electronic format, such as PDF or Microsoft Office software.

2.6.13 Taking action after an investigation

2.6.13.1 The following rules apply to action plans developed during mishap and close call investigations:

a. If you assign actions to other organizations, such as the Center Operations Directorate to modify the building or the Space Medicine Operations Division to sample the work area, contact those organizations ahead of time. If they don't refuse the action within 5 working days, they have accepted the action. It is their responsibility to complete the actions.

b. If you or another organization wants to change any estimated completion dates for any actions, you shall get approval from your director.

c. The Safety and Test Operations Division will track actions until they are completed and verified.

d. Verification of completed action will be as follows:

(1) For lost time mishaps (including restricted duty cases) or mishaps involving damage greater than or equal to $50,000 and less than $500,000, the Facility Manager shall first verify completion and the Safety and Test Operations Division will follow up with an independent verification.

(2) For less serious mishaps than those mentioned in subparagraph d(1) above and RAC 3 or 4 close calls, the Facility Manager verification will be sufficient to close the mishap or close call. The Safety and Test Operations Division may also follow up with an independent verification.

2.6.14 Mishap investigation boards

Mishap investigation boards are a formal method for investigating serious or potentially serious mishaps or close calls. Mishap investigation boards shall follow NPR 8621.1, which also specifies when an investigation board is required. Investigation board checklists are available at URL: http://www6.jsc.nasa.gov/safety/mishaps/docs/MIB/MIB_Checklist.pdf. Guidelines for interviewing witness are available at URL: http://www6.jsc.nasa.gov/safety/mishaps/docs/MIB/MIB_Witness_Guidelines.pdf.

2.6.15 Contractor mishaps and mishaps investigated by outside agencies

Contractors will investigate mishaps (including environmental mishaps) that involve only contractor personnel or equipment at an off-site location as described in their contracts and in paragraph 1.10.5 of NPR 8621.1. Contractor mishaps involving injury to NASA personnel or property shall be investigated as outlined in this chapter. JSC may accept investigations by outside agencies, such as OSHA or law enforcement agencies, as described in paragraph 1.10 of NPR 8621.1. JSC personnel shall support these investigations as needed.

2.6.16 Sharing lessons learned from mishaps or close calls

2.6.16.1 When you finish your investigation, decide whether you have any lessons learned to share with other organizations that would prevent them from having a similar safety, health, or environmental mishap:

a. If you have any lessons learned, you shall attach them to your final mishap or close call report when you send the report to the Safety and Test Operations Division. Enter the lessons learned into the NASA Lessons Learned system at http://llis.nasa.gov/. See NPR 8621.1 and NPR 8715.3, paragraph 1.4.3.k.

b. The Safety and Test Operations Division shares lessons learned with:

(1) JSC employees and organizations that would benefit through means such as alerts, announcements, or special reports

(2) Organizations outside JSC that would benefit through the Government Industry Data Exchange Program, product safety bulletins, or other means

2.6.17 Notification of mishaps

2.6.17.1 If a mishap occurs:

a. The Safety and Mission Assurance Directorate shall make notifications per NPR 8621.1.

b. JSC shall follow JPD 1712.1 “Management Notification Policy for Use in the Event of Serious Illness, Injury, or Death,” current version.

2.6.18 Training for mishap investigators

2.6.18.1 Mishap investigators shall have the following training:

a. “Introduction to Mishap Investigation” on SATERN (System for Administration, Training, and Educational Resources for NASA), course number SMA-00x-05

b. “Root Cause Analysis” through the JSC Safety Learning Center or the NASA Safety Training Center

2.6.19 For more information on reporting and investigating close calls and mishaps

2.6.19.1 You can find more information on reporting and investigating close calls and mishaps in these documents:

a. NPR 8715.1, “NASA Safety and Health Handbook, Occupational Safety and Health Programs.”

b. Letter UO, dated August 6, 1993, “Federal Agency Recordkeeping,” from the Director of Occupational Health and Aerospace Medicine Division, NASA Headquarters.

c. JPR 1040.4, “JSC Emergency Preparedness Plan,” including all annexes.

2.6.20 Individual responsibilities for reporting and investigating mishaps

a. *Line managers* are responsible for:

(1) Making sure close calls and mishaps in your area are reported as described in paragraphs 2.6.5 and 2.6.6 of this chapter.

(2) Investigating all Type C mishaps, incidents, and first-aid injuries as described in paragraph 2.6.12 of this chapter.

(3) Taking necessary actions to correct hazards discovered during your investigation as described in paragraph 2.6.13 of this chapter. This includes temporary measures to protect your employees and the environment while you wait on building or equipment changes. Improve on your action periodically.

(4) Supporting mishap investigation boards as necessary.

(5) Always reminding your employees that reporting close calls and mishaps is necessary. Reward those who promptly report close calls and mishaps, and reprimand those who don't.

(6) Monitoring the recovery of any employee with a lost time injury. Arrange for that employee to return to work on light or restricted duty as soon as possible.

(7) If the mishap results in a death or personal injury requiring immediate hospitalization or in damage estimated to exceed $10,000 to Government or private property, refer to NPR 3792.1, "Plan for a Drug-Free Workplace," to determine whether additional action outside the safety mishap reporting and investigating process should be taken.

b. As a *contractor safety representative*, you are responsible for helping contractor or NASA management with close-call and mishap reporting and investigation as necessary.

c. As a *facility manager*, your knowledge of your facility is important to a mishap investigation. You are responsible for:

(1) Responding to close calls and mishaps that occur in your facility.

(2) Making sure close calls and mishaps that occur in your facility are reported and investigated.

(3) Investigating close calls. Support mishap investigations as necessary.

(4) Making sure that employees in your facility know about action plans and lessons learned.

d. An *Organizational Director* at JSC is responsible for:

(1) Developing processes for reporting and investigating close calls and mishaps that occur in your Directorate

(2) Reviewing open close call or mishap reports in your Directorate and making sure that they are closed in a timely manner

(3) Providing services from your Directorate that other JSC organizations need to correct hazards found during investigations, such as testing, evaluating data, modifying buildings or equipment, or sampling work areas

(4) Being aware of mishaps in your Directorate and notifying the Deputy Center Director of lost time mishaps

e. If JSC's Center Director appoints you *temporary official in charge of a mishap scene*, you are responsible for:

(1) Overseeing the mishap scene until a mishap investigator or board takes over

(2) Keeping the Director, Safety and Mission Assurance, or Center Director informed of your status

(3) Cooperating with the incident commander at the scene of a hazardous material spill. The incident commander is in charge of the scene

f. The *JSC Center Director* is responsible for:

(1) Being the chief spokesperson for all JSC mishaps with local, state, and federal authorities and the news media through the Public Affairs Office.

(2) Supporting investigations of NASA mishaps by other federal agencies that have authority to investigate NASA mishaps, such as the National Transportation Safety Board for aircraft mishaps, and the U. S. Department of Labor for occupational mishaps. Support investigations of mishaps experienced by other federal agencies, foreign governments, and private industry, per agreements.

(3) Appointing a temporary official in charge of a mishap scene for major mishaps if necessary. The temporary official in charge will usually be: for JSC mishaps, the Safety and Mission Assurance Director; for aircraft mishaps, the aviation safety officer of the Flight Crew Operations Directorate; or, for mishaps at JSC field sites, the chief of the local Safety and Mission Assurance Office.

(4) Making sure the temporary official in charge of a mishap scene gets necessary support until the mishap investigator or board takes over.

g. The *Director, Safety and Mission Assurance,* is responsible for:

(1) Notifying JSC senior management and other organizations of all immediately reportable mishaps as described in paragraph 2.6.17 of this chapter.

(2) Recommending to JSC's Center Director how mishaps should be categorized (such as Type A or B) and investigated.

(3) Notifying the Office of the Inspector General (OIG) and the Office of the Chief Counsel immediately if it is reasonably suspected that a mishap resulted from criminal activity so that the OIG and Chief Counsel can appropriately coordinate their activities with the responsible workplace official.

(4) Reviewing mishap investigation board reports from other centers to determine applicability to JSC. Recommend actions as appropriate.

h. *Contracting Officers and their technical representatives* are responsible for:

(1) Making sure that JSC contractors understand and follow NASA and JSC contract requirements for reporting and investigating close calls and mishaps

(2) Including applicable mishap and close call reporting and investigating procedures detailed in the NASA Federal Acquisitions Regulations Supplement into contracts covering NASA programs and operations

2.6.21 Organizational responsibilities for reporting and investigating mishaps

a. The *Safety and Test Operations Division* is responsible for:

(1) Providing JSC with a list of personnel trained in mishap investigations.

(2) Keeping records of close call and mishap reports and investigations and tracking all items to completion.

(3) Coordinating with the Environmental Office on environmental mishap and close call investigations.

(4) Helping with close call and mishap investigations and actions as necessary.

(5) Reviewing and approving close call and mishap reports and action plans. Evaluate reports for possible lessons learned.

(6) Verifying that actions are completed.

b. The *Environmental Office* is responsible for:

(1) Helping the Safety and Test Operations Division with environmental mishap and close call investigations

(2) Helping the Safety and Test Operations Division to review and approve environmental mishap and close call reports and action plans

(3) Evaluating close call and mishap reports for possible environmental lessons learned

c. The *JSC Medical Clinic* (Space Medicine Operations Division) is responsible for:

(1) Filling out JSC Form 340 when an employee has an injury or illness on the job. Send copies to the Safety and Test Operations Division and the injured employee's supervisor or company.

(2) Informing the employee's supervisor and the Safety and Test Operations Division immediately of a fatality or a suspected disabling injury or illness.

(3) Providing any necessary occupational health and industrial hygiene support required by other JSC organizations to fulfill any of the responsibilities of this chapter.

(4) Providing medical or pathological information required to fulfill the requirements of this chapter under the Privacy Act of 1974.

d. The *Security Branch* is responsible for:

(1) Making sure that mishap scenes are secured

(2) Making sure that evidence and important information are preserved for the investigation

(3) Investigating motor vehicle accidents

e. The *Legal Office* is responsible for:

(1) Providing a legal advisor as required in NPR 8621.1.

(2) Assuring the privileged status of witness statements, witness testimony, or other matters related to a mishap is protected

(3) Reviewing mishap information or reports before they are released from JSC control to make sure they are releasable

f. The *Public Affairs Office* is responsible for:

(1) Providing a public affairs advisor as required by NPR 8621.1

(2) Preparing releases of any mishap information to the news media or other organizations outside JSC

(3) Having the JSC Legal Office and anyone else connected with the mishap, such as the mishap investigator or board chairperson, review information to make sure it is releasable

(4) Protecting the privileged status of witness statements, witness testimony, and other matters related to a mishap under Legal Office ground rules

(5) Following procedures for public announcements by NASA found in agreements with other agencies or contractors when releasing mishap information

(6) Coordinating information releases as described in paragraph 3.9 of NPR 8621.1

g. The *Information Resources Directorate* is responsible for providing photographic and other information services on a priority basis when needed by mishap investigations.

2.6.22 Safety and health records and documentation for mishap and incident investigation

a. **Center-level**. The Safety and Test Operations Division shall maintain:

(1) Copies of JSC Form 1627

(2) A tracking database to track mishap data, investigation, and closeout

(3) Mishap information and submit to the NASA Incident Reporting and Information System (IRIS)

(4) Copies of JSC mishap investigation board reports and supporting material, such as procedures, minutes, tape recordings, etc.

(5) A log of occupational injuries and illnesses, OSHA Form 300, as described in Appendix 1

(6) The Annual Summary of Federal Occupational Injuries and Illnesses on OSHA Form 300, as described in Attachment 1.1A, Appendix F

b. **Organizational-level documentation**. As a line manager, you are encouraged to keep documentation on mishaps in your work areas to include copies of completed JSC Form 1627 and any supporting information.

NOTE: See Appendix F, Attachment 1.1A for details on records and documentation required by this Chapter.

2.6.23 Measurement

a. Timeliness of mishap reporting.

b. Timeliness of investigation and follow-up.

Chapter 3.4 Preventive Maintenance

3.4.1 Applicability of this chapter

3.4.1.1 You are required to follow this chapter if you:

a. Are a line manager at any level.

b. Maintain Center-level equipment or systems.

3.4.2 Maintenance requirements

3.4.2.1 The following maintenance requirements apply:

a. If you operate JSC facilities or equipment, you shall have a written maintenance system for the facility and equipment to prevent equipment from becoming hazardous or causing an environmental noncompliance.

b. You shall maintain your facility and equipment so it is safe to operate and be around.

c. You shall maintain all safety, health, and environmental equipment so that it works when needed.

d. The maintenance system shall include maintenance:

(1) Maintenance requirements and schedules based on manufacturer recommendations, federal, state, local, or NASA requirements, consensus standards, hazard analyses, etc.

(2) Relevant records.

3.4.3 Responsibilities for preventive maintenance

a. The *Center Operations Directorate* is responsible for maintaining major facility systems.

b. *Line organizations operating user equipment* are responsible for making sure their user equipment is properly maintained.

c. The *Safety and Test Operations Division* is responsible for:

(1) Maintaining JSC fire detection and suppression systems

(2) Reviewing maintenance records

3.4.4 Safety and health records and documentation for preventive maintenance

3.4.4.1 Organizations owning systems and equipment shall maintain:

a. Maintenance procedures and schedules that document the process for maintaining systems or equipment and the required frequency.

b. Records documenting completed maintenance.

c. Records on anomalies and trends discovered, along with corrective actions.

NOTE: See Appendix F, Attachment 1.1A for details on records and documentation required by this Chapter.

Chapter 3.5 Hazard Correction Tracking

3.5.1 Applicability of this chapter

3.5.1.1 You are required to follow this chapter if:

a. You work at JSC or a JSC field site as a civil servant or contractor.

b. You are a supervisor, facility manager, contractor safety representative, or director. Paragraph 3.5.7 of this chapter lists your responsibilities.

c. Paragraph 3.5.7 of this chapter also lists the responsibilities of the Safety and Test Operations Division, contracting officers, and contracting officer's representatives.

3.5.2 Hazard correction and tracking

3.5.2.1 JSC tracks hazard correction to closure using abatement plans (also commonly referred to as action plans or corrective action plans) developed to address hazards found during hazard analyses, mishap investigations, inspections, surveys, and other similar activities. Hazard correction and tracking shall:

a. Follow the hazard abatement process found online at http://www6.jsc.nasa.gov/safety/hazard/process/.

b. Include interim abatement action as rapidly as possible to ensure protection of workers, facilities, and equipment. Interim abatement shall:

   (1) Remain effective until final abatement is complete.

   (2) Reduce the risk level to no worse than a RAC 3 (see chapter 3.2 for details).

   NOTE: Interim abatement actions are temporary fixes to bring hazards under immediate control through administrative controls, training, personal protective equipment, etc. until a permanent fix is in place.

c. Include final abatement actions to permanently control a hazard and reduce the risk level using the hierarchy of controls in Chapter 3.2.

d. Use the Hazard Abatement Tracking System (HATS) as the principle system at JSC to track hazard correction to closure.

e. Include hazards in HATS that meet any of the following conditions:

   (1) The hazard has a risk assessment code (RAC) of 1 or 2. See Chapter 3.2 for a discussion of the RAC.

   (2) The hazard cannot be fully abated within 30 days.

   (3) Center or Headquarters funding is needed to fully abate the hazard.

   (4) The Safety and Test Operations Division or Space Medicine Operations Division designates the hazard for tracking in HATS.

3.5.3 Organizational hazard correction and tracking

3.5.3.1 Line organizations, facility managers, and contractors shall track hazards that do not meet the criteria of 3.5.2.e above using their own tracking systems or HATS. When used, organizational hazard tracking systems shall:

a. Incorporate the basic features of the JSC hazard abatement process.

b. Be documented and available to the Safety and Test Operations Division for review.

c. Include A description of the hazard, location, date and time found, who is responsible for the hazard (hazard owner), and a RAC

d. Include interim and final abatement plans, including actions required; actions taken; assignees by name, organization, and title; due dates; and closure dates.

NOTE: WSTF may use its own tracking system.

Caution:

You shall never accept the risk of violating JSC, NASA, state, or federal requirements. If you think you can't follow a requirement, request a waiver as described in Chapter 1.3, "Written Safety and Health Program," of this Handbook.

3.5.4 Posting abatement plans

3.5.4.1 As a supervisor or facility manager, you have a responsibility to inform employees of the hazards in the work place and how they are being corrected. JSC Form (JF) 1240, "JSC Notice of Safety or Health Hazard and Action Plan," was designed to meet the requirements of both OSHA and NASA for posting hazards. The JF1240 is an automated report available from HATS. You shall post a JF1240 at the point of the hazard subject to the following requirements:

a. If final abatement likely will not occur within 30 calendar days of the hazard identification date, complete both parts of the form and post it within 30 calendar days

b. If final abatement will likely occur within 30 calendar days of the hazard identification date, either post only part 1 of JF1240 or provide another forum to inform employees of the hazard in a timely manner and what was done to fix it.

NOTE: The decision to post such a form depends on the criticality of the hazard, who may be exposed to it, and the type of controls used. If you decide use other means to inform employees, coordinate with the facility manager or affected line managers, the Safety and Test Operations Division, or the Space Medicine Operations Division where health issues are involved, to ensure exposed employees are informed.

NOTE: If you are unable to get a JF1240 as a completed form from HATS, contact HATS by e-mail at mailto:JSC-Safety-Report-Submittals@mail.nasa.gov to request a JF1240 for each HATS item in question.

3.5.5 If you need more time or money to correct a hazard

3.5.5.1 Follow the online hazard abatement process at http://www6.jsc.nasa.gov/safety//hazard/process/ to keep your abatement schedule up to date. Hazards in HATS are tracked automatically and reminders sent to the hazard owner and facility manager if an abatement plan is past due. Similarly, if an action item is past due, action assignees are notified with a copy sent to the hazard owner and facility manager. If you, as a hazard owner need more time or money to correct the hazard, you shall:

a. Make sure your hazard and your abatement plan is documented in HATS.

b. Report progress in HATS.

c. Maintain effective interim abatement controls.

d. Use available funding processes to obtain the funds needed. Use NASA Form 1584, "Safety and Health Hazard Abatement Plan," if you need to ask NASA Headquarters for funding.

   (1) Send a copy to the JSC Safety and Test Operations Division.

   (2) For safety issues, send a copy to the Director, Safety and Assurance Requirements Division, NASA-Headquarters.

   (3) For health issues, send a copy to the Chief Health and Medical Officer, NASA-Headquarters.

3.5.6 Leased space off site

If you oversee employees in an offsite leased space and can't correct a hazard in that leased space yourself, notify the General Services Administration or the federal agency that leases the space and ask for help in writing to correct the hazard.

3.5.7 Responsibilities for tracking and correcting hazards

a. As a *supervisor*, you are responsible for:

   (1) Taking necessary actions to correct hazards in your work areas. This includes temporary measures to protect your employees and the environment while you wait on building or equipment changes.

   (2) Informing employees when a hazard exists in your work areas.

b. As a *contractor safety representative*, you are responsible for helping contractor or NASA management identify, track, and correct hazards as necessary

c. As a *facility manager*, your knowledge of your facility is important for correcting hazards. You are responsible for making sure:

   (1) Hazards found in your facility are reported and corrected.

   (2) Employees in your facility are aware of corrective action plans.

   (3) A JF1240 is posted if the area to be abated is not under the immediate control of a line organization or contractor.

d. As an organizational *director* at JSC, you are responsible for:

(1) Developing processes for tracking and correcting hazards in your directorate.

(2) Reviewing open hazard reports for your directorate and making sure they are closed in a timely manner.

(3) Providing services from your directorate that other JSC organizations need to correct hazards such as testing, evaluating data, modifying buildings or equipment, or sampling work areas.

e. The *Safety and Test Operations Division* is responsible for:

(1) Reviewing and approving hazard reports and corrective action plans.

(2) Coordinating with the Environmental Office on environmental issues.

(3) Coordinating with the Space Medicine Operations Division on health issues.

3.5.8 Safety and health records and documentation for hazard correction tracking

a. Center-level records are located in the HATS database.

b. Organizational-level documentation includes:

(1) Tracking systems and processes in individual line organizations that document hazards not entered into HATS.

(2) Posted JSC Forms 1240, “JSC Notice of Safety or Health Hazard and Action Plan.”

(3) Work requests and other documentation related to correcting hazards.

NOTE: See Appendix F, Attachment 1.1A for details on records and documentation required by this Chapter.

3.5.9 Measurement for hazard correction tracking

a. Timeliness in correcting hazards.

b. Timeliness in maintaining status of hazard correction.

Chapter 5.2 Office and General Work Area Safety and Health

This could be you . . .

Two employees were burned by candles on their desks.

One employee was hurt when an over-loaded bookcase fell.

An employee slipped and fell on a freshly waxed floor, resulting in a lost-time case.

5.2.1 Applicability of this chapter

You are required to follow this chapter if you work at JSC or a JSC field site.

5.2.2 What this chapter covers

This chapter covers the basic controls for common hazards and safe work practices in offices and general work areas. The requirements and recommendations in this chapter stem from JSC's mishap and close call data as well as federal regulations.

5.2.3 What you need to do to be safe in your office

To increase your safety in the office or other work area, you shall follow the requirements in this chapter and think about consequences before taking action. You shall also follow the work shift limits in paragraph 2.15.3.1 of NPR 1800.1.

5.2.4 Doors, aisles, and hallways

5.2.4.1 Follow these rules to stay safe in doors, aisles, and hallways:

a. Keep required fire doors closed at all times. You may leave fire doors open if they have automatic releases and self-closing hardware, but don't block them with anything that would interfere with their operation.

b. If you see yellow stripes on the floor in front of a door and an OPEN DOOR SLOWLY sign, open the door with care. It opens into the flow of traffic, and you could hit someone.

c. Don't store anything in aisles and hallways. Keep aisles and passageways clear and in good repair. Remove or mark anything that blocks or sticks into an aisle or passageway. Maintain the minimum widths for exit routes shown in the diagram in Attachment 5.1A, Appendix F. Also, see Chapter 5.1, paragraphs 5.19 and 5.1.13. These are the minimum acceptable widths based on the National Fire Protection Association Standard 101, "Life Safety Code." The JSC Furniture Office may require wider exit widths to allow them to move furniture easily.

d. Cover sharp or pointed objects that block or stick into an aisle or a passageway to prevent someone from being cut or stabbed.

e. If you spill something or see a spill, stop what you are doing and clean it up. You will prevent JSC's most common mishap: slips, trips, and falls.

f. Place broken glass in a puncture-proof container or wrap it in paper and label it “Glass” before putting it in a trash can.

g. Make sure there is enough safe clearance when you use mechanical handling equipment such as pallet jacks or forklifts.

5.2.5 Walking and working surfaces

5.2.5.1 Follow these practices in your work area and building:

a. Keep floors and working surfaces as clean and dry as possible.

b. Maintain good drainage in areas with wet processes such as washing areas. Provide dry places to stand with false floors, platforms, mats, or other means.

c. Protect floor openings, open pits, tanks, vats, or ditches with covers or guardrails. If you can’t protect them yourself, report them to your supervisor. Make sure others don’t fall into any of these openings by using signs or cones or posting a guard.

d. Keep outside walking and working surfaces free of ice, snow, mud, grease, or other stuff that may make them unsafe. You may use sand, cinders, or other approved material to reduce slip hazards. Report any areas you can’t clear, cover, or block off to Work Control, x32038.

5.2.6 Telephones and electrical equipment

5.2.6.1 Electrical equipment and telephones cause many office mishaps. Here’s what to do to stay safe:

a. Use desks, tables, and other equipment to cover all floor telephone jacks and electrical outlets (commonly known as tombstones), ensuring your feet are clear of them, so they are not a tripping hazard.

b. Don’t place telephone or electrical cords across aisles unless you cover the cords with rubber channels designed for this purpose.

c. Use only personal equipment that is listed by Underwriters Laboratories (UL), Factory Mutual (FM), or other recognized testing laboratories, and that is in good working condition, such as coffee makers, radios, or lamps at work.

d. You may use UL-rated forced-air space heaters only if they have a tip-over cutoff switch. Never use a radiant space heater. NOTE: The Center Operations Directorate may restrict the use of space heaters for other reasons, such as energy conservation. When space heaters are allowed, they shall follow the requirements above.

e. Occasionally check all of your electrical cords, plugs, and outlets for damage or frayed points. Replace any that show signs of excessive wear.

5.2.7 Power strips and extension cords

5.2.7.1 Don’t connect power strips or extension cords together (that is, “daisy chain” them) since you risk overloading the circuit. You may only use extension cords under certain circumstances. Follow the rules below:

a. You may use extension cords only under the following circumstances:

(1) Temporary work such as buffing floors, remodeling, or construction.

(2) To provide power for temporary decorations or special events. This is limited to 90 days or less.

(3) Development projects or experiments. You shall remove the extension cords at the end of the project.

b. Power strips and extension cords shall meet the following:

(1) Use only UL-listed, double-insulated cords or power strips that are rated for the current they will carry.

(2) Never run the cords through walls or ceilings.

(3) Try to avoid running cords behind furniture, such as filing cabinets or bookcases, where they could be pinched or damaged. If this is necessary, leave a space behind the furniture for the cord.

(4) Never use power strips with high load equipment such as refrigerators, coffee pots, space heaters, microwave ovens, toaster, fans and shop equipment – essentially anything with an electric motor and possibly a pulley and belt. Power strips are ONLY designed for use with a high concentration of low-powered loads such as computers, audio and video equipment, musical instruments, home movie lighting, home workshops, and laboratory equipment

5.2.8 Computer workstations

5.2.8.1 Computers cause many small injuries that get worse if not corrected right away. Here's what to do:

a. Your furniture shall be ergonomically designed so that you have no discomfort when working at your computer. See paragraphs 5.5.7 and 5.5.8 in Chapter 5.5, "Ergonomics," of this Handbook for recommendations in setting up your workstation.

b. To clean the monitor, spray cleaning solution onto a cloth, then wipe the monitor. JSC has had several small fires and electrical shorts from cleaners sprayed directly onto screens.

5.2.9 Office environment

Everyone in the office should model good behavior and expect it from co-workers. Keep your work environment clean. Use spill-proof containers to hold beverages. Clean up any spills or crumbs daily. Dispose of any food refuse in the centralized trash area and not in the trash receptacle at your desk. At least once a week, wipe down anything you use on a daily basis: your keyboard, your mouse and your phone.

5.2.10 Office supplies and equipment

5.2.10.1 Knowing what office supplies are in your office and how to store them properly is key in this area. Follow these rules:

a. Don't store office supplies, equipment, or anything else in any building's mechanical rooms. Many fires begin in mechanical rooms, so it's best never to store anything, especially anything that burns, in these areas.

b. Store all office supplies in cabinets or on shelves in areas designed for storage.

c. Keep only small quantities of flammable or combustible fluids, such as cleaning supplies or printer toners and inks. Store quantities greater than 5 gallons in fireproof cabinets or bulk storage areas.

d. Maintain Material Safety Data Sheets (MSDSs)/Safety Data Sheets (SDSs) on all spray paints and any hazardous office supplies (for example, liquid paper, copier toner) used in greater than home-use quantities. You can download MSDSs/SDSs from the Health Home Page at http://ks.jsc.nasa.gov/haz/msds/msdssearchform.cfm. Direct questions about hazardous materials to the Space Medicine Operations Division at x37512. See Part 9, "Safety and health practices for hazardous materials," of this Handbook for more information on hazardous materials.

e. Keep combustible materials such as wall-mounted combustible materials, paper, tapes, and wood to a minimum.

f. Don't have open flames such as candles in your office; they could burn you or start a fire.

g. Don't hang anything from the ceiling. It could stress the ceiling or dislodge a ceiling tile.

h. Don't use halogen lamps. The bulbs get extremely hot and could easily start a fire.

i. Follow the requirements in Chapter 6.2, paragraph 6.2.2, for laser pointers.

5.2.11 Refrigerators and freezers

5.2.11.1 Shared refrigerators and freezers are a potential source of foodborne illness and disease. You shall follow the rules below:

a. Post a sign on the door exterior that reads "**Food and Drink Only.**"

b. Set the refrigerator at 40°F or below to effectively slow the growth of most bacteria.

c. Set the freezer temperature at 0°F.

d. Establish a schedule for cleaning. Discard perishable foods left in the refrigerator at least once a week. A general rule of thumb for cooked leftovers is 4 days.

e. Defrost freezers when the ice thickness reaches ½ inch.

f. Place an opened box of baking soda on a shelf to keep the refrigerator smelling fresh and help eliminate odors.

g. Avoid using solvent cleaning agents, abrasives, and all cleansers that may impart a chemical taste to food or ice cubes, or cause damage to the interior finish of the refrigerator. Follow the manufacturer's instructions.

5.2.12 Ice makers and ice machines

5.2.12.1 Many JSC buildings have installed ice machines in their facilities. Some of the ice is used for transporting or cooling specimens and the rest is used by employees. Dispenser machines are preferable to ice bins since bins have a greater potential for contamination. Follow these practices for safe ice handling:

a. Clean and sanitize all ice makers, regardless of type, per the manufacturers' recommendations.

b. If the ice is not for human consumption, ensure it is plainly marked "**Not for Human Consumption.**"

c. Follow these requirements for ice bins designated for human consumption:

(1) Ensure hands are thoroughly washed with soap and water or hand sanitizer before handling.

(2) Touch the ice scoop handle only when dispensing.

(3) Ensure containers and scoops used to store or transfer ice are sanitized routinely.

(4) Ensure the scoop does not come in contact with containers or other surfaces.

(5) Return scoop to proper storage location after use.

(6) NEVER use your bare hands, personal containers or cups to collect ice.

(7) NEVER leave the scoop inside the ice bin.

d. Contact the Space Medicine Operations Division for recommendations on sanitary procedures or before purchasing an ice machine.

NOTE: This paragraph does not apply to retail food establishments and the Aaron Cohen Childcare Facility.

5.2.13 Office furniture

5.2.13.1 Defective or improperly placed furniture has injured some people at JSC. Follow these prevention guidelines:

a. Periodically inspect your office furniture for worn, cracked, or loose parts.

b. Don't put anything that could fall and injure you on top of bookcases, storage cabinets, and large equipment. Small personal items such as pictures or plants, if stable, are allowed.

c. Secure books on top of furniture with bookends.

d. Keep at least an 18-inch clearance between the deflectors of sprinkler heads and materials or furniture below. This doesn't apply to cabinets or shelving placed against a wall unless the shelving is directly under a sprinkler head. Shelves or equipment against a wall or mounted to a wall may penetrate the 18-inch clearance unless they are directly below a sprinkler head. In that case, the 18-inch clearance applies.

e. Leave adequate space for proper activation and maintenance around heat or smoke detectors.

f. For stackable bookshelves:

If your bookshelves are located . . .	***Then you may stack . . .***
Against a wall, furniture, or secured panel	Four shelves
Free-standing	Three shelves

g. Multi-shelf, single-unit (non-stackable) bookcases are acceptable if they are against a wall, furniture, or secured panel.

h. Remember that while new file cabinets generally have satisfactory safety features, older units, which are prevalent on site, do not. Follow these practices for file cabinets:

(1) To prevent file cabinets from tipping over, secure them to the floor if possible or, at a minimum, weigh them down at the lowest drawer.

(2) Open only one drawer at a time, and be certain to latch closed drawers that are not in use. If more than one drawer is open, the unit can become unstable and tip.

(3) Never switch drawers between cabinets. This can render safety devices, including drawer stops and latches, inactive if they don't match between the cabinet and drawer. The drawer may seem to fit, but it may not be properly secured and could potentially cause injury.

5.2.14 If you have a disability

Contact the Equal Opportunity Programs Office at x30607. JSC makes every effort to accommodate employees according to the Americans with Disabilities Act.

5.2.15 If you visit other work areas

If you visit other work areas, you shall ask the occupants of that area what the safety rules are and follow them. For example, if you visit a warehouse, know and follow the requirements in Chapter 6.3, "Warehouse Safety and Health," of this Handbook. See the table of contents of this Handbook for a complete listing of safety and health rules for various areas and operations. If visiting Ellington Field for a tour, contact the Ellington Field Division Office, x49767. If traveling to Ellington Field on work business and you require hangar use, contact the Ellington Field Ground Safety Office at x49609 or stop by the office in E276, room 1003.

5.2.16 Jewelry in other work areas

If you do any maintenance or troubleshooting on any electrical or mechanical system or subsystem, you shall first remove all rings, watches, jewelry, or other metallic objects that are electrical conductors or that could be caught on sharp objects or corners.

5.2.17 Manual material handling

Attachment 5.2A, Appendix F, contains guidelines for safe manual lifting and material handling.

5.2.18 Telework

When teleworking, take measures to prevent injuries similar to those in this chapter. Pay special attention to ergonomic issues when setting up your work station.

Chapter 6.10 Entering Confined Spaces and Controlled Areas

This could be you . . .

Three technicians died in a confined space that contained nitrogen. The first one passed out and died when he entered the space. The other two passed out and died trying to rescue him.

A technician was working in a chamber that was not a confined space and encountered an oxygen-deficient atmosphere after climbing a ladder to a higher level. The technician lost consciousness and fell from the ladder.

6.10.1 Applicability of this chapter

6.10.1.1 You are required to follow this chapter if you:

a. Are part of a work crew entering confined spaces or controlled areas to do work, to include entry supervisors and attendents.

b. Are a facility manager or line manager who has a confined space or controlled area in your work area.

NOTE: If you do any of the above work at WSTF; you are required to follow WSTF procedures and requirements for entering confined spaces or controlled areas and use WSTF forms that meet the intent of this chapter.

6.10.2 What this chapter covers

This chapter contains JSC requirements for safely entering confined spaces that meet and exceed those in 29 CFR 1910.146, “Permit-Required Confined Spaces” and 29 CFR 1926, Subpart AA for construction. Paragraphs 6.10.31-6.10.34 cover controlled areas.

6.10.3 What is a confined space?

6.10.3.1 A confined space is one that meets all of the following criteria:

a. An employee can completely enter and work in the space.

b. The space has limited or restricted entries or exits.

c. The space isn’t designed for continuous employee occupancy.

Examples of confined spaces include tanks, vessels, silos, storage bins, hoppers, vaults, pits, and trenches deeper than four feet. Hazards of confined spaces include possible asphyxiation; explosions; poisoning from toxic vapors; engulfment; slips, trips, and falls; and mechanical and electrocution hazards. These confined spaces can be either an OSHA permit-required confined space or a JSC permit required confined space

6.10.4 What is an OSHA permit-required confined space?

6.10.4.1 An OSHA permit-required confined space, by OSHA definition, is a confined space (see definition above) with one or more of the following characteristics:

a. Contains, or has the potential to contain, a hazardous atmosphere that may expose employees to the risk of death, incapacitation, impaired ability to self rescue, injury, or acute illness from one or more of the following causes:

   (1) Flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL)

   (2) Airborne combustible dust at a concentration that meets or exceeds its LEL

   (3) Atmospheric oxygen concentrations below 19.5% or above 23.5%

   (4) Atmospheric concentration of any substance for which there is a published Exposure Limit and which could result in employee exposure in excess of its dose or Exposure Limit

   (5) Any other atmospheric condition that is immediately dangerous to life or health

b. Contains a material that could engulf an entrant.

c. Has an internal configuration which could trap or asphyxiate an entrant by inwardly converging walls or by a floor that slopes downward or tapers to a smaller cross section.

d. Contains any other recognized serious safety or health hazard.

6.10.5 What is a JSC permit-required confined space?

A JSC permit-required confined space is a confined space that doesn't contain or, with respect to atmospheric hazards, have the potential to contain, any hazard capable of causing death or serious physical harm.

6.10.6 Classifying a confined space at JSC

6.10.6.1 The Safety and Test Operations Division, the Space Medicine Operations Division and certain line organizations have classified known confined spaces using the above definitions. The Space Medicine Operations Division maintains a list of JSC's confined spaces and their normal classifications at https://meme-portal.jsc.nasa.gov/sites/groups/IH/JSCCS/default.aspx . Confined space locations and classification may change as facilities and operations change. The following requirements apply to identifying and classifying confined spaces:

a. JSC and WSTF line managers and facility managers shall evaluate their work areas to identify and classify confined spaces with concurrence from the Safety and Test Operations Division and the Space Medicine Operations Division.

b. Classification of a confined space is based on its normal use. However, the work to be done in a confined space may change its normal classification. Entry Supervisors:

   (1) Shall reclassify a JSC permit-required confined space as an OSHA permit-required confined space if the work to be done increases the hazard in the space. Examples include welding, chemical use, radiography, and painting.

   (2) May temporarilly reclassify an OSHA permit-required confined space as a JSC permit-required confined space if they can eliminate the hazards without entering the confined

space. This reclassification is only valid for as long as the hazards remain eliminated for that entry.

6.10.7 What to do if you have confined spaces in your work area

6.10.7.1 Facility managers or line managers who have an OSHA permit-required or a JSC-permit required confined space in their work areas shall follow these rules:

a. For an OSHA permit-required space:

(1) Inform exposed employees by posting danger signs or by any equally effective means of the existence and location of OSHA-permit-required spaces and the hazards present.

(2) Lock or bolt the space by a mechanical means.

(3) Post or stencil all entrances with DANGER signs if you can't lock or bolt the space. Contact the Space Medicine Operations Division at x34317 for signs and stencils.

b. Post or stencil JSC-permit required spaces with DANGER signs. Contact the Space Medicine Operations Division at x34317 for signs and stencils

6.10.8 Requirements for entering any confined space

6.10.8.1 Carefully plan and control work in a confined space to prevent death or serious injury. Ideally, you should eliminate the hazards in a confined space before entering it. If you can't eliminate the hazards, control them with other administrative measures or PPE. Entry Supervisors, attendants, and entrants shall follow these requirements for entering any confined space:

a. Have the following before entering any confined space:

(1) An approved and posted written entry procedure as described in paragraph 6.10.14

(2) An approved and posted entry permit as described in paragraph 6.10.15

(3) Current confined space training (within the last 2 years)

(4) A certification card (JF353) or equivalent from your employer (see Chapter 5.8)

b. Never enter a confined space until you have assessed the hazards.

c. Follow the current approved entry procedure and all conditions on the permit. Ensure the Entry Supervisor has approved the permit.

d. Control any hazardous energy sources as described in sub-paragraph 6.10.18.1.a.

e. Eliminate any known conditions that make it unsafe to remove any entrance cover before you remove it.

f. Ventilate the space for 30 minutes or as specified in the entry procedure. Continue ventilation while people are in the space, if required by the procedure. See subparagraph 6.10.17.1.a for more details.

g. Restrict access with barriers and tape. See subparagraph 6.10.22.1.f for more details.

h. Provide communications between those in the space and attendants. Also provide a method to

call for emergency services. See subparagraph 6.10.22.1.c for more details.

i. Carefully examine any work you will be doing in the space to make sure it doesn't increase hazards. If your work will increase the hazards in a JSC permit-required confined space, you shall upgrade the classification to an OSHA permit-required confined space.

j. Only allow the minimum number of people necessary to do the job in or around a confined space.

k. If you temporarilly downgrade an OSHA permit-required confined space to a JSC permit-required confined space, document that you have eliminated the hazards on your entry permit. Ventilate the space for 30 minutes before testing the atmosphere. Continue ventilation while people are in the space. See subparagraph 6.10.17.1.a for more details.

6.10.9 Requirements for entering a JSC permit-required confined space

6.10.9.1 A JSC permit-required confined space is defined in paragraph 6.10.5. In addition to the requirements in paragraph 6.10.8 above, workers entering JSC permit-required spaces shall:

a. Not enter the space until atmospheric testing shows:

(1) Oxygen levels are between 20.5% and 21.5 %

(2) Explosive atmospheres are 0% of the LEL (See subparagraphs 6.10.17.1.b, 6.10.17.1.c, and 6.10.17.1.d for more details.)

b. Use at least one attendant, unless the approved entry procedure exempts you from this requirement. See paragraph 6.10.20 for more details.

c. Wear PPE as required by the entry procedure. See paragraph 6.10.23 for more details.

d. Contact the Occupational Health Contractor at x36726 if you have any questions.

6.10.10 Requirements for entering an OSHA permit-required confined space

6.10.10.1 In addition to the requirements in paragraph 6.10.8 above, workers entering OSHA permit-required confined spaces shall:

a. Notify the Emergency Operations Center at x34658 and the Occupational Health Contractor at x36726 that you are entering an OSHA permit-required confined space.

b. Test for a high- or low-oxygen level, explosive atmosphere, and toxic gas or vapor, as specified in the entry procedure, before entering the space. Verify that:

(1) Oxygen levels are between 20.5% and 21.5%

(2) Explosive atmospheres are 0% of the LEL

(3) Toxic vapor levels meet the concentration levels specified in the entry procedure (See subparagraphs 6.10.17.1.b, 6.10.17.1.c, and 6.10.17.1.d for more details.)

c. Use the following equipment:

(1) Body harnesses, lifelines, and a hoisting or lifting device. Use wristlets for overhead and small openings. See paragraph 6.10.24 for more details.

(2) Required PPE, including hard hats. See paragraph 6.10.23 for more details.

(3) Intrinsically safe lighting and tools. See subparagraphs 6.10.18.1.c and 6.10.18.1.d for more details.

d. Have an attendant and entry supervisor present. The supervisor may leave the space if he or she isn't also the attendant. See paragraphs 6.10.19 and 6.10.20 for more details.

6.10.11 Requirements for entering a sewer

6.10.11.1 Sewer lift stations are classified as an OSHA permit-required confined space. Sewer entry differs from other permit entries in that you can rarely completely isolate the space. The atmosphere may suddenly become deadly from causes beyond your control. Workersentering a sewer shall follow the requirements in paragraph 6.10.10 and:

a. Keep in contact with the local weather bureau and fire and emergency services as much as possible to know whether to delay your entry or remove people from the sewer if:

(1) Sewer lines might suddenly flood from rain or firefighting activities.

(2) Flammable or other hazardous materials may be released into sewers from industrial or transportation accidents.

b. Never enter a sewer unless thoroughly trained in proper sewer entry procedures and the use of atmospheric testing equipment.

c. Monitor the sewer atmosphere before entry and continuously with an instrument that sounds an audible alarm in addition to a visual display for all of the following conditions (see subparagraphs 6.10.16.1.b, 6.10.16.1.c, and 6.10.16.1.d for more details):

(1) Oxygen level within the range of 20.5% and 21.5%.

(2) Flammable gas or vapor concentrations above 0% of the LEL.

(3) Any detectable hydrogen sulfide and carbon monoxide concentrations.

d. Carry the monitoring instrument at all times while in the sewer to warn of any change in atmospheric conditions. If others are working in the same immediate location, the group leader may carry an instrument for the group.

6.10.12 Requirements for entering the JSC tunnel system

6.10.12.1 The JSC tunnel system is normally classified as a JSC permit-required confined space and is continuously ventilated. Atmospheric testing is not normally required in the JSC tunnel system because it is continuously ventilated. Workers entering the tunnel system shall follow the requirements in paragraph 6.10.9 and:

a. Assess the work you will be doing. If it will create new hazards that require you to upgrade to an OSHA permit-required confined space for the zone that you will work in, you shall follow the requirements in paragraph 6.10.10.

b. Follow an approved, up-to-date entry procedure.

c. Fill out and sign a confined space permit to show that you've met safe entry conditions before you enter the tunnel.

d. Verify through the Operations Control Center x(x32038) that the ventilation fans in the intended work areas are operating.

e. Notify the Operations Control Center (x32038)before you enter and when you leave the tunnel system.

f. Wear hard hats, safety glasses, and industrial shoes (i.e., no soft-sole, open-toe, or canvas-covered shoes).

g. Have a flashlight at all times.

h. Read, sign, and follow “Tunnel Safety Awareness” at the Operations Control Center.

i. Use the “buddy system.” Don’t enter the tunnel system alone.

6.10.13 Requirements for entering a trench

6.10.13.1 Trenches greater than 4 feet deep are confined spaces at JSC. You can find requirements for working in trenches in 29 CFR 1926.650, 1926.651, and 1926.652. Refer to Chapters 5.8 and 10.1 for additional requirements for working in trenches and excavations. Workers entering trenches shall:

a. Have an approved entry procedure and a permit as described in paragraph 6.10.8.

b. Provide signs and barriers when the trench is unattended.

c. Conduct atmospheric testing before working in trenches 4 feet and greater in depth.

d. For trenches 5 feet or greater in depth:

(1) Conduct soil testing and protect from soil collapse.

(2) Allow no walking within three feet of the wall.

(3) Have a competent person or Professional Engineer design structures.

(4) Provide stairwells or ladders for entry and exit.

6.10.14 Procedure required to enter a confined space

6.10.14.1 Before you enter any confined space, you shall have a current, approved written entry procedure that covers the specific job you will do in the space.

a. Use JSC Form 992, “Confined Space Entry Procedure” (Appendix D).

b. The entry procedure shall:

(1) Be approved yearly by the Safety and Test Operations Division, the Space Medicine Operations Division, and your safety representative. You may use an entry procedure several times as long as its approval is current. If you change a procedure, you shall write a new one and have it approved.

(2) Be followed as written.

(3) Be posted at the entrance to the space so the entrants can confirm that safe entry conditions have been met.

c. Include MSDSs/SDSs for any chemicals that you will use in or near the confined space.

6.10.15 Permits for entering a confined space

6.10.15.1 Confined space entry permits document that you have met the safe entry conditions required by the entry procedure before you enter a confined space. Entrants shall have a completed and endorsed entry permit form, JSC Form 1476, "Confined Space Entry Permit" (Appendix D), to enter any confined space. Entry permits shall:

a. Document that all safety measures required in the entry procedure are taken before entry. The entry supervisor does this by completing and signing the entry permit form to authorize personnel to enter.

b. Be posted (when completed and signed) at the entrance to the space so entrants can confirm that safe entry conditions have been met.

c. Be valid only for the time required to complete the job identified on the permit and only for one working shift.

d. Include MSDSs/SDSs for any chemical being used in or near the space.

6.10.16 Canceling a permit

6.10.16.1 Entry supervisors shall follow these requirements to cancel a permit:

a. Cancel if one of the following occurs:

   (1) The work covered by the entry permit is completed.

   (2) The work shift is over.

   (3) A condition arises in or near the space that is not allowed under the entry procedure or permit.

b. All entrants shall leave the space when the permit is canceled.

c. Follow these steps after cancelling the permit:

   (1) Note any problems encountered during the operation on the permit so JSC can improve its confined space program.

   (2) Within one week, send a copy of each canceled permit to the Space Medicine Operations Division for a review.

   (3) Keep each canceled entry permit for at least one (1) year.

6.10.17 Controlling atmospheric hazards in a confined space

6.10.17.1 Entrants shall control atmospheric hazards in a confined space before entering it by following these requirements:

a. Ventilate all confined spaces with clean air for at least 30 minutes or as required by the entry procedure before testing the atmosphere in the confined space. If the space has permanently-installed continuous ventilation that has been running and continues to run, you may enter without the 30-minute waiting period if you have met all other safe entry conditions in the entry

procedure and permit. (In some cases, atmospheric testing may not be required in continuously ventilated spaces and as approved in the entry procedure.) You shall follow these requirements for forced-air ventilation:

(1) Ventilate the space continuously until the job is done, whether the space is occupied or not.

(2) Don't enter the space until the forced-air ventilation has eliminated any hazardous atmosphere without approval from the Safety and Test Operations Division, Space Medicine Operations Division, and your safety representative.

(3) Direct the ventilation to the immediate areas where employees are or will be working within the space.

(4) Take air from a clean source and make sure that the source won't increase the hazard in the space.

b. Test the atmosphere in the confined space with a calibrated direct-reading instrument from outside the space as required by the entry procedure. Periodic or continuous monitoring may also be required while working inside the space. A qualified person shown on the approved entry procedure does the initial testing. This person shall be an authorized representative of the Space Medicine Operations Division, a qualified Attendant, or an employer-designated confined space entry supervisor. The Safety and Test Operations Division and the Space Medicine Operations Division will decide who will do the testing while reviewing the entry procedure. Test for the following conditions in this order and record the results on the entry permit form:

(1) Oxygen content

(2) Flammable gases and vapors

(3) Potential toxic air contaminants

c. Confirm that the following acceptable atmospheric conditions exist in the confined space before entry:

(1) An oxygen level between 20.5% and 21.5%

(2) No positive indication of a combustible, explosive, or toxic gas or vapor

If initial testing shows conditions are unacceptable, you shall continue ventilation and retest the atmosphere unless the entry procedure says otherwise. If the readings continue to be unacceptable, call the Occupational Health Contractor at x36726 for further air quality testing.

d. Follow these rules while working in the confined space:

(1) Test the atmosphere in the space periodically to make sure acceptable conditions are being maintained during entry operations. The time period between tests shall be specified on the entry procedure and entry permit.

(2) Test the atmosphere continuously if you can't isolate the space because it is large or is part of a continuous system, or the work being done in the space makes continuous testing necessary.

(3) A continuously ventilated confined space may not require periodic or continuous atmospheric testing if no chemicals leak into the space or if no hazardous conditions are generated by the work being performed. If you detect a chemical leak or change in conditions in the space, re-evaluate the continuously ventilated space and test the atmosphere.

(4) Record all readings on the permit.

e. Make sure all instruments used to test the atmosphere in a confined space are:

(1) Calibrated under the manufacturer's guidelines

(2) Working properly before using them

(3) Labeled with calibration dates and cycles to show that they are within the calibration period

f. If feasible isolate pipelines containing flammable, toxic, irritating, or oxygen-displacing gases or vapors to prevent a hazardous atmosphere from forming inside the space while work is being done. Isolate pipelines by:

(1) Completely depressurizing and disconnecting possible contaminant supply lines and placing a blank flange on the pipe leading into the confined space

(2) Using two blocking valves with a vent valve open between them

(3) Using other blank, block, and bleed valve configurations previously approved by the Safety and Test Operations Division

6.10.18 Controlling other hazards in a confined space

6.10.18.1 Entry Supervisors and Entrants shall isolate energy sources to the area where they will be working to prevent mishaps, such as electrical shock, fire, or injury from moving parts as follows:

a. Follow lockout/tagout and isolation requirements in Chapter 8.2, "Lockout/tagout Practices," to protect entrants from unexpected energy release.

b. Deactivate, shield, or remove all radioactive sources.

c. Safeguard personnel by:

(1) Using only properly insulated or grounded portable electrical equipment. Double-insulated electrical hand tools are acceptable. Inspect all electrical equipment before entry.

(2) Using ground fault circuit interrupter (GFCI) circuit breakers for all case-grounded, portable electrical equipment. GFCIs should be 4 to 6 milliamp. Place them at the power source unless the source is an ungrounded portable generator, an ungrounded battery of less than 28 volts, or an ungrounded isolation transformer of less than 28 volts.

(3) Using pneumatic power tools instead of electrical tools when possible. Pneumatic tools shall have conductive air supply hoses. Never use nitrogen or other inert gases to power the tools. Use breathable air to power pneumatic tools.

(4) Using cordless, rechargeable portable power tools, with an intrinsically safe rating, when possible. If they are used, they shall have an explosion-proof or intrinsically safe rating for

spaces that could contain or develop an explosive atmosphere.

(5) Protecting temporary lighting with bulb guards or by recessing the bulbs. Power temporary lighting in locations that are wet or have standing fluids with batteries or low-voltage circuits.

(6) Grounding or double-insulating heavy-duty electric cords and all metal housings.

d. Control ignition sources by:

(1) Using explosion-proof or intrinsically safe (non-sparking) lighting, ventilation equipment, and tools in potentially flammable atmospheres.

(2) Never bringing ignition sources into an OSHA permit-required confined space until tests by a confined space monitor have confirmed combustible or flammable gases or vapors aren't present in the space. You may work in confined space atmospheres with more than 0%, but never more than 10%, of the LEL if you have previous approval from the Safety and Test Operations Division or the Space Medicine Operations Division.

(3) Never using polyethylene and other materials that generate static electricity where explosive atmospheres could exist. Tents erected over or around the space shall be of a conductive material and properly grounded.

6.10.19 Duties of entry supervisors

6.10.19.1 As an *entry supervisor*, you shall:

a. Be an employee of the organization or company owning the entry procedure.

b. Be properly trained and certified in confined space entry procedures.

c. Know the hazards entrants may face in a confined space, including information on the mode, signs or symptoms, and consequences of the hazard exposures.

d. Make required pre-entry notifications, and coordinate all entries with the cognizant safety representative.

(1) Notify the JSC Emergency Operations Center (x34658) and the Occupational Health Contractor (x36726) immediately before anyone enters an OSHA permit-required confined space.

(2) Follow the hot work requirements in Chapter 5.8, paragraphs 5.8.9 – 5.8.11 if you will be doing hot work.

e. Evaluate conditions inside and outside the confined space, including temperature extremes, humidity, noise, and vibration, before entry. Determine what measures are necessary for a safe entry and to make sure those measures are taken.

f. Complete an entry permit and check each entry to make sure of the following before signing the permit and allowing anyone to enter:

(1) All required blocks are filled in.

(2) All tests specified by the entry procedure have been conducted.

(3) All requirements and equipment specified by the entry procedure are in place.

g. Post the approved entry procedure and permit at the job site and distribute required copies.

h. Make sure all attendants and authorized entrants are properly trained and certified before entry.

i. Make sure you have all other required permits, such as hot work and hazardous operations permits, before entry.

j. Make sure oxygen and combustible gas-monitoring devices are available, calibrated, and used for atmospheric testing, if required by the entry procedure.

k. Make sure specified rescue services are available.

l. Make sure that the method of communication is appropriate for the atmosphere in the space.

m. Make sure communication devices work and attendants can maintain communications with you, the entrants, and rescue services.

n. Remove unauthorized individuals who enter, or who attempt to enter, the space during operations.

o. If you need to transfer responsibility for the space to another supervisor, make sure that operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained. Evaluate conditions as often as needed by the hazards of operations in the space.

p. Remove all workers from the space and cancel the permit when the job is done, the work shift is over, or when unacceptable conditions arise. Provide the Space Medicine Operations Division a copy of the canceled permit.

6.10.20 Duties of entry attendants

6.10.20.1 At least one attendant needs to be in the immediate vicinity outside an OSHA permit-required confined space and other spaces, if the entry procedure requires, while people are working in the space. As an *entry attendant* you shall:

a. Be properly trained and certified in confined space entry procedures.

b. Know the hazards entrants may face in a confined space, including information on the mode, signs or symptoms, and consequences of the hazard exposures.

c. Be aware of possible behavioral effects on entrants exposed to hazards.

d. Continuously keep an accurate count of authorized entrants in the space on the entry permit form.

e. Remain outside the permit space during entry operations until relieved by another qualified attendant.

f. Keep in visual or voice contact with authorized entrants as necessary to monitor entrant status. If the personnel in the space need to leave visual contact and verbal contact with the attendants, use mechanical or electronic communications.

g. Monitor activities inside and outside the space to determine whether it is safe for entrants to stay in the space. Order those inside to leave the space immediately if you:

(1) Detect a prohibited condition

(2) Notice behavioral effects of hazard exposure in someone in the space

(3) See a situation outside the space that could endanger those inside

(4) Can't effectively and safely perform all of your required duties

h. Maintain the method of contacting emergency services as required in the approved entry procedure.

i. Call emergency rescue services when you see that those inside may need help to escape from hazards in the space.

j. Take the following actions when unauthorized persons (not involved in the entry) approach or enter a permit space while entry is under way:

(1) Warn the unauthorized persons to stay away from the permit space.

(2) Advise the unauthorized persons to exit immediately if they have entered the permit space.

(3) Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space.

(4) Stop confined space operations until unauthorized personnel are removed.

k. Perform non-entry rescues, when necessary and feasible, after notifying emergency rescue services. Never enter a confined space to rescue someone unless you are part of an emergency rescue team as described in paragraph 6.10.24.

l. Never do anything that might interfere with your primary duty to monitor and protect those inside the space.

6.10.21 Duties of authorized entrants

6.10.21.1 If you are an *authorized entrant*, you shall:

a. Be properly trained and certified in confined space entry procedures.

b. Know the hazards that you may face in a confined space, including information on the mode, signs or symptoms, and consequences of the hazard exposures.

c. Properly use equipment as required by this chapter.

d. Communicate with the attendant as necessary so the attendant can monitor your status and alert you if you need to evacuate the space.

e. Alert the attendant if you:

(1) Recognize any warning sign or symptom of a dangerous situation

(2) Detect a prohibited condition

f. Exit from the permit space as quickly as possible if you:

(1) Get an order to evacuate from the attendant or the entry supervisor

(2) Recognize any warning sign or symptom of a dangerous situation

(3) Detect a prohibited condition

(4) Hear an evacuation alarm

6.10.22 Equipment for entering a confined space

6.10.22.1 Entrants shall have the following equipment before entering, as required by the entry procedure:

a. Portable ventilating equipment for spaces without permanent mechanical ventilation. You are responsible for providing ventilating equipment.

b. Testing and monitoring equipment for atmospheric testing as indicated on approved entry procedures. You are responsible for providing testing and monitoring equipment.

c. Communications equipment that is compatible with the atmosphere in the space for communicating with entrants and emergency services.

d. GFCI for all portable electrical equipment.

e. Lighting equipment for safety while working in and exiting the space.

f. Barriers, signs (as described in 6.10.7.1), and shields to prevent inadvertent entries into confined spaces while work is in progress.

g. Equipment, such as ladders, needed to safely enter and exit the space.

h. Any other equipment necessary for safe operations in the space.

6.10.23 Protective clothing and equipment for entering a confined space

6.10.23.1 If you enter a confined space, you shall wear PPE as required in the entry procedure to protect you from hazards in the space. You shall:

a. Follow Chapter 5.6, “Personal Protective Equipment.”

b. Use a self-contained breathing apparatus (SCBA) only when you can fit through the entry openings with an SCBA strapped on. If you can’t do this, or if free space opening is less than or equal to 18 inches in diameter, use a supplied-air respirator.

c. Follow Chapter 7.2, “Respiratory Protection,” for respirator use.

6.10.24 Rescue and emergency equipment

6.10.24.1 Work crews shall have rescue and emergency equipment in place before anyone enters the confined space as required in the approved entry procedure. Never enter a confined space to rescue someone. Non-entry rescue and emergency equipment shall include:

a. Retrieval equipment for anyone who enters an OSHA permit-required confined space, unless that equipment would increase the overall risk of entry or would not help you rescue an entrant. Each entrant shall have the following retrieval equipment:

(1) A chest or full-body harness with a retrieval line that meets: ANSI/ASSE A10.32-2012, “Fall Protection Systems for Construction and Demolition Operations;” ANSI/ASSE Z359.1, “Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components;” and ANSI/ASSE Z359.4, “Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems, & Components.” Attach the retrieval line at the center of the entrant’s back, near shoulder level, or above the entrant’s head. Inspect harness and lines before each use and have them inspected semi-annually as described in the

manufacturer's instructions.

(2) Wristlet harnesses instead of a chest or full-body harness if access to the confined space is less than 18 inches in unobstructed diameter. You may also use wristlet harnesses a chest or full-body harness isn't feasible or creates a greater hazard. The entry supervisor needs to show that wristlet harnesses are the safest and most effective alternative. Approval is required from the Safety and Test Operations Division and the Space Medicine Operations Division for any exceptions.

Note: Wristlets are designed to help remove people from confined spaces by extending their arms, but are not designed to lift a person out of a space. Use a full-body harness instead.

(3) A retrieval line from the harness attached to a mechanical device or fixed point outside the space so an attendant can begin rescue if he or she is aware that rescue is necessary.

b. A mechanical hoist and supporting structure over the opening for OSHA permit-required confined spaces with top-opening entrances or that are vertical and more than 5 feet deep. The entry supervisor may require hoist and support for JSC permit-required confined spaces with top-opening entrances.

c. Extra supplied air respirators for rescuers if the entrants use supplied air respirators to work in the space. You usually use supplied air respirators if openings aren't large enough for SCBAs or the job will last longer than an SCBA's air supply. Inspect and check all rescue respirators before anyone enters the space.

d. Any other equipment necessary to safely rescue someone from the space.

e. A method of contacting emergency services as required in the approved entry procedure.

6.10.25 What to do in an emergency

Remember, your emergency numbers are: x33333 or (281) 483-3333 at JSC, Sonny Carter Training Facility, and Ellington Field.

6.10.25.1 In an emergency, you as an *attendant* or *entry supervisor* shall:

a. Follow emergency procedures. Never attempt to rescue a worker from a confined space until you call your emergency number for a rescue team.

b. Never enter a confined space to rescue someone. Only approved rescue teams meeting the requirements of 29 CFR 1910.146(k) and are approved by the Safety and Test Operations Division and the Space Medicine Operations Division may enter a confined space for rescue.

c. Make sure an MSDS/SDS or similar written information is provided to the medical facility treating an entrant who is exposed to a hazardous substance .

d. Coordinate with local fire and ambulance services if you rely on them for confined space rescues by:

(1) Telling them about the hazards they may face during confined space rescues

(2) Having them visit all confined spaces to which they may be called so that they can develop rescue plans for each space and practice rescue operations

6.10.26 Medical surveillance examination

Entrants shall have a medical surveillance examination as required in Chapter 3.6 before becoming qualified to enter an OSHA-permitted Confined Space.

6.10.27 Training for confined spaces

6.10.27.1 Training provides supervisors, attendants, and entrants with the knowledge and skills needed to work safely in and around confined spaces as follows:

a. If you are involved with any work in a confined space, you shall have training:

(1) Before you are first assigned confined space duties and before your assigned duties change.

(2) Whenever work in a confined space presents new hazards for which you are not trained.

(3) Whenever you think that there are deviations from entry procedures or that your knowledge or use of the procedures may be inadequate.

(4) By taking JSC's Confined Space Entry course. This course meets the requirements of 29 CFR 1910.146 for entry supervisors, attendants, and entrants. You may also take JSC site-specific confined space entry training through the Houston Area Safety Council..

NOTE: WSTF personnel take WSTF's confined space entry course.

(5) By getting a training completion card stating you have been trained in JSC's confined space requirements. The card is good for 2 years. Then you shall be retrained.

b. As an *entry supervisor*, you shall at least have training in JSC's confined space entry program and in your duties listed in paragraph 6.10.19.

c. As an *entry attendant*, you shall at least have training in JSC's confined space entry program and in your duties listed in paragraph 6.10.20.

d. As an *authorized entrant*, you shall at least have training in JSC's confined space entry program and in your duties listed in paragraph 6.10.21.

6.10.28 Certification

The employer shall certify that the training required by the OSHA standard has been accomplished. See Chapter 5.8.

6.10.29 Off-site contractors entering confined spaces

6.10.29.1 For off-site contractors entering confined spaces:

a. If you arrange to have employees of an off-site contractor perform work in a confined space, you shall:

(1) Inform the contractor that the workplace has confined spaces and that the contractor needs to follow JSC's confined space entry program when working in confined spaces.

(2) Tell the contractor why a space in question is a confined space, including the hazards identified and JSC's experience with the space.

(3) Tell the contractor of any precautions or procedures JSC has implemented under its program to protect employees in or near the spaces that contractor personnel will be working in.

(4) Ensure the contractor is working under an approved entry procedure.

(5) Make sure that contractor employees who will enter confined spaces receive the training in paragraph 6.10.27 and have been certified by their employer.

(6) Coordinate entry operations with the contractor.

(7) Debrief the contractor when the job is done about JSC's permit space program and the hazards found or created in the spaces during operations.

b. If you are the contractor in subparagraph a above, you shall follow JSC's confined space requirements in this chapter and:

(1) Obtain any available information on permit space hazards and entry operations from the contracting organization.

(2) Make sure all employees who will work in confined spaces are trained as described in paragraph 6.10.27 and certified as described in paragraph 6.10.28. They shall also provide documentation of prior class work in confined space entry, receive the JSC confined space overview, and demonstrate an understanding of JSC's program.

(3) Coordinate entry operations with the contracting organization.

(4) Inform the contracting organization of any hazards that found or created in any confined space, either at a debriefing or while working.

6.10.30 For more information on entering confined spaces

a. 29 CFR 1910.146, "Permit-Required Confined Spaces"

b. ANSI A10.14-91, "Safety Belt Use"

c. ANSI Z117.1-2009, "Standard on Confined Space Entry"

d. NIOSH Criteria Document on Working in Confined Spaces

e. NIOSH Publication IF 87-113, "A Guide to Safety in Confined Spaces"

f. NHS/IH 1845.2, Publication No. 80-106, "Entry Into and Work in Confined Spaces"

6.10.31 Definition of a controlled area

6.10.31.1 A controlled area is one that

a. An employee can completely enter and work in, but is not, by definition, a confined space.

b. Periodically contains, or can, after a single point failure, contain a hazardous atmosphere when employees are present that may expose them to the risk of death, or acute illness, injury, incapacitation, and impaired ability to self rescue from any of the following conditions:

(1) Flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL).

(2) Airborne combustible dust at a concentration that meets or exceeds its LEL.

(3) Atmospheric oxygen concentrations below 19.5% or above 23.5%. Note: Atmospheric oxygen concentrations may vary significantly due to stratification or inadequate mixing (e.g., be acceptable at one location but not another).

(4) Atmospheric concentration of any substance for which there is a published exposure limit and which could result in employee exposure in excess of that limit.

c. Contains any other condition immediately dangerous to life or health. Examples of controlled areas include:

(1) Vacuum chambers (during non-test conditions)

(2) Hyperbaric and hypobaric chambers

(3) WSTF altitude test stands

(4) Enclosed outdoor areas for loading liquid nitrogen

(5) Laboratories with compressed or plumbed gas lines or LN2 dewars

(6) Temporary work areas where construction, welding, or other work processes can create the conditions described above

6.10.32 Identifying a controlled area at JSC

6.10.32.1 To identify controlled areas, line managers shall:

a. Evaluate work areas to identify controlled areas. Consult safety or health representatives to help in the determination. Consider the area based on its use when personnel are present. For example, evaluate the interior of a vacuum test chamber during periods for maintenance, test article mounting, instrumentation set-ups, etc. Do not evaluate a vacuum chamber while it is at vacuum under test conditions.

b. Designate an area as “controlled” if occupational safety or health representatives determine it should be a controlled area after close calls, mishaps, hazard analysis, or other inspection indicate that the hazards require additional mitigation or monitoring.

NOTE: Depending on the configuration of the area, a controlled area may be upgraded to a JSC- or OSHA-permitted confined space.

6.10.33 What to do if you have controlled areas in your work area

6.10.33.1 If you, as a facility manager or line manager, have a controlled area in your work area, you shall:

a. Ensure the controlled area is covered by a Hazard Analysis per chapter 2.3. The Hazard Analysis shall include:

(1) Control of both hardware configuration and procedures that may generate the hazardous condition. Consider an entry checklist, entry procedure, warning signs, or training.

(2) Any critical timing associated with the controls. Note that there are trades to be made. If the valve were closed and locked, the critical time may be extended to a shift or longer.

b. Notify the Space Medicine Operations Division of the controlled area.

c. Include the hazard analysis in the facility baseline documentation if required by chapter 10.4.

d. Periodically assess the effectiveness of controls by field inspection.

6.10.34 Responsibilities for controlled areas

a. The Space Medicine Operations Division shall:

(1) Maintain a list of controlled areas under these requirements at https://meme-portal.jsc.nasa.gov/sites/groups/IH/Lists/Controlled%20Areas%20Database/AllItems.aspx

(2) Assess the effectiveness of controlled area controls yearly

b. The Safety and Test Operations Division shall:

(1) Assess the hazard analyses and controls during audits of the facility.

(2) Assess workplace conditions for compliance with these requirements during periodic facility inspections

Chapter 8.2 Lockout/Tagout Practices

This could be you . . .

An electrician received a shock from a 480-volt alternating current source while modifying a motor controls panel. The hot junction was an undocumented change to the panel. The electrician could have been killed but only suffered injury since the current passed through the arm only.

An operator failed to turn off and lockout a pipe-cutting machine after it stalled. He lost a finger as a result because he was touching the chain and sprocket drive when the machine unexpectedly restarted.

Employees who were not certified to service or operate a crane violated a Do Not Operate tag and operated the crane. They damaged highly valued equipment.

8.2.1 Applicability of this chapter

8.2.1.1 You are required to follow this chapter if you do any of the tasks listed in paragraph 8.2.4 below at JSC, including Ellington Field or Sonny Carter Training Facility, whether a civil service or contactor employee. If you work at a JSC field site, follow local requirements that meet the intent of this chapter.

8.2.2 JSC's LO/TO program

8.2.2.1 This chapter is JSC's LO/TO standard, which is designed to implement 29 CFR 1910.147, "The Control of Hazardous Energy (Lockout/Tagout)." It provides a consistent and uniform policy and *minimum* requirements for locking out and tagging out energy-isolating devices during maintenance, service, or repairs on machinery, equipment, or systems. The intent of JSC's LO/TO program is to ensure machines, equipment, and systems are properly and uniformly locked out and tagged out throughout JSC, and *ALL* employees are protected from exposure to an unexpected energy release. Projects, contractos, and organizations:

a. May take this basic LO/TO standard and develop addendums to meet their particular operations and procedures, as long as the intent of the standard is met or exceeded. Addendums shall be followed by all employees, and strictly enforced.

b. Shall develop, document, and use procedures for controlling potentially hazardous energy unless specifically exempted under 29 CFR 1910.147(c)(4)(i). These procedures are required to meet the requirements in this chapter and clearly and specifically outline the scope, purpose, authorization, rules, and techniques to be used for controlling hazardous energy and the means to enforce compliance including, but not limited to, the following:

   (1) A specific statement of the intended use of the procedure

   (2) Specific procedural steps for shutting down, isolating, blocking, and securing machines or equipment to control hazardous energy

   (3) Specific procedural steps for placing, removing, and transferring LO/TO devices or tagout

devices and who is responsible for them

(4) Specific requirements for testing a machine or equipment to verify the effectiveness of lockout devices, tagout devices, and other energy control measures before starting the maintenance, repair or service work

8.2.3 Operations not covered by this chapter

a. Work on cord- and plug-connected electrical equipment where the hazard of unexpected energizing or start up of the equipment is controlled by meeting both of the following conditions:

(1) Unplugging the equipment from the energy source.

(2) Keeping the plug under the exclusive control of the employee performing the servicing or maintenance. At no time should servicing or maintenance be performed while the equipment is plugged in. You may troubleshoot electronic circuits if you have an approved safe procedure and follow the requirements in chapter 8.1, “Electrical Safety.”

b. Hot tap operations involving transmission and distribution systems for substances, such as gas, steam, water, or petroleum products on pressurized pipelines, provided that the project, contractor, or organization demonstrates that all of the following are true:

(1) Continuity of service is essential.

(2) Shutdown of the system is impractical.

(3) Documented procedures were followed and special equipment was used to provide proven effective protection for employees.

8.2.4 Operation control of equipment when lockout/tagout is not required, but control is needed to prevent damage or for other operational issues. This is covered in attachment 8.2B, Appendix F, “Operational Control.”**LO/TO Employee Categories**

8.2.4.1 Specific categories of employees under this chapter are:

a. *Authorized employee*: A person who locks out or tags out machines or equipment to service or maintain those machines or that equipment.

b. *Affected employee*: An employee whose job requires him or her to operate or use a machine or equipment that is being serviced or maintained under lockout/ tagout, or whose job requires him or her to work in an area in which the servicing is being done. An affected employee becomes an authorized employee when the employee’s duties include servicing or maintenance covered under LO/TO.

c. *Other employee*: An employee whose work operations actually is, or potentially may be, in an area during the period when energy control procedures will be used.

d. *Task Group Representative (TGR)*: A person who is responsible for the identification and locking/tagging of the energy isolation points during group LO/TO.

8.2.5 Contracts involving LO/TO at JSC

8.2.5.1 The following requirements apply for contract work involving LO/TO in JSC facilities:

a. If you contract or sub-contact for services, you are responsible for notifying contractors or subcontractors of JSC's LO/TO program requirements, and shall provide a copy of this chapter to the contractor or subcontractor.

b. All contractors shall make sure that their employees understand and follow this chapter.

8.2.6 General requirements and enforcement

8.2.6.1 The following requirements apply to all employees, machines, and equipment at JSC:

a. If you see a piece of equipment that is locked out or tagged out, you **shall never** attempt to start, energize, or use that machine or equipment except as required to verify isolation in subparagraph 8.2.7.1.g. below.

b. If you are an "authorized employee," you shall follow the steps listed in subparagraph 8.2.6.1 below when locking out or tagging out a component or system.

c. If you violate LO/TO, you are subject to disciplinary measures by your employer as described in Chapter 3.7, "Disciplinary System."

d. When installing new machines or equipment, or when replacing, repairing, renovating, or modifying existing machines or equipment, you shall design the energy-isolating devices to accept a lockout device.

8.2.7 JSC's basic LO/TO requirements

8.2.7.1 You shall follow these steps when maintaining, servicing, or repairing equipment:

a. Prepare for shutdown. Determine the types and magnitudes of the energy sources (such as mechanical, electrical, chemical), assess the hazards of each energy source, and define the method or means to control each energy source.

b. Notify "affected employees" who operate the equipment that you will be working on.

c. Shut down equipment using procedures established for that machine or equipment.

d. Isolate all energy sources.

e. Attach LO/TO isolation devices as described in paragraphs 8.2.8 and 8.2.9 below. Also note the requirements for group lockout and shift changes in paragraphs 8.2.13 and 8.2.14 below.

f. Release all potential or stored energy, as described in paragraph 9 below.

g. Verify the isolation, including testing; see paragraph 8.2.11.

h. Service, repair, or maintain the equipment.

i. Inspect the work area to ensure all nonessential items have been removed and machine or equipment components are operationally intact. Make sure all employees have been safely positioned and are not in the operational area before re-energizing the equipment.

j. Notify "affected employees" that lockout or tagout devices will be removed.

k. Remove LO/TO isolation devices as described in paragraph 8.2.12 below.

l. Restore the equipment to operation.

Note: If the equipment you will be working on has another lock or tag, such as the WARNING: DO NOT OPERATE tag, or another employee's lock and tag, you still need to lockout and tagout the equipment per this chapter before working on it. This includes evaluating the situation to determine if your lockout/tagout devices can be applied in addition to the existing lock or tag or whether you must have the other lock or tag removed. Revise your lockout/tagout procedure as needed.

8.2.8 Hardware (locks and lockout devices)

8.2.8.1 Attaching locks, tags, and other necessary hardware will ensure the energy isolation device cannot be inadvertently switched or changed during maintenance or repair activities. To get locks for lockout, follow the "Policy on issuing locks and tags" in Attachment 8.2A, Appendix F. The following requirements apply to locks and lockout devices:

a. **Locks**. You shall only use locks provided by JSC for isolating, securing, or locking equipment from identified energy sources. Dedicated lockout padlocks at JSC are RED in color and individually keyed and numbered. Never use a RED lock for any other purpose. Orange locks with RED shrink wrap shall designate high voltage lockout/tagout by the Center Operations Directorate.

b. **Other lockout devices.** These include, but are not limited to, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware for isolating, securing, or blocking machines or equipment from energy sources. Your company or organization shall provide these devices. They shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as bolt cutters or other metal-cutting tools.

8.2.9 LO/TO tags

8.2.9.1 Tags are essentially informational devices attached to the lockout devices. Tags do not provide the physical restraint provided by a lockTo get tagout tags, follow the "Policy on issuing locks and tags" in Attachment 8.2A, Appendix 8F. The following requirements apply to tags:

a. If you are going to personally work on a system, you shall only use the red LO/TO form (JSC Form (JF) 1291) and attach it by putting the red padlock through the grommet or by using nylon cable ties provided by JSC to attach it to the padlock or same point as the padlock.

b. Tag information shall be legible and understandable.

c. If an energy-isolating device is not capable of being locked out, you shall use a tagout device instead.

d. You shall never use the red LOCKOUT TAGOUT tag as a WARNING, DO NOT OPERATE tag. The DANGER, LOCKOUT TAGOUT (JF 1291) tag means one thing and one thing only: that you are personally working on the system.

e. If you use a tag without a lockout device, you shall also use other methods to isolate all sources of energy, such as block and bleed, blinds, valve hand-wheel removal, etc.

f. You shall also use all reasonable means to make sure that the energy-isolating device is not

operated.

g. You shall document that these other methods are at least as effective as a lockout device would have been, if it were used. This shall meet all tagout provisions of 29 CFR 1910.147, and specifically paragraph 147(c)(3)(ii).

h. When a tag is attached for energy isolation, no one may remove it without the authorization of the person responsible for the tag. It shall never be bypassed, ignored, or otherwise defeated. Never energize the system when a tag is in place except under specific conditions per written procedure outlined in this chapter (testing system to ensure that there is no power, etc.).

i. For energy-isolating devices not capable of being locked out, you shall attach the tag to the device or as closely as safely possible to the device and in a position immediately obvious to anyone attempting to operate the device.

j. JSC tags contain log and tag number spaces, which you may use as best fits your needs, but you shall address the log and tag numbers in any LO/TO procedures you develop.

8.2.10 Releasing stored energy

After attaching lockout or tagout devices to energy isolating devices, you shall relieve, disconnect, restrain, and render safe all potentially hazardous stored or residual energy. Stored or residual energy could include, but is not limited to, electrical capacitors, batteries, contained hydraulic or pneumatic pressure, springs, and suspended weights. If the stored energy could re-accumulate to a hazardous level, continue to verify isolation until the servicing or maintenance is completed, or until the possibility of the energy accumulation no longer exists.

8.2.11 Verifying isolation

8.2.11.1 Before starting work on the machinery, equipment, or system that has been locked out or tagged out, you, as an authorized employee, shall verify that the equipment has been isolated and de-energized by the following:

a. Verify personnel are not exposed to potential danger.

b. Test the isolation of the equipment by *attempting to energize it, using the normal operating controls* (where possible) to make certain that the machinery, equipment, or system will not operate.

c. Verify, using the appropriate equipment, that exposed, previously energized parts are free of energy before removing electrical PPE or exposing any unprotected persons. If the circuit to be tested is over 600 volts, test the test equipment used for proper operation immediately before and immediately after the test.

d. Verify on a gauge, open a vent valve, or use other positive verification methods, if pressure sources are involved.

Caution: Return operating controls to neutral or off position after attempting to start.

8.2.12 LO/TO lock release or removal

8.2.12.1 Only one key is authorized for each red LO/TO lock and LO/TO tag and *only* the person who attached the lock is authorized to remove the lock and maintain custody of the key. The TGR is the only person who is authorized to release and remove the LO/TO lock and tag from his or her assigned group lock box. There is a *special condition to this rule*: If the employee who attached the red LO/TO lock and LO/TO tag is not at the facility and is unavailable to remove the lock, the trained supervisor is authorized to remove the lock after following the procedure below. If you need a red LO/TO lock removed, you shall contact the employee's supervisor. If you, as a supervisor, are asked to remove a red LO/TO lock with a LO/TO tag, you shall develop a procedure that includes these steps and others pertinent to your organization or the specific situation:

a. Confirm the employee who attached the lock is not at the facility and not available to remove the lock.

b. Attempt to contact the employee. Call home phone, cell phone, or pager. Document all attempts to contact the employee.

c. Make sure all work is completed and no employees are exposed to any type of hazards created by removing the LO/TO device(s).

d. Notify all affected employees that you will be removing the lock.

e. Have an authorized employee test and visually inspect the equipment, as necessary, to verify all tools, electrical jumpers, shorts, grounds, and other such devices have been removed so the circuits and equipment can be safely energized.

f. Remove the lock. Avoid destroying the lock, if possible, by cutting the chain, hasp, or other restraining device.

g. Immediately inform the authorized employee whose lock you removed that the lock has been removed when he or she returns to the facility or becomes available, *and before* he or she returns to the task or system where the lockout was in effect. You may need to notify coworkers, leave a phone message, an email, or use other means to notify him or her to report to you before going to the task or system where the lockout was in effect. Your message shall say that their lock has been removed and the system is now live or dangerous if work is resumed.

h. Return an undamaged lock to the employee with an explanation of circumstances as soon as possible.

8.2.13 Group lockout

8.2.13.1 An LO/TO application may involve more than one maintenance, repair, or servicing employee or more than one point of energy isolation. Several options exist for “group” LO/TO procedures. The examples in subparagraphs d–g below for group LO/TO illustrate the range of approaches. These examples are not intended to represent the only acceptable procedures for group LO/TO. The primary requirement is that the process used shall provide the employee protection equivalent to using a personal LO/TO. This would include use of “controlled key locks” and LO/TO tags per a written procedure for the task. The following requirements apply:

a. The group or supervisor shall designate a TGR for any group LO/TO to maintain control of the group lock box during the entire duration of the maintenance or service task. Specific responsibilities for the TGR are found in 29 CFR 1910.147(f)(3)(ii).

b. An important element of “group LO/TO” is to enable the TGR to initially lockout and tagout the system and place all LO/TO keys and tag tabs in a group lockbox. Then the TGR hangs an LO/TO tag with a red LO/TO lock on the lock box. The TGR controls the key while he or she is working the task. Each authorized person shall install his or her individual red LO/TO lock and LO/TO tag on the lockbox.

c. The energy isolation devices shall never be released until all authorized personnel and the TGR have removed all locks and tags from the lockbox. The TGR is responsible for control of the lock box and key. The control responsibility of the TGR may be transferred between shift changes and job reassignments.

d. Single energy source, multiple maintenance, servicing personnel, and ***single point with use of multi-lock adapter (Figure 8.2-1)***:

   (1) If the equipment operation is the responsibility of a system owner or user, that individual may configure the equipment for operational control before the group applies any tag or lock. (see Appendix F, attachment 8.2B)

   (2) Each authorized person who will be performing the maintenance or service task shall install an individual red LO/TO lock and LO/TO tag at the de-energized single-energy control point before starting work. This will often require the use of a multi-lock adapter to accommodate the numerous locks.

   (3) If energy isolation is required during periods where the work area may be unattended by authorized personnel, a TGR installs a separate red LO/TO tag and red LO/TO lock at the single-energy control point at the time of isolation. The TGR shall maintain control of the key throughout the maintenance or service task period.

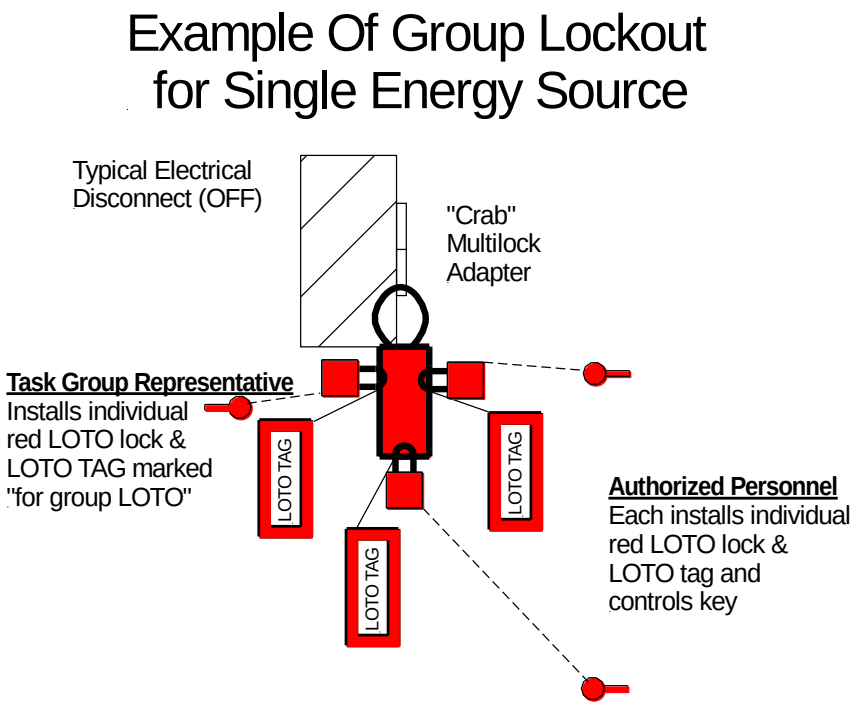

Figure 8.2-1. Group lockout/tagout concept for single energy control point.

e. Single energy source, multiple maintenance, servicing personnel, and ***single point with use of lockbox***:

(1) An alternate approach is to use a lockbox when the number of locks and tags are too numerous to be supported by the single energy control point.

(2) If the equipment operation is the responsibility of a system owner or user, that individual may configure the equipment for operation control before the group applies any tags or locks (see Appendix F, attachment 8.2B).

(3) The TGR shall attach a red LO/TO tag marked or stamped with the words “for group LO/TO” and a red LO/TO lock at the de-energized single energy control point at the time of isolation. The key is then placed in the lockbox.

(4) The TGR shall install a red LO/TO tag and a red LO/TO lock on the lockbox.

(5) The TGR shall maintain control of the key throughout the maintenance or service task period until all work is completed and the equipment is safe to reactivate. This provides energy isolation during periods where the work area may be unattended by authorized personnel.

(6) The authorized personnel who will be performing the maintenance or service task shall each install an individual red LO/TO lock and LO/TO tag on the lockbox before working.

f. Multiple energy sources, multiple maintenance, servicing personnel, and ***multiple point sources using lockbox (Figure 8.2-2)***:

(1) An alternate approach is to use a lockbox when there are multiple energy control points. In this case, a system owner or user may have applied other tags and locks for operational control per Attachment 8.2B, Appendix F. The group would apply its devices in addition to the other locks or tags.

(2) The TGR shall attach a red LO/TO tag marked or stamped with the works “for group LO/TO” and a red LO/TO lock at each energy control point at the time of isolation. The keys are then placed in the lockbox.

(3) The TGR shall install a red LO/TO tag marked or stamped with the words “for group LO/TO” and a red LO/TO lock on the lockbox.

(4) The TGR shall maintain control of the key throughout the maintenance or service task period until all work is completed and the equipment is safe to reactivate. This provides energy isolation during periods where the work area may be unattended by authorized personnel.

(5) The authorized personnel who will be performing the maintenance or service task shall each install an individual red LO/TO lock and LO/TO tag on the lockbox before working. This option requires the least number of locks and ensures each person has control of the total system when he or she is working on the system.

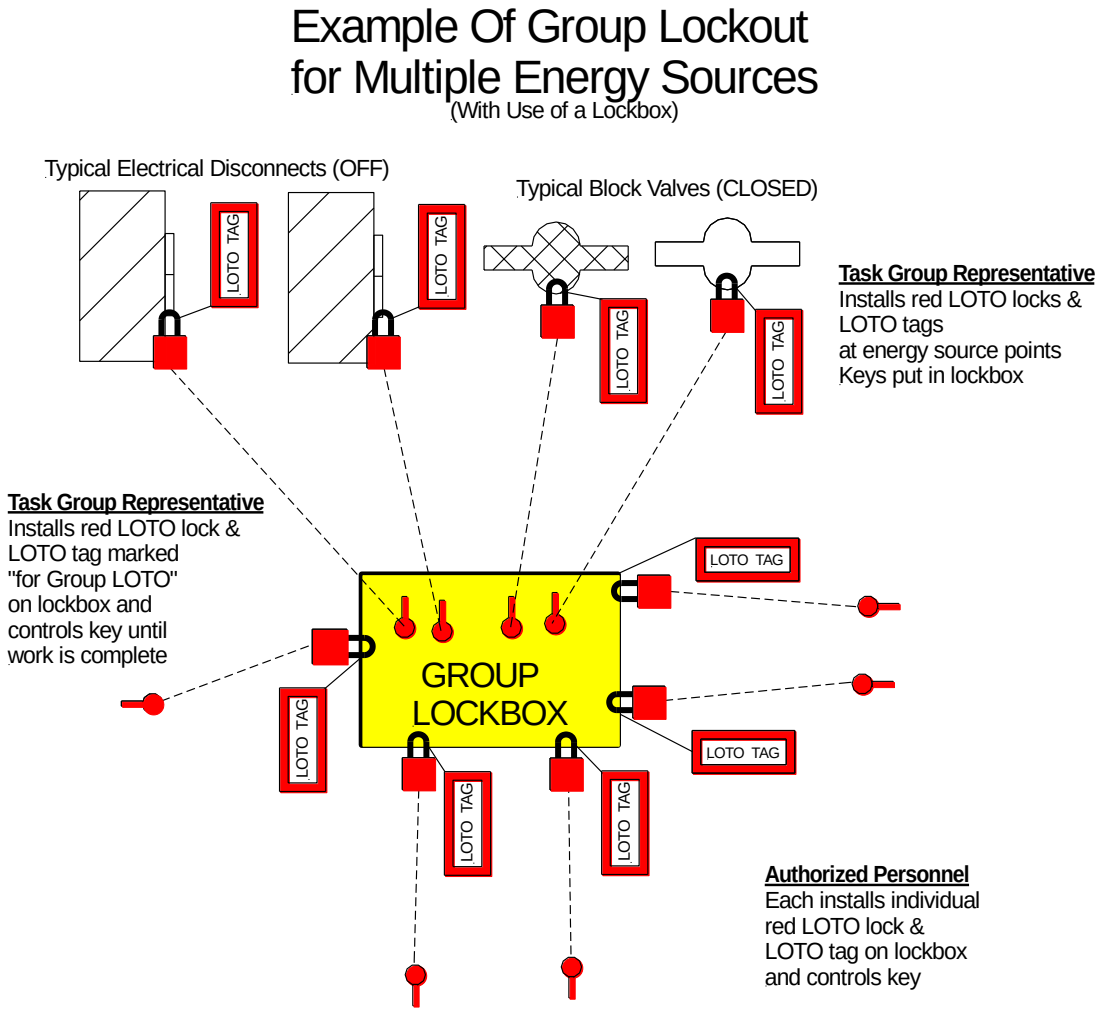

Figure 8.2-2. Group LO/TO multiple energy source control points.

g. Multiple energy sources, multiple maintenance, servicing personnel, and ***multiple point sources using multi-lock adapters***:

(1) If the equipment operation is the responsibility of a system operator or user, the user or operator may have to use other tags for operational control (such as the “Do Not Operate” tag) with appropriate shop or craft locks, per Attachment 8.2B, Appendix F.

(2) Each authorized person who will be performing the maintenance or service task shall install an individual red LO/TO lock and LO/TO tag at each of the multiple energy control points before starting work. To accommodate multiple objectives, this will often require the use of a multi-lock adapter to accommodate the numerous locks.

(3) The TGR shall attach a red LO/TO tag marked or stamped with the words “for group LO/TO” and a red LO/TO lock at each energy control point at the time of isolation. This provides ongoing, uninterrupted lockout during periods where the work area may be

unattended by authorized personnel.

(4) The TGR shall maintain control of the keys throughout the maintenance or service task period.

8.2.14 LO/TO during shift changes

8.2.14.1 During the course of work, work crews or individuals may take turns working on the locked out equipment. The following requirements apply:

a. If a new authorized person or crew of authorized persons carries on the work started by an earlier person or crew, there are two options:

(1) Arriving employees attach their own locks and verify energy isolation, and departing employees remove their locks, or

(2) Each departing employee transfers his or her key to an arriving employee, so that each arriving employee has a key and corresponding lock.

b. Each authorized person shall use his or her own red LO/TO lock. When multiple shifts work on a locked-out system, the TGR will be responsible for making sure all authorized personnel have either installed individual red LO/TO locks and tags at all energy sources or the appropriate group lockbox.

c. Arriving employees shall verify energy isolation.

d. When a system must be handed over to a new crew to continue the work, and there is equipment already locked and tagged out, this constitutes a shift change and you shall follow these steps:

(1) Inform the arriving shift or crew of the devices, hazards, and other employees involved in this particular lockout/ tagout operation.

(2) The employees on the arriving shift or crew attach their lockout and tagout devices on the isolation device(s) currently locked and tagged or receive keys form the departing employees.

(3) The employees on the departing shift remove their lockout and tagout devices, or transfer keys to the arriving employees.

(4) The TGR for the departing group will be the last person of the departing group to remove his or her lock or transfer a key; this ensures energy isolation at all times until the new TGR is ready to accept the responsibility. If they opt for lock changeout, the arriving TGR will be the first person of the arriving group to attach his or her lock prior to or immediately after the previous TGR removed his or her lock. Both TGRs will witness the transfer of energy isolation control and note the transfer in the task documentation.

(5) The current TGR shall verify energy isolation for the system.

e. During a TGR shift change, transfer of the control of a group lockout/tagout may consist of transferring a key to a secure cabinet that contains the lockout padlock on the group lockout box.

f. When LO/TO is to be handed over from one TGR to another while the work is continued by the

same authorized employees, this does not constitute a shift change. However, the task documentation shall be annotated to document this transfer of energy isolation control.

(1) Inform all authorized personnel working on the system of the impending transfer of LO/TO authority.

(2) The departing TGR will remove his or her lock and the new TGR will attach his or her lock prior to the previous TGR removing his or her lock or the TGRs transfer the key. Both TGRs will witness the transfer and note the transfer in task documentation.

8.2.15 Training for LO/TO

8.2.15.1 A competent person shall conduct LO/TO training, and the training needs to follow the requirements of Chapter 4.1 for conduct and documentation.

a. **Initial training**. Each employee involved in LO/TO or energy control as described below shall be trained in the purpose and scope of the LO/TO program, recognizing hazardous energy sources and the methods and means necessary for energy isolation, and using the LO/TO procedures. Training for the four types of employees (*authorized*, *affected*, *other,* and *supervisor*) is based on the relationship of that employee's job to the equipment being locked out or tagged out as follows:

(1) *Authorized employee* (use LO/TO to service or maintain equipment) training shall cover details about the type and magnitude of the hazardous energy sources present in the workplace and the methods and means necessary to isolate and control energy sources.

(2) *Affected* or *other employee* (operate or use the machines) training shall cover: recognizing when the control procedure is in place, understanding the purpose of the procedure, and understanding the importance of not attempting to start up or use equipment that has been locked out or tagged out.

(3) *Supervisors* over authorized employees shall be trained as an authorized employee and trained in the procedure for removing lockout/tagout devices in paragraph 8.2.12 above.

b. **New-hire training**. If you are a new employee, you shall attend LO/TO training before doing any tasks that could expose you to energy hazards. Your supervisor shall tell you if you require LO/TO training when you are first assigned to work.

c. **Retraining**. As an authorized employee, you require retraining at least every 2 years or as required in 29 CFR 1910.147(c)(7)(iii).

d. **Certification of training**. Supervisors shall certify employee training records (see chapter 4.1, paragraph 4.1.11) as required by 29 CFR 1910.147(c)(7)(iv).

8.2.16 Periodic audits of JSC's LO/TO program

8.2.16.1 Each organization or contractor is responsible for continually monitoring and periodically auditing (at least annually) its LO/TO and energy control programs. The following requirements apply:

a. The audit shall follow the requirements of 29 CFR 1910.147 (c) (6) and be documented.

b. The Safety and Test Operations Division shall:

(1) Audit JSC's LO/TO program at least annually by inspecting organization and contractor audit documentation to ensure all affected employees understand and are following the program.

(2) Forward any deviations noted on the audit to the responsible organization or contractor for correction.

Chapter 8.5 Lifting Operations and Equipment Safety

This could be you . . .

A crane load fell 3 feet from a 20-ton overhead crane hook. The operator was concentrating on the load itself and not on the path of travel. A section of the hoist rope hung up on an air handler pulley cover in the path of travel. The hoist rope unseated itself and dropped the load. The crane had to be shut down, repaired, and inspected before it could be used again.

8.5.1 Applicability of this chapter

You are required to follow this chapter if you manage, operate, service, or maintain lifting equipment as described in paragraph 8.5.2 below. Paragraph 8.5.15 lists the responsibilities of organizational directors, program managers, contract project managers, the Center Operations Directorate, the Safety and Test Operations Division, and the program offices.

8.5.2 What this chapter covers

This chapter covers minimum safety requirements for operating any mechanical device designed for lifting or lowering, and supplements the requirements in NASA-STD 8719.9, “Standard for Lifting Devices and Equipment.” It applies to overhead and mobile cranes, powered industrial forklift trucks, manually operated material handling equipment, and commercially owned cranes used at JSC.

8.5.3 Requirements for lifting equipment and operating procedures for lifting equipment

8.5.3.1 You shall follow these requirements for lifting:

a. All lifting equipment and operating procedures for lifting equipment shall at least meet the requirements for “noncritical lifts” in NASA-STD 8719.9, “Standard for Lifting Devices and Equipment,” and other requirements listed in this chapter. NASA-STD 8719.9 covers requirements for design, testing, inspection, maintenance, operation, personnel certification and marking requirements for lifting devices and associated equipment used to support NASA operations.

b. Use JSC Form 941, “Pre-Lift Checklist,” to plan and evaluate your lifting operations.

c. Use only electrically powered lifting equipment inside buildings to prevent carbon monoxide accumulations. The Safety and Test Operations Division and the Space Medicine Operations Division shall approve any proposed indoor use of combustion-engine-powered equipment. Pay special attention to the outdoor placement and location of combustion-powered equipment to prevent the entrainment of carbon monoxide and other combustion products into JSC buildings, tunnel system, structures, etc.

d. Refer to Chapter 3.6 of this Handbook for physical examination requirements for individuals performing lifting operations.

8.5.4 Requirements for critical lifts

8.5.4.1 Critical lifts involve lifting and lowering special high-dollar items, such as spacecraft, one-of-a-kind articles, or major facility components whose loss would have serious program impact. Critical lifts also include operations with personnel and equipment safety concerns beyond normal lifting hazards. The following requirements apply to critical lifts:

a. Critical lifts shall also follow the requirements for “critical lifts” in NASA-STD 8719.9.

b. Safety personnel shall monitor critical lifts to ensure that they follow all of the requirements in NASA-STD 8719.9.

8.5.5 Commercially owned cranes

8.5.5.1 Commercially owned cranes are contractor- or subcontractor-owned, -rented, or -leased cranes. Critical lifts and cranes shall meet the following requirements:

a. Follow the requirements in paragraph 8.5.4 above.

b. Critical lift cranes shall meet OSHA requirements and ASME B30.5, “Mobile and Locomotive Cranes.”

c. Before using a crane for a lift, you shall provide the Safety and Test Operations Division with the following information:

   (1) Type of crane and capacity

   (2) The kind of lift (critical or noncritical) that the crane will make

   (3) The item to be lifted, the weight of the item, and the location of the lift

   (4) The purpose of the lift (task)

   (5) The schedule, estimated start and completion

   (6) Any other pertinent information to include the crane’s load chart and a pre-lift checklist as described in JSC Form 941, “Pre-Lift Checklist”

8.5.6 Requirements for powered industrial forklift trucks

8.5.6.1 If you use a forklift, you shall follow these requirements:

a. Make sure forklift trucks meet the design and construction requirements established in ASME B56.1, “Safety Standard for High Lift and Low Lift Trucks,” and in 29 CFR 1910.178, “Powered Industrial Trucks.” Chapter 12 of NASA-STD 8719.9 lists safe operating requirements for powered industrial trucks (forklifts).

b. Inspect the forklift per paragraph 12.4 of NASA-STD 8719.9 and document periodic inspections per subparagraph 12.4.7.

c. Whenever possible, use non-CO-producing equipment such as electric-powered equipment, lifts, or forklifts inside enclosed or semi-enclosed areas. Never allow CO-producing motors to idle in enclosed or semi-enclosed areas. The Safety and Test Operations Division and the Space Medicine Operations Division shall approve any proposed indoor use of combustion-engine-powered equipment. If approval is granted, the Space Medicine Operations Division

may require CO monitoring and exhaust ventilation. Additionally, if approval is granted, coordinate with the facility manager for work scheduling and occupant notifications and with the Fire Protection Services for Fire Alarm Outages where engine exhaust could activate smoke detectors. Pay special attention to the outdoor placement and location of combustion-powered equipment to prevent the entrainment of CO and other combustion products into JSC buildings, tunnel system, structures, etc.

d. Charge batteries only in well-ventilated areas that meet ASME B56.1 and NFPA 505. Keep vent caps in place to avoid electrolyte spray when charging batteries of electric forklifts. Make sure that vent caps are functioning.

e. If you use forklift extensions; you shall:

(1) Follow ASME B56.1

(2) Use only manufacturer-approved extensions

(3) Follow the manufacturer's recommendations

(4) Uniquely identify the extensions

(5) Use only a professionally modified forklift's load chart

8.5.7 Requirements for other lifting equipment

8.5.7.1 You shall follow these requirements:

a. Use other lifting equipment such as low-lift pallet trucks, hand trucks, man lifts, aerial platforms, and dollies only for the purpose intended by the manufacturer.

b. Never operate this equipment unless you have been trained and certified by the proper authority.

c. Follow the manufacturer's instructions and the appropriate chapters of NASA-STD 8719.9.

8.5.8 Possible issues during lifting operations

If you will handle any of the materials on this list, you shall follow the requirements referenced before starting the lifting operations.

For handling and storing . . .	*Follow this standard . . .*
Hazardous materials	Chapter 5.1, "Fire Safety," and Part 9, "Safety and Health Practices for Hazardous Materials."
Flammable liquids and gases	MSDSs/SDSs and other procedures found in Chapter 5.1 of this Handbook.
Cryogenic materials	Chapter 6.5, "Cryogenic Materials and Gases: How to Work with Them Safely," of this Handbook.
Explosives and propellants	Chapter 9.5, "Explosives and Propellants Safety," and Chapter 9.1, "Hazardous Materials Safety and Health," of this Handbook. Appropriate paragraphs of NASA-STD 8719.9.

8.5.9 Requirements for slings and rigging equipment

8.5.9.1 Slings and rigging equipment shall meet the requirements in NASA-STD 8719.9. These include testing, inspection, and supporting documentation as required in chapter 14 of the standard.

8.5.10 Precautions for moving or operating a mobile crane

8.5.10.1 If you are in charge of moving or operating a mobile crane, you shall follow these requirements as well as the requirements in NASA-STD 8719.9, chapter 5:

a. Determine the path of travel and inspect it for hazards before the operation begins. Make sure clearances along the path of travel are adequate. Pay special attention to the following:

   (1) Power lines – keep them clear of the crane at all times

   (2) Personnel or objects in the crane's path of travel

   (3) Weight limits for the roadway or bridges

b. Appoint a person responsible for determining and controlling the safety of the operation. These responsibilities include positioning of the crane and the load, boom extension and radius, ground support, travel route, and speed of movement.

c. Hold a pre-departure crew safety meeting. Discuss the route and any hazards or conditions that the crane might encounter, such as: proximity of overhead power lines, close vertical or horizontal clearances, speed limits, planned stops, escort positions, and other special instructions. Make sure that no one other than required operating personnel are permitted on the equipment being moved.

d. Make sure that safe load capacities, operating speeds, and other essential data are posted in or on equipment being driven or transported.

e. Take these actions when moving a crane:

   (1) Place flags and warning signs on the crane or vehicle before moving it with a secondary vehicle.

   (2) Avoid sudden starts and stops.

   (3) Stop if you encounter overhead power lines that appear to be too close and make sure you can clear them safely with a 10-foot space or a verified de-energized line. Note that the clearance distance will change as a function of the line voltage. Ten feet is for at or less than 50,000 volts. Treat all overhead lines as energized until you are certain it is safe to proceed.

f. Maintain at least a 2-foot clearance between the crane boom or jib and nearby walls, overhead trestles, columns, or other structures.

8.5.11 Requirements for working under a suspended load

8.5.11.1 OSHA requirements prohibit putting people under suspended loads. The Department of Labor approved an alternate standard for NASA to allow employees to work under suspended loads if certain conditions are met. However, you are discouraged from putting workers under suspended loads unless absolutely necessary to fulfill NASA's mission. This includes multiple load lifts (Christmas tree loads) because this practice requires personnel to work under or near suspended loads. You shall follow these requirements:

a. Follow the requirements in Appendix A of NASA-STD 8719.9 if working under a suspended load is necessary.

b. The Director, Safety and Mission Assurance, shall approve all work under a suspended load. To get approval, send your request and all documentation required by Appendix A of NASA-STD 8719.9 to the Safety and Test Operations Division.

8.5.12 Waivers to lifting requirements

To get a waiver to any lifting requirement, including equipment design requirements, submit a waiver request as described in Chapter 1.3, "Written Safety and Health Program," of this Handbook. The Safety and Mission Assurance Office will forward your request to the Center Director or NASA Headquarters as needed. Paragraph 1.5 of NASA-STD 8719.9 lists NASA's policy for getting a waiver to lifting requirements. JSC's Center Director may approve some waivers to NASA-STD 8719.9.

8.5.13 Training and certification requirements for operating lifting equipment

Operators and crew members shall meet the training and certification requirements in NASA-STD 8719.9 and Chapter 5.8, "Hazardous Operations: Safe Practice and Certification," of this Handbook. You may arrange safety-related training through the JSC Safety Learning Center or arrange training on your own as described in Chapter 4.1, "Safety and Health Training," of this Handbook. Consult your organization's policies and processes for certification.

8.5.14 Other requirements

8.5.14.1 As an operator or crew member, you shall follow these requirements as well as this chapter:

a. NASA-STD 8719.9

b. 29 CFR 1910 Subpart N, "Material Handling and Storage"

8.5.15 Other responsibilities for lifting operations and equipment safety

a. As a ***director, program manager, or contract project manager***, you are responsible for:

   (1) Evaluating all lifting operations in your organization and making informed decisions on the risks they pose.

   (2) Determining which lifting operations in your organization are critical. You may delegate the authority for determining critical lifts, but you shall do it in writing.

b. The ***Center Operations Directorate*** is responsible for:

(1) Preparing and maintaining up-to-date lists of all overhead cranes and fixed hoists.

(2) Developing detailed inspection and test procedures, and test criteria for each item listed.

(3) Carrying out a program to periodically inspect existing and permanently installed handling and lifting equipment.

(4) Supervising the adjustment or modification of all cranes and hoists.

(5) Keeping inspection and recertification records as described in this chapter.

(6) Keeping records of all material-handling equipment used for critical lifts as defined in NASA-STD 8719.9.

(7) Evaluating the adequacy of newly purchased handling and lifting equipment for permanent installation. This includes coordinating a review of design specifications, manufacturing controls, and operational acceptance testing to make sure that the equipment satisfies NASA-STD 8719.9.

(8) Developing processes to identify critical lifting operations, lifting devices, and equipment that shall meet critical lift requirements. Get input from facility, program, user, safety, and quality assurance personnel. Document the results of the process and have it approved as a minimum, by the Director, Safety and Mission Assurance.

(9) Making sure JSC has documentation, procedures, and controls in place to ensure that leased, owned, or rented special-purpose mobile equipment is adequate for its intended use and meets requirements that apply.

c. The ***Safety and Test Operations Division*** is responsible for reviewing lifting operations and certifications to ensure that all requirements are being met.

d. ***Program offices*** are responsible for making sure contracts require contractor-directed lifting operations to meet NASA-STD 8719.9.

Chapter 8.8 JSC's Fall Protection Program

8.8.1 Applicability of this chapter

You are required to follow this chapter if you do any work requiring fall protection at JSC or a JSC field site, whether civil servant or contractor employee. Paragraph 8.8.17 lists the responsibilities of the Fall Protection Program Administrator, Qualified Person, Competent Person, Authorized Person, and supervisors.

8.8.2 What this chapter covers

This chapter defines JSC's Fall Protection Program with policy and safety requirements for protecting civil servants and contractors engaged in any activity or operation exposing them to potential falls.

8.8.3 Fall protection policy

8.8.3.1 It is JSC policy to:

a. Protect civil servants and contractors engaged in any activity or operation exposing them to potential falls.

b. Assess and control fall hazards to prevent injury or loss.

c. Continually improve the program beyond minimum requirements and standards to prevent falls.

d. Require fall protection at heights of 4 feet or greater for general industry and 6 feet or greater for construction.

e. Have a JSC Fall Protection Program Administrator appointed by the Center Director.

8.8.4 Controlling fall hazards

8.8.4.1 The following controls, in order of preference, shall apply:

a. **Hazard Elimination.** Evaluate the specific work creating the fall hazard to determine if a change in process, area, technology, or equipment would eliminate the fall hazard. If so, implement the change.

b. **Guarding.** Establish physical barriers between the worker and the fall hazard so the barrier can prevent the worker from falling (i.e., guardrails, vertical netting, covers, etc.).

c. **Fall Restraint.** Use personal fall protection equipment to assemble a system (permanent or temporary) that will prevent a worker from reaching the fall hazard.

d. **Fall Arrest.** Use personal fall protection equipment to assemble a system (permanent or temporary) that arrests the fall safely before the worker strikes the ground or surrounding structure.

e. **Administrative Controls.** Administrative controls (such as Safety Monitors) are only allowed in situations where all other fall protection methods are deemed infeasible. This option is available only to employees engaged in leading edge work or precast concrete erection work.

Administrative controls shall follow 29 CFR 1926.502. A competent or qualified person must approve administrative controls.

8.8.5 Fall protection system performance

a. Assess clearance and fall distance, as follows:

Fall Distance = Length of Lanyard + Length of Deployed Shock Absorber + Height of the harness dorsal D Ring from workers feet + Safety Factor (3 feet)

NOTE: The vertical distance from the anchorage connector point to the next lower level must exceed the fall distance or the worker will hit the surface.

b. Many of the JSC roof systems and loggia ledges have the Latchway Fall Arrest Systems. You shall use components and systems compatible with Latchway Systems. If a Latchway System is not feasible, use other fall protection systems.

c. Fall restraint systems shall meet the following requirements to prevent a worker from reaching the unprotected edge:

(1) Ensure the anchorage point is able to hold 1,000 pounds.

(2) Use a full body harness. Never use waist belts for fall restraint.

(3) Design fall restraint systems to meet Occupational Safety and Health Administration (OSHA) and American National Standards Institute (ANSI) standards.

d. Fall Arrest Systems shall meet the requirements in the applicable OSHA subpart(s). Follow ANSI fall protection standards except where deemed inappropriate by a qualified person. Fall arrest systems shall meet the following:

(1) When using fall arrest systems, the fall distance of the lanyard shall not exceed 6 feet and 900 pounds maximum arresting force, except when designed by a qualified person.

(2) Never violate the manufacturer's instructions without the approval and documentation of a qualified person or exceed an arresting force of 1,800 pounds in a fall greater than 6 feet.

(3) The installer of the fall protection system (authorized or competent person) shall know the arresting force and the total required clearance of the system.

(4) If the system is being installed for workers other than the installer, provide a procedure to ensure the authorized user can determine that the system is approved for use.

(5) An acceptable anchorage structure may be I-beams, columns, tower legs, stairwell support structures, or other structures capable of holding 5,000 pounds per person or designed by a qualified person with a safety factor of 2. If the anchorage is questionable, do not use the system and notify a competent or qualified person.

e. You shall use a personal fall arrest system in conjunction with a work positioning system. Rig the positioning system so the employee shall not free fall more than 2 feet.

8.8.6 Fall protection equipment

8.8.6.1 Fall protection equipment shall meet the following requirements:

a. Meet or exceed OSHA and ANSI Fall Protection Standards. All new fall protection equipment must meet the most current ANSI/ASSE Z359.1 at the time of purchase.

b. Follow manufacturer's instructions when using fall protection equipment. Only a qualified person may change the instructions based on calculations with fall protection engineering support, and shall document those changes before use and maintain the documentation until the equipment is removed from service.

c. Inspect fall protection equipment per paragraph 8.8.12 below.

d. Never use equipment not designed for fall protection without the approval of a qualified person based on engineering calculations. Document the approval and label the equipment "For Fall Protection Use Only."

e. Never use harnesses and lanyards that have been impact- or load-tested.

f. Once equipment has been exposed to a fall, remove it from service and dispose of it immediately.

g. Take defective equipment out of service and return it to the manufacturer.

h. Use equipment as designed for fall protection only. Under no circumstances use it to hoist tools or other work materials.

8.8.7 When and how to use a safety net

8.8.7.1 You shall follow 29 CFR 1926.502, "Fall Protection Systems Criteria and Practices," or the following requirements for safety nets:

a. Provide a safety net for workplaces where other means of fall protection, such as scaffolding, ground-supported personnel-lifting devices, lifelines, or safety harnesses, cannot protect a worker due to the conditions of the elevated work area. These conditions may include:

   (1) Structural ironwork where there is no tie-off.

   (2) Working above bodies of water.

   (3) The height of the work area is such that using ladders or erecting scaffolding would be a greater risk.

   (4) The area isn't accessible with ground-supported personnel-lifting devices.

b. You may also use safety nets, specifically designed as debris nets, where there is a danger of items dropping from the workplace and endangering people below.

8.8.8 Specific fall hazards and assessments

a. For walking or working surfaces with unprotected edge or opening or other fall potential of four feet (general industry) or greater to surface below and six feet (construction industry) or greater to a lower level, you shall meet the following:

   (1) If a vehicle or trailer is used as a walking or working surface, a competent person shall evaluate the need for fall protection.

(2) If work requires employees to be closer than 6 feet from any unprotected edge or opening, use positive fall protection (guardrail system or personal fall protection to include harness with arrest or restraint system) or other means, such as vehicle mounted work platforms or scaffolding.

NOTE: Be cautious when using guardrails or chains as a secondary means of positive fall protection. Such mechanisms may be subject to failure due to wear and tear and/or faulty design, construction, installation, and testing. Personnel should not lean on guardrails, gates, or chains.

b. Horizontal Life Lines: Install commercially available ANSI-approved temporary horizontal life lines per manufacturer's written instructions. Only a qualified person may change the instructions based on calculations to show they meet ANSI Z359.1. Those changes must be documented before use. If not commercially designed, a qualified person must design and provide installation.

c. Over/Near Water Operations: If employees are required to work vver or near water, the employer shall protect them from falling as required by this chapter. This applies to construction activities, and is not intended to apply to marine operations governed by 29 CFR 1917, Subpart B, Marine Terminal Operations. For construction or maintenance activities, you shall also follow 29 CFR 1926.106.

d. Tower Climbing Operations: Climbing towers presents unique hazards not associated with other jobs requiring fall protection. Before tower climbing, you shall address the following:

(1) Weather conditions

(2) Coordination with fire rescue

(3) A rescue plan

(4) Safe transport of equipment and tools

(5) Safe tower energy sources

(6) Ensure at least two climbers are present and trained to climb towers

(7) Training and certification.

e. Roof work on low-sloped or flat roofs (less than or equal to a 4:12 pitch) shall meet the following:

(1) From unprotected edge to 6 feet, use positive fall protection.

(2) From 6 feet to 15 feet, you may use a warning line and safety monitor system in lieu of positive fall protection.

(3) Fifteen feet or more from unprotected edge, you may use a warning line without a monitor in lieu of positive fall protection.

f. Roof work on steep roofs (greater than a 4:12 pitch) requires positive fall protection at all times.

g. Non-roof work on steep roofs(greater than a 4:12 pitch) requires positive fall protection, such as a personal fall arrest system or restraint system, guardrails, or use of other means, such as aerial lifts or scaffolding.

h. Non-roof work on roofs with a pitch less than 4:12 above 6 feet shall meet the following:

(1) From unprotected edge to 6 feet, use positive fall protection.

(2) From 6 feet to 15 feet, you may use a warning line.

(3) Fifteen feet or more from unprotected edge, no warning line is required.

i. Roof inspections shall meet the following:

(1) For inspections or assessments only during pre- and post-construction work, follow the requirements for “Non Roof Work on Roofs” in this paragraph.

(2) For inspections during construction activities, follow the requirements for “Roof Work on Roofs” in this paragraph.

8.8.9 Precautions to take when working where fall protection is required

8.8.9.1 You shall follow the requirements below:

a. Use a full body harness.

b. Use suspension trauma relief devices.

c. Use lifelines, lanyards, and harnesses only for safeguarding workers. Don’t use them for any other purpose. A lifeline shall be able to support a minimum dead weight of 5,000 pounds per person applied to the center of the lifeline.

d. Securely buckle all harnesses and wear them tight enough to prevent yourself from slipping out.

e. Secure lanyard to fixed anchorages and use pads over sharp corners.

f. Keep lanyard length as short as the work allows. Always ensure the attachment is positioned as high as possible when you are in position to do work.

g. Use a body harness and shock-absorbing device in the lanyard system if a long freefall is possible.

h. Make sure you are securely attached to a secondary restraint system when using a bosun’s chair.

8.8.10 Fall protection for specific operations

a. On articulating lifts, you shall:

(1) Use an energy-absorbing length-adjustable lanyard and full body harness.

(2) Connect the lanyard to an approved anchor point in the basket.

(3) Adjust the lanyard length to reduce the possibility of the worker falling over the guardrails, yet allows the work to be accomplished.

b. For Scaffolding, you shall:

(1) Designate a competent person to supervise fall protection for employees working on scaffolds.

(2) Erect and dismantle per chapter 8.7.

(3) Provide fall protection (guardrails, fall arrest, fall restraint) where the potential for a fall 6 feet or greater exists. A qualified person may develop a fall protection plan for scaffolding up to 10 feet in height if fall protection systems are not feasible.

(4) Use positive fall protection when the scaffold height is greater than 10 feet.

(5) During scaffold erection and dismantling, have a person trained to the level of competent person determine if fall protection systems (guardrails, fall arrest, fall restraint) can be used and provide written approval.

NOTE: A scaffolding-competent person is not the same as a fall protection-competent person.

c. Ladder climbing shall meet the requirements in chapter 8.7 and the following:

(1) For fixed ladders, use appropriate personal fall protection equipment when climbing fixed ladders equipped with fall protection systems such as cable grabs or rails.

(2) For portable ladders, personal fall protection equipment is not required.

d. Excavations shall meet the following:

(1) A fall protection system is required for excavations or trenches 4 feet in depth or greater.

(2) Barriers shall be an adequate distance back on the outside perimeter of the spoil pile or an adequate set distance from the excavation opening, so that support posts and barriers do not fail if a person falls against the barrier. The minimum distance from the excavation opening is 2 feet, unless the ground is unstable or the side wall is undercutting or fissured.

8.8.11 Storage and maintenance of fall protection equipment

8.8.11.1 You shall store and maintain fall protection equipment as follows:

a. Never store personal fall arrest equipment in the bottom of a toolbox, on the ground, or outdoors exposed to the elements (e.g., sun, rain, snow, etc.).

b. Hang equipment in a cool, dry location in a manner that retains its shape.

c. Clean with a mild, nonabrasive soap and hang to dry.

d. Never force dry or use strong detergents in cleaning.

e. Never store equipment near excessive heat, chemicals, moisture, or sunlight.

f. Never store in an area with exposures to fumes or corrosive elements.

g. Avoid dirt or other types of buildup on equipment.

h. For testing purposes, use only sample equipment and worn equipment or equipment of doubtful integrity. Test them to destruction, if possible, or at least to a 4:1 safety factor of the

anticipated load. Keep equipment that was used for testing only as samples to help judge the safety of other equipment.

8.8.12 Inspecting fall protection equipment

a. Inspections shall follow manufacturer's recommendations.

b. The end user shall inspect his or her fall protection equipment before and after use.

c. The competent person shall inspect fall protection equipment semi-annually per the manufacturer's guidelines or checklist in d below.

d. The employer shall inspect fall protection equipment annually, submit the results to the Fall Protection Administrator, and indicate the date inspected on the manufacturer's inspection tag or equivalent documentation available for audit or inspection to show compliance. Any component of a personal fall arrest system found to be defective, damaged, or worn shall be withdrawn from service and disposed of immediately. Annual inspections shall use manufacturer's guidelines or the following checklists at URL: http://www9.jsc.nasa.gov/safety/Checklists/index.htm:

(1) Full Body Harness Annual Inspection Checklist

(2) Lanyards Annual Inspection Checklist

(3) Snap Hooks and Carabineers Annual Inspection Checklist

(4) Self-Retracting Lanyard/Lifeline Annual Inspection Checklist

8.8.13 Fall protection plan

a. Contractors working at JSC shall submit a Fall Protection Plan addressing specific and potential fall hazards that will be encountered while working at heights.

b. Construction contractors working at JSC shall submit a Site-Specific Fall Protection Plan that:

(1) Meets 29 CFR 1926.502(k)

(2) Addresses project-specific fall hazards that will be encountered while working at heights

(3) Becomes a part of the contractor's overall Site-Specific Safety and Health Plan, which addresses the contractor's approach to implementing the requirements of the JSC Fall Protection Program and all applicable OSHA regulations.

NOTE: The requirements for a fall protection plan are at the following URL: http://www6.jsc.nasa.gov/safety/engineer/docs/Contractor_FPP.pdf

8.8.14 Qualifications and training

8.8.14.1 The following personnel shall be trained as described in the Fall Protection Training Matrix, Attachment 8.8A, Appendix F, and meet the qualifications indicated:

a. The Fall Protection Program Administrator shall:

(1) Have the skills, experience, and abilities to ensure effective management of the Center's or employer's fall protection program. This would include a working knowledge of current fall protection regulations, standards, fall protection equipment, and systems.

(2) Be appointed in writing by the JSC Center Director . For contractors, the contract project manager shall appoint a contractor program administrator.

b. A Qualified Person shall be:

(1) Identified in writing by the Fall Protection Program Administrator. Documentation shall include training records.

(2) Familiar with fall protection practices, equipment, regulations, engineering principles, and the effects permanent fall protection systems will have on the surrounding structure.

c. A Competent Person shall:

(1) Be identified in writing by the Fall Protection Program Administrator. Documentation shall include training records.

(2) Be responsible for the immediate application of fall protection requirements where fall protection is required.

(3) Be knowledgeable of applicable fall protection regulations, standards, equipment and systems, and mandatory requirements for fall protection equipment and systems used by their employers.

(4) Have work experience related to the application where fall protection is required.

(5) Have the ability to identify unsafe conditions or practices as they relate to fall protection during the course of the work and have the authority to take prompt corrective action.

d. An Authorized Person shall have training per the Training Matrix in Attachment 8.8, Appendix F.

e. Trainers shall have training per the Training Matrix in Attachment 8.8, Appendix F, and the following qualifications:

(1) Competent Person Trainer – Experience, knowledge, training and education as a Competent Person.

(2) Competent Rescue Person Trainer – Experience, knowledge, training and education as a Competent Rescue Person.

(3) Qualified Person Trainer – Experience, knowledge, training and education as a Qualified Person.

8.8.15 Emergency preparedness and response

a. Before starting any work activity where fall protection is an issue, the employer shall develop rescue plans and discuss them with all employees. A rescue plan is available for tailoring from the Safety and Test Operations Division.

b. In the unlikely event a fall arrest occurs on site, personnel, using an articulating man lift or ladders where feasible, shall rescue the affected employees if rescue by ladder or man lift is feasible.

NOTE: Authorized Rescuer trainging is not required for rescue via ladder or man lift.

c. Technical high-angle rescue will be through local emergency services.

d. All employees involved in a fall arrest or fall shall immediately be sent for a medical evaluation to determine the extent of injuries.

e. In the event of a fall, notify the following people as soon as possible:

(1) Rescue personnel :JSC, Sonny Carter Training Facility, and Ellington Field Emergency Number, x33333 or 281-483-3333 ;White Sands Emergency Number, x5911

(2) Manager or supervisor

(3) Project manager

(4) Safety representatives

f. The competent person or contractor safety representative shall report and investigate all falls per chapter 2.6 of this Handbook.

8.8.16 Fall protection program evaluation

8.8.16.1 The JSC Fall Protection Program Administrator shall evaluate JSC's fall protection program yearly to determine its effectiveness via the following criteria:

a. Accident reports

b. Number of accidents

c. Management/staff compliance with program components

d. Periodic on-site audits

e. Staff feedback and interviews

8.8.17 Responsibilities for fall protection

a. As the ***JSC Fall Protection Program Administrator***, you are responsible for:

(1) Developing, implementing, and coordinating JSC's fall protection program.

(2) Evaluating the Center-wide hazards, determine where protection from falls from elevations is required, and establish any additional, more stringent requirements necessary to protect against Center-specific fall hazards.

(3) Providing guidance and oversight to ensure NASA fall protection requirements are included in contracts where contractor employees will be working in situations that require fall protection.

(4) Providing oversight to ensure NASA fall protection requirements are included in work instructions for work in situations requiring fall protection.

(5) Providing oversight to ensure anyone who is identified as a qualified person, to serve as a subject matter expert in support of the Center's fall protection program, fulfills the responsibilities and qualifications in this chapter.

(6) Providing oversight to ensure, for each situation that requires fall protection at the Center (NASA or contractor led), there is a competent person assigned responsibility for the immediate application of fall protection requirements where fall protection is required, whose education and training meet requirements as defined below.

(7) Remaining current with changing OSHA and ANSI fall protection requirements, NASA requirements, local laws, and new fall protection systems.

(8) Conducting an annual review and audit of the Center's fall protection program to ensure compliance with NPR 8715.3. Use of new technology, regulations, and industry practices should be considered during the annual review and audit.

(9) Establishing a JSC Fall Protection Program committee.

(10) Ensuring JSC prime contractors and subcontractors appoint, in writing, a fall protection program administrator or team.

(11) Ensuring available fall protection equipment is included in the training of competent, authorized, and qualified people.

NOTE: A contractor's Fall Protection Program Administrator has similar responsibilities for work under the contract.

b. As a ***Qualified Person***, you are responsible for:

(1) Supporting the program administrator, competent and authorized persons, and the fall protection program by supplying technical information and serving as a subject matter expert.

(2) Being available when the authorized or competent person cannot select an appropriate non-engineered anchorage for a fall arrest or fall restraint system.

(3) Designing and documenting any permanent anchorage, fall arrest system, fall restraint system, or lifeline (vertical and/or horizontal).

c. As a ***Competent Person***, you are responsible for:

(1) Being available to authorized persons when fall protection situations arise to identify unsafe conditions or practices as they relate to fall protection and taking prompt corrective action.

(2) Helping authorized persons when requested to ensure non-engineered anchorages selected are acceptable, fall protection system(s) will work as intended, fall protection equipment is inspected prior to use, fall protection systems are used per manufacturer's recommendations, OSHA requirements, qualified person designs, and local policy, and rescue plans are in effect.

d. As an ***Authorized Person***, you are responsible for:

(1) Protecting yourself by applying fall protection practices during the course of the work.

(2) Inspecting, installing, using, and dismantling fall protection equipment according to manufacturer's instructions, OSHA requirements, and local policy.

(3) Notifying a competent person for determination of the appropriate action to be taken when conducting any work where required fall protection is not in place or the performance of the fall protection system is unpredictable.

(4) Ensuring these requirements are adhered to as written.

e. As a ***Supervisor,*** you are responsible for:

(1) Ensuring JSC fall protection requirements are included in work instructions where JSC employees or contractors will be working in situations that require fall protection.

(2) Ensuring anyone who is identified as a qualified person to serve as a subject matter expert in support of JSC's Fall Protection Program has been trained per paragraph 8.8.14 above.

(3) Ensuring a JSC-designated competent person is assigned responsibility for the application of fall protection requirements where required.

Chapter 9.5 Explosive and Propellant Safety

This could be you . . .

An employee received minor injuries when a NASA standard initiator ignited from being exposed to RF radiation without a Faraday cap installed.

A small amount of propellant ignited when someone scraped it with a "non-sparking tool." No one was hurt, but the employee was very surprised.

A propellant production facility was heavily damaged when spilled propellant ignited. The cost of this accident was in excess of $10 million.

9.5.1 Applicability of this chapter

You are required to follow this chapter if you use, test, handle, store, receive, transport, or dispose of explosives, solid propellants, or systems containing explosives or solid propellants, pyrotechnic devices, or electro explosive devices at JSC or a JSC field site.

9.5.2 Definition of an explosive, solid-propellant, system that contains an explosive or solid propellant, or of an electro-explosive device

9.5.2.1 The following defines an explosive, solid propellant, system that contains an explosive or solid propellant, pyrotechnic device, or electro-explosive device (EED):

a. An explosive is a material that undergoes rapid chemical change and generates large amounts of hot, high-pressure gases when exposed to heat, impact, friction, detonation, or other means of ignition.

b. A solid propellant is an explosive mixture that propels rockets or missiles, or generates gases for powering auxiliary devices or systems. Solid propellant and propellant, as used in this chapter, mean the same thing.

c. A system that contains explosives or propellants is any system, subsystem, component, or device that functions by igniting an explosive or a propellant inside the system, subsystem, or component. A device that functions by igniting an explosive or a propellant inside the system, subsystem, or component is also known as a pyrotechnic device. "System" is used instead of "system that contains an explosive or propellant" in this chapter.

d. An EED is a system that contains explosives or propellants, and that is fired by passing an electrical current through a bridgewire embedded in the explosive or propellant.

9.5.3 General operating requirements

9.5.3.1 You shall follow the requirements below when working with explosives, propellants, or pyrotechnic devices or systems containing explosives at JSC:

a. Follow NASA STD 8719.12, "Safety Standard for Explosives, Propellants, and Pyrotechnics" and paragraph 3.11 of NPR 8715.3.

b. Don't handle explosives in a manner that could cause damage.

c. Don't carry explosives in pockets, toolboxes, lunch boxes, or other unprotected places.

d. Don't expose explosives to open flame, direct sunlight for long periods of time, or heating and electrical equipment.

e. Don't use nails through packing materials or containers of explosives.

f. Keep the safe distances required by subparagraph 9.5.7.1.c.

g. Have a Hazardous Operations Permit as described in Chapter 5.8, "Hazardous Operations: Safety Practices and Certification," of this Handbook. Exceptions to the permit requirements are as follows:

(1) Test Readiness Reviews, Test Procedures, or Technical Orders reviewed and approved by the Explosive Safety Officer (ESO) or ESO designee (such as a qualified Test Safety Officer) at the locations listed in 9.5.5.c, where pyrotechnic operations are performed routinely.

(2) Test Readiness Reviews or User Readiness Reviews signed by the ESO or ESO designee for pyrotechnic operations performed at locations outside of those locations listed in 9.5.5.c. The ESO or ESO designee (such as a qualified Test Safety Officer) shall provide guidance for, review, and approve the safety measures put in place to mitigate the safety risks of the pyrotechnics operation.

h. Prepare detailed operating procedures listing tasks in a logical order that doesn't introduce new hazards.

i. Prepare a hazard analysis before working with explosives, propellants, or pyrotechnic systems.

j. Have a Safety and Test Operations Division representative review and sign off on the detailed test procedures and hazard analysis.

k. Prohibit smoking, open flames, or heat-producing operations around explosive, propellant, or pyrotechnic systems.

l. Make sure that test chambers are designed and built to JPR 1710.13, "Design, Inspection, and Certification of Pressure Vessels and Pressurized Systems."

m. Allow only authorized personnel, trained and certified per paragraph 9.5.9, to handle explosives, propellants, or systems.

9.5.4 Explosives, propellants, and pyrotechnic systems inventory

a. The explosives owner is ultimately responsible for the control and custody of explosives and shall maintain strict accountability.

b. Each facility shall maintain an ongoing accountability of all explosives, propellants, and pyrotechnic systems through the use of an inventory, tagging, and document management system. The information retained shall include, as a minimum:

(1) Name.

(2) Part number.

(3) Lot number (if applicable).

(4) Serial number (if applicable).

(5) Unit explosive weight.

(6) Quantity.

(7) Total explosive limit.

(8) Hazardous classification.

(9) Compatiblity designation.

(10) Manufacturer.

(11) Manufacturing date.

(12) Date explosives, propellants, or pyrotechnic materials/devices were placed in the facility.

(13) Date explosives, propellants, or pyrotechnic materials/devices were removed from the facility.

(14) Signature(s) of person(s) placing or removing materials or devices from the facility.

9.5.5 Compliance audits

a. The ESO or knowledgeable designee shall perform a compliance audit to verify compliance with the requirements of this chapter and NPR 8719.12 and to verify that the procedures and practices developed under this document are adequate and being followed.

b. Compliance Audits shall occur at least every three years or more often if the ESO deems it appropriate.

c. The JSC facilities below shall be audited using checklists developed for each facility:

(1) Energy Systems Test Area

(2) Ellington Field

(3) White Sands Test Facility

(4) Forward Operating Location, El Paso, TX

(5) CEV Parachute Assembly System hangar, Yuma, AZ

d. The ESO or designee shall produce a report of the audit findings that contains:

(1) A list of the participants.

(2) The date(s) audit was conducted.

(3) The location of the audit.

(4) A description of the findings.

(5) The deadline for implementing corrective actions.

e. The Audit report shall be sent to the Head of the Responsible Organization.

f. Organizations being audited shall document that the deficiencies have been corrected and retain the two most recent audit reports.

g. The ESO shall:

(1) Verify that the corrective actions have been properly implemented.

(2) Retain copies of the two most recent audit reports for each facicility audited.

9.5.6 Requirements for safely handling explosives, propellants, or pyrotechnic systems

a. Personal Protective Equipment (PPE). Before working with explosives, propellants, or pyrotechnic systems, you shall perform a hazard analysis to determine what PPE is required. It may include the following:

(1) Protective equipment and clothing as required by NASA-STD-8719.12, paragraphs 5.28 – 5.39.

(2) Wriststats or legstats to control electrostatic discharge as required by NASA-STD-8719.12, paragraph 5.13.2.

(3) Cotton clothing.

b. To avoid problems with electrical energy you shall:

(1) Meet the National Fire Protection Association Standard 70, “National Electric Code,” for hazardous locations.

(2) Provide static grounding systems per NASA-STD-8719.12, “Explosives Safety,” Chapter 5.

(3) Provide lightning protection per NASA-STD-8719.12, Chapter 5.

(4) Verify all grounding systems annually and retain records for at least two years.

(5) Verify all lightning protection systems every six months and retain records for at least two years

c. To work safely with Electro Explosive Devices, you shall:

(1) Follow all other requirements for working with explosives, propellants, or pyrotechnic systems in this chapter.

(2) Shield or short together wire leads.

(3) Make sure that wire leads are not twisted into loops, dipole antennas, or other types of antennas.

(4) Eliminate electrostatic charge buildup by using wriststats or legstats approved for use with EEDs.

(5) Never use or allow radios, cellular telephones, or other transmitting equipment around EEDs.

(6) Never rub or polish EEDs.

(7) Use only continuity testers and firing units specifically designed for use with EEDs.

d. The ESO shall verify that any training of off-site personnel coming on site to perform temporary explosives work meets the intent of the on-site explosives training program before the work is begun. For example, an off-site Prime Contractor working on a NASA Program that comes on site to install a pyrotechnic thruster assembly on a test article must first demonstrate to the ESO that he or she has met an appropriate level of training to safely handle and install the thruster assembly and cartridges. This could include a list of training classes and on the job training completed at the Prime Contractor's facility.

9.5.7 Safely storing explosives, propellants, or pyrotechnic systems

a. You shall follow these requirements in and around storage locations:

(1) Remove all loose packing materials, skids, dunnage, empty boxes, and other combustible materials from magazines.

(2) Mow and clean a 50-foot or larger fire break around your magazine.

(3) Don't use or store flammable materials in magazines.

(4) Don't allow flame-, or spark-producing devices in magazines without written permission from the Safety and Test Operations Division.

(5) Don't smoke within 50 feet of a magazine.

(6) Don't use magnesium flashlights, X-ray equipment, photographic flashbulbs, or strobe lights with 10 feet of a magazine without written permission from the Safety and Test Operations Division.

(7) Use only "non-sparking" tools around explosives, propellants, or pyrotechnic systems.

b. You shall follow these requirements for all facilities storing explosives:

(1) Have the Safety and Test Operations Division review and approve all facilities used to store explosives, propellants, or pyrotechnic systems.

(2) Keep magazine doors in good working condition.

(3) Keep magazine doors locked at all times, except when working in the magazine.

(4) Have at least one 3A- or larger-rated fire extinguisher in good working condition outside the magazine.

(5) Separate storage according to the class, division, and storage compatibility group (SCG). See paragraphs 9.5.7.c & d below.

(6) Post signs stating, "Explosives," "No Smoking," along with the appropriate fire symbol. See paragraph 9.5.7.e below.

(7) Keep up-to-date inventories of all explosives, propellants, and systems stored in the magazine as required in 9.5.4.b.

c. You shall observe the following safe distances:

If the class and division is . . .	*And if the exposure is to . . .*	*Use the safe distance tables listed in . . .*
1.1	Inhabited buildings or public transportation routes	NASA-STD-8719.12, Table XII
1.1	Operations on the same line	NASA-STD-8719.12, Table XIII
1.1	Other magazines	DOD 6055.9-STD, "Ammunition and Explosives Safety Standard," Tables 9.4 and 9.5
1.2	Anything	DOD 6055.9-STD, Tables 9.6 to 9.9
1.3	Anything	NASA-STD-8719.12, Table XXIII
1.4	Any exposure	DOD 6055.9-STD, Table 9.11
1.5	Same as 1.1	
1.6	Same as 1.1	

d. The class and division numbers and the SCGs were set up by the United Nations Organization for storage and shipment of hazardous materials worldwide. Explosives, propellants, and systems fall under Class 1. The divisions and SCGs indicate the relative hazard within Class 1:

(1) See NASA-STD-8719.12, paragraph 5.44, to find the class and division.

(2) See NASA-STD-8719.12, paragraph 5.46 table, to find the SCGs.

e. Post fire symbols as required by NASA-STD-8719.12, paragraphs 5.3 and 5.4, in the following ways:

On . . .	*Then display . . .*
Small buildings	A symbol on each side of a building
Buildings with long sides	As many symbols as required, but more than one
Buildings that are not visible from approaches	At least one symbol on each approach
Storage buildings	At least one symbol on a building
Vehicles transporting explosives on site at JSC	At least two symbols on the vehicle

f. You shall follow these requirements for unservicable pyrotechnics:

(1) Store unserviceable pyrotechnics separately from serviceable stocks.

(2) Mark or tag all damaged pyrotechnic devices and put them in separate, properly marked continers.

(3) When deemed safe to do so by the ESO, damaged pyrotechnics devices may be "safed" by firing in place.

(4) When deemed safe to do so by the ESO, unserviceable propellants, pyrotechnic devices, or pyrotechnic systems may be initiated on-site for purposes such as engineering tests, autoignition tests, checkout test firings,extended age life testing, and training.

(5) Ship unserviceable devices back to the original supplier or to an authorized disposal facility, when the owning organization deems them unusable. The owning organization is responsible for veifying that the disposal facility has the necessary permits required by local, state, and federal regulations.

9.5.8 Transporting explosives, propellants, or pyrotechnic systems

a. All motor vehicle shipments shall comply with Department of Transportation (DOT), State, and municipal regulations.

b. Propellants and pyrotechnic devices shall only be transported in vehicles approved for transporting explosives per NPR 8719.12 Section 5J.

c. Before any motor vehicle designated for movement over public highways may be loaded with explosives or ammunition (DOT Class 1, all Divisions), the vehicle shall be inspected and aproved by a qualified explosives vehicle inspector.

d. Personnally owned vehicles (POV's) shall not be used to transport explosives, pyrotechnic devices, or propellants.

e. Do not transport explosives in the cab of the vehicle.

9.5.9 Training and certification to work with explosives, propellants, or systems

9.5.9.1 Personnel handling explosives, propellants, or pyrotechnic systems shall be certified to handle explosives, propellants, or systems per the requirements of this chapter and Chapter 5.8, “Hazardous Operations: Safe Practices and Certification,” of this Handbook. Training shall cover the following subjects, as a minimum, for each explosive, propellant, or pyrotechnic system involved:

a. A safe attitude toward working with explosives

b. Nature and properties of the explosive, propellant, or pyrotechnic system.

c. Correct PPE to use in specific environments and where you can find it.

d. Approved materials that are compatible with the explosive, propellant, or pyrotechnic system.

e. Information on physical and health hazards.

f. Proper handling methods for the explosive, propellant, or pyrotechnic system.

g. Proper storage for the explosive, propellant, or pyrotechnic system.

h. Proper transportation requirements for explosives, propellants, or pyrotechnic systems.

i. Labeling systems and Safety Data Sheet terms.

j. The correct skills and procedures for safe performance of pyroechnic operations.

k. The purpose and proper use of engineering controls, work practice controls, and PPE.

l. Detection methods for the presence or release of a hazardous material in a work area.

m. Procedures for rersponding to unexpected hazardous conditions and emergency situations.

9.5.9.2 Explosives Handler certifications are good for three years. To be certified as an Explosives Handler, you shall:

a. Complete the training requirements in 9.5.7.1.

b. Complete a minimum of six months of on the job training under the supervision of a certified Explosives Handler.

c. Successfully complete training courses as designated by the individual's immediate supervisor and the ESO. Training shall include Basic Explosives Safety as a minumum. Recommended training courses include:

(1) ESD, EMI and EMC training.

(2) Chemistry of Explosives.

(3) Hands on Explosives and Lab Safety course.

d. Pass an annual physical per NPR 1800.1, Appendix 3.

e. Be certified by letter signed by your Immediate superviser.

9.5.9.3 The ESO has discretion to grant Limited Pyrotechnic Certification for pyrotechnic operations involving a small number of pyrotechnic devices for a specific test. To be certified, you shall:

a. Successfully complete training for that specific operation.

b. Successfully complete the Basic Explosives Handler's Course.

c. Be certified by letter signed by your immediate supervisor and the ESO and stating the following:

(1) Name of the person being certified.

(2) Name of the device(s) on which the person has successfully completed training.

(3) The date on which the certification begins.

(4) The duration of the certification, not to exceed one year.

(5) The name of the test or hardware on which the pyrotechnic device is being used or installed.

9.5.10 Emergency actions for explosives, propellants, or systems

a. If an *explosion* happens, you shall:

(1) Evacuate the building according to your building's EAP.

(2) Call your emergency number and report the explosion.

b. If a *fire* happens, you shall call your emergency number and take action as described in this table for the fire symbol posted.

If the fire symbol is . . .	***Then . . .***
1	• Don't fight the fire unless you have planned a rescue attempt • Don't try to put out the fire unless other fire symbol 1 materials are far enough away and the fire chief approves • Take cover if your safety is in doubt
2	• Sound an alarm • Fight the fire only if it is in the beginning stages and you are trained to do so • Prevent the fire from spreading, if possible • Protect yourself from fragments
3	• Fight the fire only if explosives are not involved and you are trained to do so • Use lots of water if white phosphorus or tear-producing agents are involved • Use dry sand or dry powder in the early stages of a fire involving tear-producing agents • Don't use CO_2, water, or halon on fires involving magnesium, titanium, aluminum, or other light metals; use a 2-inch layer of dry sand or powder on the floor for light metal fires; rake the burning metals into the layer of sand or powder and put another layer of sand or powder on top of the burning metals
4	• Fight these fires if you are trained to do so • Protect yourself from minor explosions and hot fragments

Remember, your emergency numbers are: x33333 or (281) 483-3333 at JSC, Sonny Carter Training Facility, and Ellington Field, 911 at any off-site location, and x5911 at WSTF. You shall call your emergency number if you see an emergency.

9.5.11 For more information on working with explosives, propellants, and systems

a. Department of Defense, DOD 6055.9-STD

b. Air Force Manual, AFM 91-201, "Explosives Safety Standard"

c. Army Materials Command Regulation, AMC-R 385-100, "Safety Manual"

d. Army Technical Manual, TM5-1300, "Structures to Resist Accidental Explosions"

e. NASA-STD-8719.12, "Safety Standard for Explosives , Propellants and Pyrotechnics"

f. JPR 1710.13, "Design, Inspection, and Certification of Pressure Vessels and Pressurized Systems"

g. 49 CFR 172–183, "Department of Transportation Regulations for Transportation of Hazardous Materials"

9.5.12 Responsibilities for explosives safety:

a. The *JSC Explosives Safety Officer* has jurisdiction for explosives safety at all JSC facilities and field sites and is responsible for:

(1) Fulfilling the responsibilities in paragraph 3.11.4 of NPR 8715.3.

(2) Maintaining a current master list of all licensed explosive operating locations and explosive storage sites and their locations, fire symbols, and available empty storage sites. This list shall be available to emergency forces (such as, fire department, guard forces) at all times.

(3) Approving Pyrotechnics Safety Officers for all JSC facilities outside of WSTF.

b. The Manager, WSTF, is responsible for designating, in writing, as required in WSP 25-0007:

(1) A WSTF Assistant Explosives Safety Officer.

(2) WSTF Pyrotechnics Safety Officers with acceptable explosives experience and training to perform duties as required to ensure compliance with applicable requirements.

c. The WSTF Assistant Explosives Safety Officer is responsible for the day-to-day explosives safety activities at the WSTF as required in WSP 25-0007.

d. Pyrotechnics Safety Officers are responsible for ensuring compliance with NASA-STD-8719.12, this chapter, and other applicable regulations in their areas.

e. The *Safety and Test Operations Division* is responsible for:

(1) Supporting ESO assessments as required in paragraph 3.11.4 of NPR 8715.3..

(2) Reviewing readiness of new or modified energetic test facilities as requried in Chapter 10.3.

(3) Reviewing readiness of energetic test operations as required in Chapters 6.9.

(4) Reviewing Facility Safety Management Process documentation of energetic test facilities as required in 10.4.

f. The *Security Office* is responsible for maintaining a current copy of JPD 4500.1 Pyrotechnics – Logistic Management (the master list of storage sites at JSC and Ellington Field) to make available to emergency forces (such as, fire department, guard forces) as needed.

Chapter 10.4 Facility Safety Management Process Documentation (FSMPD) Requirements for Critical, Complex, or Hazardous Facilities

10.4.1 Applicability of this chapter

10.4.1.1 You are required to follow this chapter if you are:

a. A facility operations manager of a facility described below or on the list of facilities requiring FSMPD at the following URL: http://www6.jsc.nasa.gov/safety/FacMgr/List_of_FBD_Facilities.pdf.

b. An appointed safety coordinator in facilities described below or on the list at the URL in subparagraph a.

c. A director at JSC and have facilities described below or on the list at the URL in subparagraph a.

10.4.2 What facilities require FSMPD

10.4.2.1 "Facility," as used in this chapter, may be a building, a work area in a building such as a laboratory, or an outside work area. A facility shall have FSMPD if it:

a. Is critical to JSC's overall mission, such as:

(1) Unique, irreplaceable facilities that support manned space flight activities.

(2) Facilities directly supporting those unique, irreplaceable facilities that provide water, electrical, heating andcooling, and computer services.

b. Contains historically significant national treasures, including, film, video, and scientific specimens that are irreplaceable.

c. Is hazardous, such as:

(1) Facilities, by their standard operation or mission, subject personnel to risks or hazards that are not normally seen in the standard workplace environment, such as high voltage or current electricity, plasmas, vacuum environments, hypobaric or hyperbaric test chambers, cryogenics, and human suited operations

(2) Facilities housing or using explosive, flammable, toxic, caustic, radioactive, or oxidizing materials.

d. Has very complex operating systems, such as those:

(1) Requiring multiple organizations to conduct its operations.

(2) Requiring extensive employee training to operate.

(3) Having internally and externally integrated systems using specialty and prototype equipment.

(4) Containing specifically designed and high value equipment.

(5) Housing special communications and telemetry systems that interface with other NASA centers, international organizations, and the Department of Defense (DOD).

e. Is listed in the table at the following URL: http://www9.jsc.nasa.gov/safety/FacMgr/List_of_FBD_Facilities.pdf. Organizational directors may propose addition or deletion of facilities subject to these requirements to the Safety and Test Operations Division. The list of applicable facilities is subject to change considering the scope of this chapter and risk to life, safety, mission, property, or the environment.

10.4.3 FSMPD requirements

10.4.3.1 If your facility meets the above criteria or is listed above, you shall develop, validate, and maintain a set of FSMPD for your facility as required by a readiness review per chapter 10.3 of this handbook before beginning operations and through the life cycle of the facility. The contents of FSMPD chapter 8 of NPR 8715.3 and are as follows:

a. **Configuration control documentation** as follows:

(1) Have a documented system to identify and control your facility's configuration that meets JPD 8820.3, "Facility Configuration Management Program."

(2) Document your configuration control system in your general operating documentation, described in sub-paragraph b below.

b. **General operating documentation:**

(1) Containing your basic policies.

(2) Describing your facility organization and its functions and responsibilities.

(3) Describing how you collect and control your facility baseline documentation.

NOTE: This documentation may be included in test plans, operating plans, readiness reviews or inspections, work instructions, management system documents, or customer agreements, provided all elements are addressed and revised as appropriate as conditions change.

c. **Detailed procedures** describing how you operate machinery or systems, conduct tests, and control resources and schedules. Include limitations, controls, and requirements associated with sub-paragraph b, above, and sub-paragraph d, below, as necessary to assure that hazards and key operating conditions are fulfilled. Either develop these procedures yourself or use manufacturers' procedures when available.

d. **Safety documentation** assessing risks associated with the facility, identifying and tracking hazards, and verifying hazard resolution.

e. **Training documentation** defining the minimum training and certification needed to qualify personnel to operate equipment or systems, or to be a member of a test team.

f. **Maintenance documentation** describing how you maintain the facility, facility systems, and facility equipment in a safe working order, and show maintenance history. You may use manufacturers' maintenance manuals.

g. **Other documentation such as:**

(1) Records from a readiness review, such as an operational readiness inspection or a user readiness review that approved your facility, if such a review was done.

(2) Records documenting operational decisions or critical operations in the facility.

NOTE: See the checklist at URL http://www9.jsc.nasa.gov/safety/Checklists/docs/Facility/NS-PA-CH07-FacBaselineDocChecklist.docx for a list of possible FSMPD items for the facility.

10.4.4 Maintaining FSMPD

Follow NPR 1441.1, "NASA Records Retention Schedules" (current version), for keeping, archiving, or destroying records.

10.4.5 Responsibilities for FSMPD

a. As an ***organizational director***, you are responsible for:

(1) Deciding which of your facilities needs to follow the requirements in this chapter and notifying the Safety and Test Operations Division of any additions or deletions to the list.

(2) Making sure each facility or laboratory manager has the required FSMPD.

(3) Reviewing the status of your FSMPD during readiness reviews or inspections to make sure it meets this chapter. If your facility is used continuously or frequently, you may define prescribed intervals for review based on maintenance requirements or change milestones.

(4) Bringing any discrepancies found during your review to the attention of the responsible facility or laboratory manager for corrective action.

(5) Providing FSMPD to the Safety and Test Operations Division during its assessments.

(6) Assessing laboratories and facilities for applicability of this chapter, and to direct the appropriate facility or laboratory manager to develop or upgrade FSMPD to conform to these requirements.

(7) Periodically self-assessing FSMPD using the checklist at URL: http://www9.jsc.nasa.gov/safety/Checklists/docs/Facility/NS-PA-CH07-FacBaselineDocChecklist.docx. Tailor the checklist to the documentation required by the readiness review. Send completed checklists to the Safety and Test Operations Division for an evaluation of compliance. You may use data from other assessments, inspections and audits to fulfill FSMPD requirements

b. The ***Safety and Test Operations Division*** is responsible for:

(1) Assessing the risk associated with facilities identified as hazardous, critical, or complex as listed at URL: http://www9.jsc.nasa.gov/safety/FacMgr/List_of_FBD_Facilities.pdf.

(2) Developing a schedule of facilities to be assessed annually, considering operational objectives, scheduling impacts, age, changes in mission scope. Compliance with this chapter and risks associated with these facilities may also be assessed during the course of readiness reviews, facility inspections, internal or external audits .

(3) Assessing the adequacy of Directorate Reviews through evaluation of supporting information.

Chapter 11.1 Reserved

Chapter 11.2 Reserved

Chapter 12.1 Asbestos Control

12.1.1 Applicability of Asbestos Control Requirements

You are required to follow Part 12 if you conduct any asbestos-related construction, remodeling or demolition activities at JSC, Sonny Carter Training Facility, or Ellington Field, whether as a JSC organization, a resident support contractor, or a construction and fixed-price contractor. JSC field sites follow equivalent requirements that also meet their state and local regulations.

12.1.2 About Part 12

12.1.2.1 Part 12 provides the information, guidance, standards, and procedures necessary to implement NASA and JSC policy relating to asbestos-related activities. The definitive procedures in Part 12 and the basic policies of federal regulations provide a basis for asbestos-related activities at JSC.

The following are the general provisions of Part 12:

a. Minimum acceptable standards and procedures for all JSC asbestos-related activities. It includes specific performance requirements for the most common asbestos-related tasks at JSC. The standards and procedures set forth are consistent with health and safety standards and procedures in industry and those established by the Occupational Safety and Health Administration, the Environmental Protection Agency (EPA), and NASA. It also applies to other operations that may involve asbestos, even though they are not specifically cited in Part 12.

b. Policy, procedures, and guidance for conducting asbestos-related activities at JSC with minimum risk to the employees involved and to building occupants. Part 12 identifies controls for protecting workers, work practices, and methods of minimizing asbestos release. Workers and employees who follow these controls will also prevent the unnecessary exposure of building occupants to unacceptable concentrations of asbestos.

c. Generally, it is only necessary for a job supervisor or foreman to determine whether the work area is known to have Asbestos Containing Materials (ACMs) and to select the appropriate procedures and controls necessary to perform the work. You can find an inventory of areas currently known to contain asbestos in the JSC Asbestos Tracking Tool at https://rebel.larc.nasa.gov/jsc/htmldb/f?p=ASBESTOS.

d. Areas suspected to have ACM for which no data exist either shall be presumed to have ACM or confirmed by bulk sampling and analysis before the work activity begins. Confirmatory sampling and analysis will be conducted by either the Space Medicine Operations Division (SMOD) or by the Facility Support Services (FSS) contractor. (See paragraphs 12.1.3.1.c, 12.1.3.1.d., and 12.1.3.1.e. below.)

e. JSC recognizes that some of the requirements within Part 12 procedures may add expense and time delays to procedures previously in place. This is the cost of providing the additional degree of control to ensure the occupational safety and health of workers at JSC.

f. Part 12 is organized to assist the job supervisor or foreman, referred to as the originator, in effective planning. Oversight and enforcement of the plan and the procedures established by Part 12 will be the responsibility of the Asbestos Program Manager (APM) (Mail Code JE).

The APM will rely heavily upon the SMOD in monitoring conformance with the asbestos control procedures established by the individual procedures. In rare cases, the APM or SMOD will issue a stop-work order under the authority of JPD 1700.3, subparagraph 1.3.4, if work practices do not provide sufficient protection to workers and building occupants.

12.1.3 How to use Part 12 for planning and conducting asbestos-related activities

12.1.3.1 Planning and conducting asbestos-related activities shall follow the basic steps listed below:

a. Establish the job description and initiate the appropriate work order (e.g., work authorization document (WAD), modification, construction, rehabilitation, and repair (MCRR), Construction of Facilities Project). Then identify the asbestos hazard, if known, or request sampling assistance from the SMOD to determine the hazard if the presence of asbestos is suspected but not known. The following apply:

   (1) Any Construction of Facilities Project, WAD, or MCRR that will, or has the potential to, disturb facility or building materials shall have a written assessment from the SMOD or FSS contractors on the presence or absence of ACM.

   (2) Involve the APM and the SMOD in the planning, design, and construction of projects involving Class I and Class II asbestos work.

   (3) Pre-approved project designs for Class I and Class II activities, involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or presumed ACM (PACM), and pre-approved project designs for a number of Class III and Class IV activities are described in Chapter 12.15 and Chapter 12.16.

   (4) All Class I, Class II, and Class III projects, not otherwise described in Chapter 12.15 or Chapter 12.16 shall have a formal project design approved by an EPA-accredited project designer. The JSC APM and/or the SMOD shall approve the design.

b. The originator (usually the foreman or supervisor) shall confirm whether the work area is in the JSC asbestos database as an area containing asbestos. Refer to the JSC Asbestos Tracking Tool at https://rebel.larc.nasa.gov/jsc/htmldb/f?p=ASBESTOS.

c. If the work area is not in the database, the originator or supervisor checks with the APM or the SMOD (x36726) to determine whether there is any other evidence of asbestos in the area.

d. If there is no evidence, the originator requests the SMOD perform bulk material sampling to determine the presence of asbestos. The SMOD needs sufficient lead time, usually a minimum of 3 weeks, to coordinate sampling, obtain analyses, and write a report.

e. The FSS contractor collects bulk asbestos samples in support of its routine operations and maintenance activities. In lieu of sampling, the originator may presume asbestos-containing materials (PACMs) are present.

f. If there is no ACM, PACM, or evidence of asbestos, the originator may proceed with the job as a normal non-asbestos job.

g. If any work area is in the database or other evidence indicates the presence of ACM, the originator plans an asbestos-related activity using Part 12. The originator shall also identify the scope of the work to be performed.

h. If asbestos is identified in the work area, but no pre-approved project design exists for the job to be performed, follow the alternative procedures of Chapter 12.2, paragraphs 12.2.2 and 12.2.3. The originator develops a project design for the job and has it approved by the SMOD.

i. If a pre-approved project design exists for the job, the originator or supervisor reviews the requirements of the procedure and develops the asbestos work permit (shown in Appendix D). Refer to Chapter 12.4 for the classes of asbestos work and to Chapter 12.15 and Chapter 12.16 for job-specific performance requirements of work to be performed. Work permits are not required for Class IV asbestos work. The permit may be used as a coordination or notification document by sending a facsimile copy to the identified JSC office.

j. The originator or supervisor completes and signs the permit (see Appendix D), identifying the necessary controls.

k. The Competent Person for the job also signs the permit. Give this permit to the individuals assigned to the task and keep it at the asbestos work site, as well as a copy of the appropriate job-specific performance requirements from Chapter 12.16.

l. Once the task is completed, return the work permit to the originator for recordkeeping. Maintain executed work permits for at least 1 year, and make them available to the APM upon request.

m. All asbestos-related work requires supervision by a Competent Person. The appropriate employer designates the Competent Person for each asbestos-related job. Qualifications of the Competent Person are subject to review by the JSC APM, the JSC SMOD, or their designated representatives.

n. During the actual job, perform on-site inspections and monitoring as required by the procedure. If the assigned Competent Person is not at the job site, he or she shall visit the job site a minimum of twice per task and once per shift during the course of the work.

o. Upon completion of the job, the originator conducts or requests clearance inspection and air monitoring, as required by the procedure. Additionally, the originator, supervisor, or Competent Person shall obtain a Pick-up Request Number by calling the JSC Environmental Office at x36207 and enter this information on the JSC Form 1161 and the work permit.

p. Upon satisfactory clearance inspection and air monitoring results, if required, the originator shall reestablish the work area and prepare and submit any documentation required by the procedure.

Chapter 12.3 Asbestos Control Program (ACP)

12.3.1 Purpose

The purpose of the ACP is to provide a safe work environment by maintaining potential asbestos exposure hazards as low as reasonably achievable for all building occupants and service personnel. This can be achieved through a well-defined ACP that includes asbestos inspection, hazard assessment, and response actions, and by ensuring that all JSC asbestos-related work follows the requirements set forth in the remaining chapters of Part 12. Other important aspects of a comprehensive ACP include employee training (Chapter 12.5), medical surveillance (Chapter 12.5), personal protection (Chapter 12.5), work practices and procedures (Chapters 12.3 through 12.13), air and exposure monitoring (Chapter 12.8), emergency and mishap procedures (Chapter 12.14), and job-specific performance requirements(JPRs) (Chapter 12.15 and Chapter 12.16). This chapter defines the specific procedures for identifying and assessing ACM, developing appropriate response actions for mitigating its hazard potential, and conducting annual ambient air monitoring.

12.3.2 Responsibilities

The APM (JE) has primary responsibility for coordinating the ACP. He or she will use the services and support of the OHB and facilities maintenance FSS contractor to implement the ACP.

12.3.3 Objectives

12.3.3.1 The primary objectives of the ACP are to:

a. Manage-in-place the ACM in JSC buildings and facilities in a manner that minimizes asbestos exposure to building occupants, service workers, and the environment. To accomplish this, the ACP is designed to:

   (1) Remove asbestos debris that may have been released from the ACM.

   (2) Avoid or control disturbances of the ACM during building activities to eliminate or greatly reduce the release of fibers.

   (3) Remove or repair damaged ACM.

   (4) Implement a program of removal of asbestos materials as part of the JSC Facility Maintenance and Construction of Facilities Programs, as feasible.

   (5) Isolate and respond to episodic, potential fiber release incidents.

   (6) Properly manage and dispose of asbestos waste.

b. Identify the locations(s), type(s), and quantity of ACM.

c. Inspect and periodically re-inspect to determine the physical condition of existing or suspect ACM.

d. Assess the hazard potential posed by existing or suspect ACM based on a set of standard criteria.

e. Perform routine annual ambient air sampling.

f. Develop and implement response actions to abate existing and potential ACM contamination.

g. Respond to emergencies and fiber release episodes.

h. Prevent future contamination through minimization of ACM disturbance and damage.

i. Focus on service workers and workers involved in operations removing ACM since their activities are most likely to release asbestos fibers. These activities include building renovation, maintenance, repair work on building systems, and routine cleaning and custodial work.

j. Provide controls for all tasks involving potential asbestos exposure. Part 12 covers the removal of even one ceiling tile in a building known to contain SAI. The degree of control depends on the potential of exposure to workers and to building occupants.

12.3.4 Program elements

12.3.4.1 To achieve program objectives, the ACP shall:

a. Alert building occupants to the existence and location of ACM and to the need for not disturbing it through awareness training per chapter 5.7 of this Handbook (e.g., Hazard Communication, etc.).

b. Establish appropriate work practices for cleaning and maintaining the buildings.

c. Establish procedures for minimizing ACM disturbances during demolition and renovation projects.

d. Establish procedures for removing ACM.

e. Establish procedures for collecting and removing fibers after a release episode.

f. Establish procedures for those workers exposed at, or above, the action level for medical surveillance, training, and compliance with the existing respiratory protection program.

12.3.5 ACM inspections and hazard assessments

The APM shall ensure that periodic inspection and hazard assessment of suspect or confirmed ACM is accomplished in JSC facilities. The hazard assessment process uses the information contained in the inspection report and involves evaluating the degree of hazard potential that exists based on a set of criteria. The inspection or assessment process provides guidance in anticipating response actions; preparing scopes of work, cost estimates, and schedules; and in developing and prioritizing an overall asbestos management plan.

12.3.6 Bulk sampling

12.3.6.1 Bulk sampling verifies the presence or absence of asbestos in a particular building or facility material. At JSC, the ACM of primary concern is the SAI or fireproofing on the structural members and decking, but you may also find ACM in a wide variety of other building materials. The following requirements apply:

a. You shall presume the presence of asbestos when there are no bulk sample analyses or other information to confirm or refute the presence or absence of ACM.

b. Collecting bulk samples of ACM can cause significant damage and fiber release. Only individuals designated by the APM, who are trained and certified in the proper sampling techniques, are allowed to collect samples. The APM has designated both the OHB and the FSS contractor's industrial hygiene staff as having trained personnel to perform this sampling. Other contractors shall request this designation from the APM.

c. Analyze bulk samples by EPA-approved methods listed in 40 CFR 763.

d. Respiratory protection (or the use of wet methods when appropriate) is required while obtaining bulk samples of suspect ACM to prevent inhaling fibers.

12.3.7 Routine building ambient air sampling

12.3.7.1 The following air sampling occurs at JSC:

a. **Annual and quarterly ambient air sampling.** The OHB conducts routine annual and quarterly ambient air sampling in buildings known to have ACM SAI and exposed ACM asbestos acoustic or decorative material. The OHB samples:

(1) In areas readily accessible to building occupants.

(2) At least annually in each of the JSC buildings known to contain ACM SAI.

(3) At least quarterly in buildings and areas with exposed ACM acoustical or decoration materials or exposed ACM SAI.

NOTE: The data collected from past sampling has shown that ***no*** significant quantity of airborne asbestos fibers exists within JSC facilities and that levels are far below EPA and OSHA limits.

b. **Asbestos abatement project air sampling.** The OHB has primary responsibility for air sampling during asbestos abatement projects and particularly the final clearance air sampling. The abatement contractor or an outside consultant conducts personnel and other air sampling during the performance of a particular project, as required.

c. The OHB collects and analyzes all ambient air samples using the National Institute for Occupational Safety and Health (NIOSH) Method 7400 or 7402. As the OHB obtains additional sample data, it adds the results to the existing database. For additional information about air sampling requirements, refer to Chapter 12.8 of this Handbook.

12.3.8 Response actions

12.3.8.1 You shall follow these requirements for asbestos response:

a. The APM (JE) is responsible for all response actions. The EPA has defined "response action" to mean "a method including removal, encapsulation, permanent enclosure, repair, operations and maintenance that protects human health and the environment from friable ACBM" (40 CFR 763).

b. At JSC, only trained workers are allowed to perform one of the following four types of responses when notified about damaged ACM or when notified of a minor or major fiber release:

(1) **Cleanup of ACM.** This response is appropriate when loose ACM dust or debris is encountered. This is a nonemergency, scheduled activity that is normally completed within 48 hours from notification.

(2) **Repair of ACM.** This response is appropriate whenever ACM is found in a damaged, delaminated, or deteriorated condition over a relatively small area.

(3) **Removal of ACM.** This response is appropriate whenever ACM is found in a damaged, delaminated, or deteriorated condition over a relatively large area and poses a potential exposure hazard to building occupants. In addition to removing asbestos due to its condition or hazard potential, it shall also be removed before any construction, renovation, or demolition in structures containing friable asbestos or asbestos that will be made friable by these activities. In addition, no asbestos removal in excess of 160 square feet of surfacing material or 260 linear feet of pipe insulation or 35 cubic feet of any ACM will be performed without prior written notification to the Texas Department of State Health Services (TDSHS) (see Chapter 12.6).

(4) **Emergency response.** Cleanup and containment of a spill or release of known or suspected ACM that presents a potential hazard to building occupants. The APM (JE) is notified of any emergency involving significant damage to ACM resulting in the release of asbestos fibers. This type of situation is referred to as a fiber release episode. Upon notification, the APM coordinates response actions with the OHB and facilities maintenance FSS contractor. The situation will be evaluated and appropriate actions will be taken. These actions may include cleanup, repair, or removal of ACM as dictated by the particular circumstances.

c. Call the site EOC, x33333 or (281) 483-3333, to report suspected asbestos debris at JSC, Sonny Carter Training Facility, and Ellington Field. The EOC will contact the JSC Environmental Spill Team for cleanup and containment and the OHB for hazard assessment and air monitoring.

12.3.9 Prohibited activities

12.3.9.1 To minimize the potential for exposure to asbestos, all *uncontrolled* activities that may damage ACM or PACM or cause the release of airborne asbestos fibers are prohibited. You shall NEVER:

a. Cut or drill holes in any ACM or PACM.

b. Install hangers or fasteners in any ACM or PACM.

c. Sand, grind, drill, remove, or damage any ACM or PACM, including floor tiles, carpet tiles, or adhesives used on these tiles.

d. Damage ACM or PACM while moving equipment or furniture.

e. Install curtains, drapes, or dividers in such a manner that they will damage ACM or PACM.

f. Use an ordinary vacuum or compressed air or dry sweeping to clean up ACM or PACM debris.

g. Remove ceiling tiles below ACM or PACM without following the procedures set forth in Part 12.

h. Hang any item from the suspended ceiling grid below a ceiling plenum with SAI.

i. Damage any pipe or mechanical system insulation that contains or could contain ACM or PACM. Insulating materials such as Styrofoam, foam rubber, foam glass, or fiberglass do not contain asbestos; however, ACM may exist at the joints and fittings. Contact the APM before conducting activities that may cause disturbance or damage to these materials or follow the applicable procedure in Chapter 12.16.

Chapter 12.5 General Asbestos Work Requirements

12.5.1 What this chapter covers:

12.5.1.1 This chapter covers the following general requirements for any asbestos work at JSC, to include:

a. 12.5.2 Medical surveillance requirements.

b. 12.5.3 Training requirements.

c. 12.5.4 Respiratory protection requirements.

d. 12.5.5 Personal protective clothing and equipment.

e. 12.5.6 Decontamination.

f. 12.5.7 Secure electrical, fire, and HVAC systems.

g. 12.5.8 Electrical power hazards.

h. 12.5.9 Slips, trips, and falls.

i. 12.5.10 Confined spaces.

j. 12.5.11 Ladders and scaffolds.

k. 12.5.12 Heat stress.

l. 12.5.13 Prohibited activities.

12.5.2 Medical surveillance requirements

12.5.2.1 You shall follow these requirements for medical surveillance:

a. You can find medical surveillance requirements in three OSHA regulations. Refer to the listed regulations for details and specifications of these requirements. Note that all three regulations require a physician's written opinion. These three regulations are:

   (1) 29 CFR 1926.1101, "Construction Industry Standard for Asbestos," requires employees who perform Class I, II, and III asbestos work for 30 or more days per year, or those who are exposed to airborne concentrations of asbestos at or above the PEL, to be enrolled in a medical surveillance program.

   (2) 29 CFR 1910.1001, "General Industry Standard for Asbestos," requires all employees who are exposed to airborne concentrations of asbestos at or above the PEL to be enrolled in a medical surveillance program.

   (3) 29 CFR 1910.134, "Respiratory Protection Standard," specifies that any employee required to wear respiratory protection equipment while performing his or her job shall receive a medical evaluation.

b. Medical examinations are required before asbestos work or exposure (pre-placement), annually, and upon termination of employment and are also required to determine an employee's ability to perform work while wearing a respirator. The frequency of medical

evaluations for asbestos workers and respirator wearers at JSC is listed in Chapter 3.6 of this Handbook.

c. The medical support contractor provides medical surveillance of JSC civil service employees. On-site resident support contractor employees receive medical surveillance as specified in their contract. Fixed-price contractors shall provide the required medical surveillance from medical resources other than JSC.

d. Medical surveillance is not required for building occupants since no ambient levels of asbestos fibers have been identified within JSC facilities that would expose building occupants to even a significant fraction of the JSC action level.

12.5.3 Training requirements

12.5.3.1 When an entire area is turned over to a contractor, who was hired for Class I or Class II asbestos abatement of a building, a floor, or a room; the contractor's asbestos workers are not required to take JSC site-specific training. However, the workers shall be current in their Class I or Class II asbestos training, as described below. Competent Persons for off-site contractors shall meet the requirements of Chapter 12.7.

12.5.3.2 The following subparagraphs list the JSC minimum training requirements for Class I, II, III, and IV asbestos work. The OSHA Construction Industry Standard for Asbestos, 29 CFR 1926.1101(k) (9), provides the basis for this training. Complete the training for your appropriate class of asbestos work before or at the time of your initial assignment and take refresher training at least annually thereafter. Training requirements are as follows:

a. **All Class I work and any Class II work that uses critical barriers or negative pressure enclosures.** Initial training equivalent to the 4-day EPA Model Accreditation Plan asbestos abatement worker training specified in 40 CFR 763, Subpart E, Appendix C. If you have a current certificate or license issued under 25 TAC 295.42 for an Asbestos Abatement Worker, you meet this requirement. Currency in this training expires exactly 12 months after the date of the initial or last refresher training, and you may not perform Class I or Class II work activities until you have again received the required 8-hour refresher training. If you let more than 24 months lapse since the date of your last training, you shall retake the initial training. You shall have a current medical examination and respirator fit test.

b. **All other Class II work**. Only for work involving ACM roofing materials, flooring materials, siding materials, ceiling tiles, or transite; training shall meet these requirements:

(1) Initial 8-hour training equivalent to the requirements specified in 29 CFR 1926.1101(k) (9) (iv).

(2) Currency in this training expires exactly 12 months after the date of the initial or last refresher training. You may not perform Class II work activities until you have again received refresher training. If you let more than 24 months lapse since the date of your last training, you shall retake the initial training.

(3) You shall also have a current medical examination and respirator fit test.

c. **Class III work.** Training shall meet these requirements:

(1) Initial 16-hour Operations and Maintenance training equivalent to the requirements specified in 29 CFR 1926.1101(k) (9) (v) and 40 CFR 793.92(a) (2).

(2) Currency in this training expires 12 months after the date of the initial or last refresher training. If you can demonstrate that you are scheduled for refresher training, you may continue to perform Class III asbestos-related work on site at JSC until receiving the scheduled refresher training, but not longer than 14 months after the date of your last training.

(3) If you let more than 24 months lapse since the date of your last training, you shall retake the initial training.

(4) You shall also have a current medical examination and respirator fit test.

(5) When emergency response involves a cleanup of a major fiber release episode, the responders shall have training meeting the requirements of Class I asbestos work (see above).

d. **JSC Site-Specific Asbestos Training for Class I, II and III Work.** All onsite workers performing any Class I, II or III asbestos work are required to take the JSC Site-Specific course to acquaint them with JSC conditions, JSC procedures, and job-specific performance requirements described in Chapter 12.15 and Chapter 12.16. OHB will offer this course only by request. **An exception exists for off-site contractors; see subparagraph h. below.**

e. **Restricted Class III asbestos operations and maintenance work.** All employees (contractor or civil service) at JSC who work in ceiling plenums or mechanical rooms, beneath computer floors, and anywhere that ACM could potentially be disturbed shall complete the JSC 8-hour Asbestos Site-Specific and Class III (Restricted) Worker Training course offered by the OHB. This course, along with medical surveillance or evaluation and a current respirator fit test, is required before conducting restricted Class III activities at JSC. Refresher training requires completion of the JSC 2-hour Asbestos Site-Specific and Class III (Restricted) Worker Refresher course offered by the OHB. Additional discussion about this JSC training is provided below:

(1) JSC Class III Asbestos O&M (Restricted): The work is considered restricted because it is limited to the specific areas and specific conditions at JSC where activities have the potential to disturb asbestos-containing SAI or to disturb dirt or dust containing SAI debris. The asbestos work is restricted because it ***does not*** include removal or abatement of any ACM. This encompasses work in ceiling plenums or mechanical rooms, beneath computer floors, and anywhere that ACM could potentially be disturbed. For example, entry into ceiling plenums to “pull cables” or install electrical utility lines in buildings with SAI falls under this classification.

(2) The JSC Class III Asbestos O&M (Restricted) initial and refresher courses neither address nor train workers to perform the other types of Class III asbestos-related work, such as glovebag removal or spot abatement of ACM. If you perform actual removal of ACM for operations and maintenance activities, you shall meet the appropriate training requirements for asbestos Class I, II, or III work as described in the paragraphs above.

(3) Currency in the JSC Class III Asbestos O&M (Restricted) training expires 12 months after the date of the initial or last refresher training. If you can demonstrate that you are scheduled for refresher training from OHB, you may continue to perform restricted Class III asbestos-related operations and maintenance work on site at JSC until receiving the scheduled refresher training, but not longer than 14 months after the date of your last training. If you let more than 24 months lapse since the date of your last training, you shall retake the initial training.

f. **Class IV work (except emergency response)**. Training equivalent to the requirements specified in 29 CFR 1926.1101(k) (9) (vi) and 40 CFR 793.92(a) (2). This 2-hour awareness training class includes specific topics and work practices.

g. **Resilient Floor Covering Institute (RFCI)**. Training in the methods specified by the RFCI for the removal of resilient floor coverings and adhesives that contain asbestos. These floor coverings may be: (i) sheet flooring that contains asbestos or has an asbestos felt backing, (ii) vinyl or asphalt floor tiles, or (iii) adhesives and mastics. If you remove floor coverings and adhesives using RFCI methods at JSC, you shall also have Class II (32-hour) or Class III (16-hour) asbestos training as required by the activity. Training in RFCI methods shall last a minimum of 8-hours. The specific RFCI methods may be found in the RFCI document "Recommended Work Practices for Removal of Resilient Floor Coverings" at http://www.rfci.com/index.php . See the TDSHS statement concerning RFCI procedures at http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf.

h. **JSC Site Specific Training for Off-Site Contractors Conducting Class I, Class II, and Class III Asbestos Work.** Off-site contractors who conduct small scale Class I/ II work or Class III work using the pre-approved project designs described in Chapter 12.15 and Chapter 12.16, shall have competent persons take the 2-hour OHB training course to acquaint them with JSC conditions, JSC procedures, and job-specific performance requirements described in Chapter 12.15 and Chapter 12.16. OHB will offer this course only by request from the contractor. The competent persons must provide proof of currency in 40-hour initial or 8-hour refresher Contractor/Supervisor training either before the course start date or at the time of the course.

i. **Training for Custodial Workers**. If you are involved in housekeeping and custodial activities at JSC in areas with ACM (e.g., acoustical or decorative treatments and flooring materials), you shall receive annual awareness training. You will also receive training in the use of High-Efficiency Particulate Air (HEPA) vacuum cleaners and methods to avoid the generation of asbestos fibers from flooring materials as referenced in 29 CFR 1910.1001(k) and 29 CFR 1926.1101(l).

j. Training for any employees likely to be exposed above the PELs for asbestos shall meet the minimum training requirements specified in both 29 CFR 1910.1001(j) (7) and 29 CFR 1926.1101(k) (vii) and (viii).

k. Training for employees required to wear respiratory protection for any level of work involving asbestos materials shall meet the requirements of 29 CFR 1910.134.

l. Fixed-price contractors subject to these training requirements shall provide documented proof of required training for their workers and supervisors before proceeding with work identified within Part 12.

m. Building occupants shall receive asbestos awareness training through the annual JSC requirement for Hazard Communication Training.

12.5.4 Respiratory protection requirements

12.5.4.1 The following requirements apply for respiratory protection:

a. JSC policy requires the use of respirators when they are necessary to protect the health of the employee and reduce the risk of asbestos exposure during asbestos-related activities. You shall follow the basic OSHA requirements in 29 CFR 1910.134 and chapter 7.2 of this Handbook.

b. JSC provides respirators at no cost to civil service employees. Respiratory protection for on-site support contractor employees will be provided as specified in their contract. Fixed-price contractors subject to these requirements shall furnish their own equipment and provide documented proof of fit testing, medical surveillance, and training for their workers and supervisors before proceeding with work identified within Part 12.

c. If you perform any Class I, II, or III asbestos work at JSC, you shall wear appropriate respiratory protection. If you perform Class IV asbestos work, you may be required to wear respiratory protection. Select respirators based on the requirements stated in either 29 CFR 1926.1101(h) or 29 CFR 1910.1001(g) and chapter 7.2 of this Handbook.

d. Select all respiratory protection devices from those approved by NIOSH. Workers performing asbestos activities are prohibited from wearing a filtering face-piece respirator. If you must wear a respirator, you shall not wear a beard or other facial hair that would interfere with the facial seal with the face piece. See Chapter 5.6 of this Handbook for contact lens use.

e. If you're required to wear a half-mask respirator, you shall wear safety glasses with side shields or safety goggles.

12.5.5 Personal protective clothing and equipment

12.5.5.1 You shall follow these requirements to protect yourself:

a. Provide personal protective clothing and equipment required for employees engaged in asbestos-related activities as specified in Part 12. Follow the PPE requirements in chapter 5.6 of this Handbook. If you are exposed to hazardous noise, follow the hearing protection requirements in chapter 7.1 of this Handbook. Additionally, you can find OSHA requirements on PPE in the following standards:

(1) 29 CFR 1910.132, "General Requirements for Personal Protective Equipment"

(2) 29 CFR 1910.133, "Eye and Face Protection"

(3) 29 CFR 1910.135, "Head Protection"

(4) 29 CFR 1910.136, "Foot Protection"

(5) 29 CFR 1910.138, “Hand Protection”

(6) 29 CFR 1910.95, “Occupational Noise Exposure”

b. Wear protective clothing and equipment during asbestos-related work to protect from gross contamination of the body, hair, etc., and to provide protection from other physical hazards in the workplace. The proper use of protective clothing, coupled with the appropriate use of decontamination showers, as required, and HEPA-filtered vacuum cleaners, will minimize your chance of bringing asbestos out of the work area and into your general environment and home.

c. Use protective equipment, such as hard hats and eye protection, as required in chapter 5.6 of this Handbook or as determined by the designated Competent Person, the job supervisor, or the JSC Safety and Test Operations Division.

d. Never use street clothes (or shoes), T-shirts, blue jeans, sweatbands, kneepads, or socks as protective clothing. If you use any of these items inside the work area, you shall remain there until the job is completed and either be decontaminated using HEPA-filtered vacuum cleaners or wet wiping, or alternatively have these items disposed of as asbestos-contaminated waste.

e. Keep other protective clothing or items, such as hard hats and safety shoes or boots, if required, or other appropriate footwear, in the work area for the duration of the project. Upon project completion, you can clean these items, place them in a plastic bag, label them as asbestos contaminated, and take them to the next project. If these items cannot be decontaminated, dispose of them at the end of the project as asbestos-containing waste.

f. Protective clothing for asbestos-related work shall consist of disposable coveralls and gloves. These coveralls are normally paper or a synthetic material (i.e., Tyvek) with built-in or attached hoods and booties. Do not cut the hood or booties from the coveralls. After each use, discard these items as asbestos-contaminated waste. Disposable coveralls, such as Tyvek, are extremely vulnerable to hot surfaces or open flames. They burn rapidly, and some plastic materials may melt and severely damage exposed skin.

12.5.6 Decontamination

12.5.6.1 You shall follow these requirements for decontamination after asbestos work:

a. Complete the decontamination sequence after leaving an asbestos Regulated Area for any reason. Visible signs of asbestos will not be tolerated in areas serving building occupants.

b. Ensure that the degree of decontamination is directly proportional to the potential of exposing someone outside the work area. For the majority of JSC jobs, where disposable clothing is worn and where an enclosure is not required, first use a HEPA-filtered vacuum on or wet wipe the protective clothing, then carefully remove the protective clothing and bag it as asbestos-containing waste. Bag contaminated materials for disposal as asbestos waste.

c. When it is necessary to work within a large enclosure, in-process through a “hygiene unit” or “clean room” to change from street clothes into work clothes and out-process through the decontamination or hygiene units to remove contaminated work clothing, decontaminate, and change back into street clothes.

12.5.7 Secure electrical, fire alarm, and HVAC systems

12.5.7.1You shall take the following actions to secure critical systems before starting asbestos work:

a. Secure or deactivate all electrical, fire alarm, and HVAC systems in the work area before a major abatement activity, especially when it is necessary to construct a large enclosure. Activities involving small-scale or incidental asbestos exposure will generally not require securing the electrical, fire alarm, or HVAC systems; however, you will need to evaluate this on a case-by-case basis. Regardless, you shall coordinate any outage of electrical or HVAC systems through work control using established procedures.

b. De-energize the electrical systems serving the work area and control their operation before any wet operations begin. The amended water used to saturate ACM creates a humid environment and a potential hazard.

c. Disable fire alarm sensors before and throughout the project and have the Fire Protection Coordination Office approve all fire alarm sensor outages. They can be triggered during abatement activities.

d. Shut down, isolate, and control the HVAC in the work area before and during any asbestos-related activity. The HVAC system, if left operational in an asbestos work area, represents a potential route for spreading ACM fibers into other areas of the facility and, therefore, increases the risk of employee exposure.

e. Cover and seal all vents and air ducts inside the work area with two layers of 6-mil plastic and tape.

f. If the HVAC system supplying the work area supplies other areas in the building that are still operational, de-energizing the system may not be feasible; you shall develop an alternate method of isolating the work area portion of the HVAC.

g. Control electrical and HVAC systems shut down or de-energized at the point of isolation with an orange JSC Form 19A, “WARNING – DO NOT OPERATE” tag, and a lock (the lock shall be a color other than red). Use this tag and the operation or energy control procedures found in Chapter 8.2 of this Handbook to ensure the systems are controlled.

12.5.8 Electrical power hazards

12.5.8.1 One of the most common hazards, and one that gives the least warning, is electrical power. Incorrect wiring, improper grounding, and lack of proper shielding in the wet environment of asbestos-related activities can significantly increase workers’ risk. To lessen the risk of injury, you shall follow the requirements in chapter 8.1 of this Handbook and take the following actions:

a. De-energize as much of the work electrical system as possible.

b. Use portable light systems.

c. Use nonconductive scrapers, tools, and vacuum attachments.

d. Use hot-line covers over energized cables and power lines when possible.

e. Use caution to avoid damaging power cable insulation with scrapers, shovels, scaffolding, and wheeled equipment.

f. Avoid stringing electrical wiring across floors. Elevate wiring, if possible, to keep it away from litter on the floor, physical abuse, and damage from equipment use.

g. Use stable, wooden or fiberglass ladders – not metal.

h. Consider electrical equipment and lines to be energized unless tested and determined otherwise.

i. Use three-wire type extension cords with portable electric tools and appliances and connect them to a GFCI.

j. Equip all 120-volt, single-phase, 15- and 20-ampere receptacle outlets in the work area that are not part of the permanent wiring of the building or structure with an approved GFCI.

k. Establish and implement an assured equipment grounding conductor program covering all cord sets and receptacles that are not part of the permanent wiring of the building or structure, and equipment connected by cord and plug, which is available for use or used by employees on asbestos-related activities covered by Part 12.

12.5.9 Slips, trips, and falls

12.5.9.1 Asbestos-related projects, particularly abatement projects, are inherently dangerous for numerous reasons: the presence of multiple layers of plastic sheeting on the floor, the accumulation of debris, poor lighting, and the need to work from ladders and scaffolds. To deal with these problems, you shall take steps to prevent slips and falls in the work areas:

a. Install the first layer of floor sheeting as tight and flat as possible. Secure the second layer of plastic to the first with tape, spray adhesive, or other means. (This will reduce the chance of the two layers sliding over one another.)

b. Keep electrical lines off the work floor by taping them high on the wall, behind the wall plastic if possible.

c. Do not allow debris from abatement activities to pile up or lay about. Pick up and place the material in appropriate containers at the time of generation.

d. Select a secure area out of the normal traffic pattern for the temporary storage of waste bags.

e. For plastic floor sheeting on stairs, install a nonskid surface over the plastic on each tread. Do not cover stairs unless they require protection from water damage.

f. Ensure that all workers in the work area wear a good-quality protective shoe or boot. Rubber boots that provide good traction are preferred. Rubber boots also provide some protection from electrical shock as well as being easy to clean. Workers should not wear Tyvek booties on the outside of their work shoes.

g. Always follow established procedures for the installation and use of ladders and scaffolds.

h. Always be on the lookout for tools, cable equipment, etc., left lying about the work area that may trip you as you move about. Most abatement work requires that you be constantly looking at the ceiling or pipes overhead.

12.5.10 Confined spaces

You may encounter confined spaces in asbestos-related activities. *A confined space is a space that, by design, has limited openings for entry and exit; that has unfavorable natural ventilation, which could contain asbestos fibers, other hazardous materials or is oxygen-deficient; and that is not intended for continuous employee occupancy.* Confined spaces can include, but are not limited to, storage tanks, process vessels, pits, vats, degreasers, security vaults, boilers, underground utility tunnels or vaults, and pipelines. This Handbook and the OSHA requirements in 29 CFR 1910.146 govern entry into confined spaces during asbestos-related activities. Anyone working in a confined space at JSC shall complete the JSC Confined Space Training Course at the JSC Safety Learning Center or the Houston Area Safety Council before working in a confined space at JSC. Any asbestos-related work in a confined space, including the underground utility tunnels, requires a confined space procedure and permit approved by the OHB and the Safety and Test Operations Division. Follow Chapter 6.10 of this Handbook.

12.5.11 Ladders and scaffolds

Asbestos-related activities specified in Part 12 routinely use ladders and scaffolds. Both items represent potential safety hazards. Use ladders and scaffolds at JSC per the requirements in Chapter 8.7 of this Handbook, and the OSHA requirements of 29 CFR 1910.25, 29 CFR 1910.26, 29 CFR 1926.450–454, and 29 CFR 1926.1053.

12.5.12 Heat stress

12.5.12.1 You shall take the following measures to control heat stress:

a. Control employees' total heat exposure when conducting JSC asbestos-related activities so that workers are not exposed to combinations of metabolic and environmental heat, which produce unacceptable heat stress. Heat stress, for the purpose of Part 12, is the total effect of environmental and physical factors that makes up the total heat load imposed on the body. Unacceptable heat stress is defined as any combination of metabolic and environmental heat that produces any symptom or adverse effect.

b. Several biological effects can occur from heat stress. They include, in increasing order of severity, heat rash, heat cramp, heat exhaustion, and heatstroke. Heatstroke is an acute medical emergency that requires immediate medical attention. If you are a work area supervisor, you shall be familiar with the signs and symptoms of these conditions and take appropriate action whenever any worker shows signs of heat stress.

c. The major factors affecting heat exchange between a person and the environment are air temperature and humidity, skin temperature, air velocity, evaporation of sweat, and radiant temperature, as well as type, amount, and characteristics of clothing. Summer weather in Houston is both hot and humid.

d. Protective clothing required for asbestos-related activities serves as a barrier against gross contamination of the body by asbestos materials and the potential spread of asbestos to uncontrolled environments. It also alters the rate and amount of heat exchange between the skin and the ambient air, thus increasing the stress of metabolic and environmental heat.

e. The effects of heat stress can be increased if the individual is using alcohol, therapeutic drugs, or social drugs while being exposed to high heat stress in the work environment. Many drugs prescribed for therapeutic purposes also affect the body's mechanisms for adapting and adjusting to heat stress. If you require therapeutic medication, you may not work asbestos-related activities that may promote heat stress unless you are under the supervision of a physician who provides a written opinion that you will not be adversely affected by the heat stress of the proposed work activity.

f. To the extent possible, use only employees acclimated to heat stress in asbestos-related activities requiring full protective clothing and work area enclosures.

12.5.13 Prohibited activities

12.5.13.1 While in an asbestos Regulated Area, you shall **NEVER**:

a. Smoke

b. Eat

c. Drink

d. Chew gum or tobacco or use snuff

e. Apply cosmetics

Chapter 12.6 Notification Requirements

12.6.1 Introduction

All JSC asbestos-related activities require some level of notification as specified below. Resolve any questions or notification before beginning asbestos-related activities. Some jobs require notification of state or federal agencies before beginning them. The JSC Center Operations Directorate, Environmental Management Office (JE), makes all notifications to state or federal agencies for asbestos-related activities at JSC.

12.6.2 JSC offices to be notified

12.6.2.1 The organization starting an asbestos job shall notify the following JSC offices of proposed or planned asbestos-related activities. Failure to provide this notification may result in delay, work stoppage, or discontinuance of the job by the APM, a representative of the Space Medicine Operations Division, or of the Safety and Test Operations Division. Notification requirements are as follows and are summarized in Table 12.6-1:

a. Notify the facility manager and work area supervisor of all planned asbestos Class I, II, or III work in sufficient time for the facility manager or supervisor to inform building occupants.

b. Notify the OHB, either orally (x36726) or by fax (x33395), before all asbestos Class I, II, and III activities, as well as for any Class IV asbestos emergency response cleanup activities. Use JF664, “Job Procedures Requirements Permit and Notification,” shown in Appendix D for written or fax notification. For telephone (oral) notification, include all information found in Table 12.6-2 at the end of this chapter.

c. Notify the JSC Environmental Office (JE), either orally (x33120) or by fax (x33048), when any asbestos Class I or II activities will cause the removal, abatement, or encapsulation of more than 260 linear feet, 160 square feet, or 35 cubic feet of ACM; or will cause the demolition of a building or portion thereof, regardless of whether ACM has been identified or not. At least 15 working days before the start of these activities, provide the Information on the most current revision of Form APB#5, “TDSHS Renovation or Demolition Notification Form.” You can download a copy of this form and instructions for filling it out from the TDSHS Asbestos Programs Home Page at http://www.dshs.state.tx.us/asbestos/default.shtm A link to this form is also shown in Appendix D.

NOTE: The JSC Environmental Office (JE) will make all required notifications to external state and federal governmental agencies. Additionally, JE will determine whether and when there are any exemptions for TDSHS notifications.

12.6.3 Project design requirements

12.6.3.1 The job-specific performance requirement descriptions in Chapter 12.15 and Chapter 12.16 of this Handbook are the pre-approved project designs for asbestos Class I and Class II abatement activities involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM and for asbestos Class III activities.

12.6.3.2 If your activity will cause the demolition of a building or portion thereof, regardless of whether ACM has been identified or not; or if you perform asbestos Class I or Class II or Class III

work using an Alternative Procedure under Chapter 12.2, Paragraph 12.2.2; or if you perform asbestos Class I or Class II abatement work involving the removal of ACM or PACM in an amount equal to or greater than 260 linear feet, 160 square feet, or 35 cubic feet, you shall:

a. Provide the JSC APM and the OHB with a project design before beginning work. To meet the requirements of both OSHA (under 29 CFR 1926.1101(g)) and the EPA (under 40 CFR 763.90(g)), the project design shall be reviewed and approved by an accredited project designer who meets the requirements of 40 CFR 763, Appendix C, Model Accreditation Plan.

   The JSC APM and the OHB shall review and approve the project design for use at JSC. You shall not begin work until the JSC APM and the OHB approve your project design.

b. Provide all information necessary for the JSC APM to make required notices to all federal, state, and local agencies responsible for enforcement of the National Emission Standard for Asbestos or other applicable regulation within the required time period. The JSC APM must receive this information at least 15 working days prior to the start of: (i) any planned abatement involving the removal of ACM or PACM in amounts equal to or greater than 260 linear feet, 160 square feet, or 35 cubic feet; or (ii) the demolition of a building or portion thereof. You shall not begin these activities until 10 working days after the JSC APM confirms that the required documents were filed with the TDSHS.

c. Submit a project design that contains:

   (1) Documentation that required permits, site location, and arrangements for transport and disposal of asbestos-containing waste have been made, per JPR 8550.1, latest revision

   (2) A detailed design outlining the sequence of events, including days or shifts per event, and procedure(s) to be followed.

   (3) Documentation that the contractor's employees – including foremen, supervisors, Competent Persons, and any other company personnel or agents who may be exposed to airborne asbestos fibers or who may be responsible for any aspect of the abatement action – have received all necessary training that includes, at a minimum, the training requirements of 29 CFR 1926.1101.

   (4) Documentation that all employees or agents who may be exposed to airborne asbestos in excess of the PEL of 29 CFR 1926.1101 or who shall wear respiratory protection have been medically examined as required by the regulation to determine whether they are physically capable of working while wearing a respirator without suffering adverse health effects, or whether they have any condition that might be aggravated by exposure to asbestos.

   (5) Shop drawings for layout and construction of the Regulated Area containment systems, decontamination areas, and other barriers to isolate the work area. Drawings shall include the negative-pressure equipment location as detailed in the project specifications and required by regulation.

   (6) Manufacturer's certification that HEPA-filtered vacuums, negative-pressure ventilation units, and other local exhaust ventilation equipment conform to ANSI Z9.2.

   (7) A copy of the written notification to owners of rental equipment to be used in abatement areas or to transport asbestos waste.

(8) Documents showing NIOSH approvals for all respiratory protective devices to be used on site. If supplied-air respirators are used, document that the air source has been checked and qualified to provide breathing air meeting the requirements of the CGA, Specification G-7, for D-grade air.

(9) Documentation of respirator fit testing for all contractor employees and agents who must enter the restricted or enclosed area. This fit testing shall meet the requirements of 29 CFR 1926.1101 and 29 CFR 1910.134, as a minimum.

(10) Necessary documentation to demonstrate compliance with the applicable paragraphs of Part 12 and applicable federal, state, and local regulatory requirements.

d. Ensure the contractor performing the asbestos work complies with the approved project design.

e. Ensure that any changes to a building demolition (total or partial) or an asbestos abatement activity affecting start dates, end dates, or quantities, etc., where the JSC APM must notify the TDSHS of a project amendment, are submitted in writing to the APM at least 2 working days in advance. The APM will process the request and submit the amendment to the TDSHS. The contractor shall not implement the changes until the JSC APM confirms that the required amendments were filed with the TDSHS. If the project start date was changed, then the contractor shall not begin these activities until 10 working days after the JSC APM confirms that the required amendment was filed with the TDSHS.

f. During major, large-scale abatement activities, upon request, provide the JSC APM and the OHB with:

(1) Job progress reports detailing abatement activities, progress on previously established milestones and schedules; major problems and actions taken; injuries; equipment and bulk material used; air-sampling results taken by the contractor or a representative; and any OSHA compliance monitoring results.

(2) Copies of daily worksite entry logs with information on worker and visitor access.

Table 12.6-1

Notification Requirements

	Asbestos Class			
Notifications Made to:	**I**	**II**	**III**	**IV***
Facility Manager and Work Area Supervisor	**X**	**X**	**X**	**X**
Space Medicine Operations Division	**X**	**X**	**X**	**X**
JSC Environmental Office (JE): shall provide written notice 15 working days before project start when exceeds limits or involves building demolition	**X**	**X**		
*** Asbestos Class IV notifications only required for emergency response**				

Table 12.6-2 Telephonic and Oral Notification Requirements
a. Name and Telephone Number of caller
b. Organization and Employer
c. Job Location: Building Number and Room Number
d. Asbestos JPR and description of activity
e. Start Day and Time
f. Estimated job completion Day and Time
g. Name and Telephone Number of the Competent Person
h. Amount of ACM that will be removed in either linear feet, square feet, or cubic feet
i. Asbestos Training and Respirator Fit Test dates for the Competent Person and each Asbestos Worker
j. Assurance the following items on the work permit are available at the worksite: • **Respirators and PPE or clothing** • **Materials to establish the Regulated Area** • **Equipment to perform the JPR and perform cleanup or decontamination** • **Hazard warning signs**

Chapter 12.7 Competent Person

12.7.1 Requirement

12.7.1.1 JSC requires that all asbestos-related work, which meets the definition of construction work in 29 CFR 1910.12 and 29 CFR 1926.1101(a), be conducted under the supervision of a Competent Person as defined below.

> A ***competent person*** is one who is capable of identifying existing and predictable hazards in the work area or unsanitary, hazardous, or dangerous working conditions, and who has authority to take prompt corrective measures (29 CFR 1926.32(f)).

12.7.1.2 The following requirements apply to an asbestos Competent Person:

a. 29 CFR 1926.1101(b) states that "…competent person means, in addition to the definition in 29 CFR 1926.32 (f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure…" and "… who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f)." The Competent Person shall ensure that all asbestos work follows the approved work practices and work plans.

b. The duties of the Competent Person to supervise asbestos-related work and to perform inspections and other activities are detailed in 29 CFR 1926.1101(o). If you are a Competent Person, you shall be capable of performing the class of asbestos-related work over which you have control. The assigned Competent Person signs the JSC Form 664, "Job Procedure Requirements Permit and Notification Form" (see Chapter 12.1). If the assigned Competent Person is not at the job site, he or she must visit the job site a minimum of twice per task and once per shift during the course of the work. You should post your company name and contact telephone number on any Regulated Area for which you are responsible.

12.7.2 Qualifications

12.7.2.1 The following qualifications are required for an asbestos Competent Person:

a. As a Class I and Class II Competent Person, you shall:

(1) Demonstrate current training meeting the requirements of EPA's Model Accreditation Plan (40 CFR 763, Subpart E, Appendix C) for supervisor, or its equivalent. This 5-day training course includes specific lecture topics, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, a course review, and a written test. If you have a current license issued under 25 TAC 295.46 for an Asbestos Abatement Supervisor, then you have demonstrated that you have met this requirement.

(2) Complete either the JSC 8-hour Asbestos Site-Specific and Class III (Restricted) Worker Training course or a 2-hour training course on JSC policies and procedures. These courses are offered by SMOD and are required to familiarize you with JSC policies, procedures, and job-specific performance requirements described in Chapter 12.15 and Chapter 12.16, as well as the conditions found at JSC.

(3) Ensure that your training is current. The training expires exactly 12 months after the date of the initial or last refresher training. You may not perform as a Class I or Class II

Competent Person until you have again received the required 8-hour refresher training. If you let more than 24 months lapse since the date of your last training, you shall retake the 5-day initial training.

(4) Have a minimum of 6 months experience either after initial completion of a 40-hour Contractor/Supervisor training or as an OSHA Class I/II asbestos abatement worker.

(5) Pass a written test developed and administered by Space Medicine Operations Division (SMOD), to evaluate the ability of the candidate to identify and predict asbestos hazards in the work place and to demonstrate a working knowledge of OSHA, EPA, and JSC asbestos regulations, policies, and procedures. Note, this testing requirement is waived for offsite licensed abatement contractors.

b. As a Class III and Class IV Competent Person for asbestos work involving minor abatement or spill response, you shall:

(1) Demonstrate current training meeting the requirements of EPA's Model Accreditation Plan (40 CFR 763, Subpart E, Appendix C) for supervisor, or its equivalent. This 5-day training course includes specific lecture topics, demonstrations, at least 14 hours of hands-on training, individual respirator fit testing, a course review, and a written test. If you have a current license issued under 25 TAC 295.46 for an Asbestos Abatement Supervisor, then you have demonstrated that you have met this requirement.

(2) Complete either the JSC 8-hour Asbestos Site-Specific and Class III (Restricted) Worker Training course or a 2-hour training course on JSC policies and procedures. These courses are offered by SMOD and are required to familiarize you with JSC policies, procedures, and job-specific performance requirements described in Chapter 12.15 and Chapter 12.16, as well as the conditions found at JSC.

(3) Take the JSC 2-hour Asbestos Site-Specific and Class III (Restricted) Worker Refresher course offered periodically by SMOD to maintain currency as a Competent Person for Class III and Class IV work. Also maintain currency in training as a Class I/Class II Contractor/Supervisor.

(4) Ensure your training is current. Training expires exactly 12 months after the date of the initial or last refresher training. You may not perform as a Class III or Class IV Competent Person until you have again received the required refresher training. If you let more than 24 months lapse since the date of your last training, you shall retake the 5-day Contractor/Supervisor Course and either the JSC 8-hour Asbestos Site-Specific and Class III (Restricted) Worker Training course or a 2-hour training course on JSC policies and procedures offered by SMOD..

(5) Have a minimum of 6 months experience either after initial completion of a 40-hour Contractor/Supervisor Course or as an OSHA Class I/II asbestos abatement worker.

(6) Pass a written test, developed and administered by SMOD, to evaluate the ability of the candidate to identify and predict asbestos hazards in the work place and to demonstrate a working knowledge of OSHA, EPA, and JSC asbestos regulations, policies, and procedures. Note, this testing requirement is waived for offsite licensed abatement contractors.

c. As a Class III O&M (Restricted) Competent Person, you shall:

(1) Demonstrate current training meeting the requirements of 40 CFR 763.92(a)(2) for custodial and maintenance staff. This training consists of at least 16 hours in specific topics, demonstrations, and hands-on training in the use of respiratory protection, other personal protective measures, and good work practices. (See Chapter 12.5, subparagraph 12.5.3.1.d. for more details on this training.)

(2) Complete either the JSC 8-hour Asbestos Site-Specific and Class III (Restricted) Worker Training course or a 2-hour training course on JSC policies and procedures offered by SMOD. This training is required to familiarize you with JSC policies and procedures as well as the conditions to be found at JSC.

(3) Take the JSC 2-hour Asbestos Site-Specific and Class III (Restricted) Worker Refresher course offered periodically by SMOD to remain current as a Class III O&M (Restricted) Competent Person.

(4) Ensure your training is current . The training described in this paragraph expires 12 months after the date of your initial or last refresher training. If you can demonstrate that you are scheduled for refresher training, you may continue to perform as a Class III O&M (Restricted) Competent Person on site at JSC until receiving the scheduled refresher training, but no longer than 14 months after the date of your prior training. If you let more than 24 months lapse since the date of your last training, you shall retake the 16-hour Operations and Maintenance initial training and either the JSC 8-hour Asbestos Site-Specific and Class III (Restricted) Worker Training course or a JSC Site-Specific training course on JSC policies and procedures offered by SMOD.

(5) Have a minimum of 6 months experience as an OSHA Class III or Class III O&M (Restricted) asbestos worker.

(6) Pass a written test developed and administered by SMOD, to evaluate the ability of the candidate to identify and predict asbestos hazards in the work place and to demonstrate a working knowledge of OSHA, EPA, and JSC asbestos regulations, policies, and procedures.

d. You shall have sufficient authority to take prompt corrective measures to ensure compliance with OSHA, EPA, TDSHS, and TCEQ regulatory requirements and guidelines.

e. You shall be qualified to use respiratory protection (see requirements in Chapter 12.5).

Chapter 12.8 Asbestos Worker and Regulated Area Air Sampling

12.8.1 Air sampling objectives

12.8.1.1 Air sampling for airborne asbestos is done to meet a variety of needs. These include ensuring the protection of employees outside any asbestos Regulated Area, ensuring asbestos Regulated Area barriers maintain their integrity, documenting the exposures to asbestos workers, and meeting OSHA compliance requirements. These needs are met through a combination of the following types of air sampling: worker exposure, random area, work area, indoor ambient air, barrier, and clearance air sampling.

12.8.1.2 Perform air sampling and analysis at various stages of asbestos-related activities specified in Part 12 to establish and document that the procedures limit the spread of airborne ACM. Collect and evaluate all samples taken to meet the requirements of this chapter following the procedures specified in the OSHA Reference Method, 29 CFR 1926.1101, Appendix A; NIOSH Method 7400, or NIOSH Method 7402. Conduct all sampling under the supervision of a **Certified Industrial Hygienist (**CIH) or an individual who has completed the air monitoring technician training requirements of 25 TAC 295.64(g) and who meets the requirements for licensing to perform air monitoring under 25 TAC 295.

12.8.2 Air sampling plans

12.8.2.1 Every ACM abatement or removal project requires an objective review of the air sampling requirements. Project planners shall determine the number and type of samples during the preparation of the work plan in consultation with the Space Medicine Operations Division (SMOD) (x36726). Each project may include the following air sampling requirements:

a. Pre-job air sampling (background ambient air).

b. During-the-job air sampling (worker or personal, work area, barrier integrity).

c. Post-job air sampling (clearance).

12.8.2.2 Air sampling shall be conducted for any Class I and Class II asbestos abatement activity using critical barriers, and may be conducted for other asbestos-related activities listed in Part 12. The SMOD will establish and conduct random or periodic sampling of routine Class III and Class IV asbestos work activities. The SMOD is responsible for determining the effectiveness of control procedures identified in Part 12 by periodically air sampling work activities.

12.8.3 Worker exposure air sampling

12.8.3.1 To determine worker exposure to asbestos, the following apply:

a. Determine employee exposures from breathing zone air samples that are representative of the 8-hour TWA as well as the 30-minute TWA short-term excursion limit of each employee. Take breathing zone samples by attaching a sample collection device, generally a filter cassette, to the front collar of the worker's uniform.

b. You shall conduct worker exposure air sampling on your employees as required by 29 CFR 1926.1101 if you are performing asbestos Class I and Class II work. Provide copies of your sampling results to the SMOD, including TWA exposure calculations. The SMOD may also

perform air sampling on contractor employees as a "spot check" of the contractor's procedures. The SMOD will provide copies of its results to the asbestos work contractor. The asbestos work contractor shall:

(1) Conduct 1 day of sampling on each worker for a project lasting no more than 3 days when similar work is being done each day.

(2) Conduct 3 days of sampling on 10% of all workers for a job lasting between 3 days and one month.

(3) Conduct 3 days of sampling on 10 % of all workers every month for jobs lasting longer than one month.

(4) Re-accomplish all exposure assessments every year

c. The SMOD has a database of worker exposure air sampling for most of the Class III and Class IV asbestos activities described in Chapter 12.15 and Chapter 12.16. This database indicates that employees performing activities following the Class III and Class IV procedures in Part 12 have exposures less than the OSHA PEL of 0.1 f/cc of air. Any on-site contractors performing asbestos-related work may use the SMOD database to meet the "initial exposure assessment" and "negative exposure assessment" requirements of either 29 CFR 1910.1001 or 29 CFR 1926.1101. The SMOD periodically performs additional worker air sampling of Class III and Class IV activities to maintain and update its database, and will provide copies of results to the employer or supervisor of the monitored employee.

d. If you are an on-site contractor performing Class III or Class IV work at JSC, you're encouraged to perform your own personnel air sampling. If you do so, you shall provide copies of your sampling results to the SMOD.

e. If you're an off-site contractor performing Class III asbestos-related work at JSC, you shall conduct worker exposure air sampling on your employees as required by 29 CFR 1926.1101, and provide copies of sampling results to the SMOD.

f. Notify the employee(s) affected by air sampling results individually, as outlined in the current applicable OSHA regulation. Maintain a copy of each individual's air sampling results per OSHA Recordkeeping Requirements (29 CFR 1910.20, 29 CFR 1910.1001, 29 CFR 1926.1101).

12.8.4 Background and other ambient air sampling

12.8.4.1 The SMOD will conduct:

a. Background ambient air sampling in buildings before any Class I or Class II asbestos abatement project where critical barriers and enclosures are to be erected. The SMOD will conduct or provide results of background ambient air sampling prior to any other project that may disturb spray-on asbestos insulation and has the potential to affect any building's ambient conditions (e.g., roofing projects).

b. Building ambient air sampling during any project that may disturb spray-on asbestos insulation and which has the potential to affect any building's ambient conditions (e.g., roofing projects). This sampling is in addition to the routine building ambient sampling discussed in Chapter

12.3, paragraph 7. Ambient air sampling results will be compared to the background samples and to the JSC "safe occupancy" level of 0.01 f/cc.

12.8.5 Regulated area barrier and containment integrity air sampling

12.8.5.1 The following applies to sampling for integrity of barriers and containment:

a. The SMOD will conduct perimeter area surveillance during all Class I and Class II asbestos abatement projects as required by 29 CFR 1926.1101. The purpose of this surveillance is to ensure that no asbestos exposures occur in adjacent areas and that any critical barriers do not leak. Air sampling may or may not be performed on projects conducted outdoors or with outdoor barriers. (Reference 29 CFR 1926.1101(g)(4)(ii)(B)).

b. The SMOD may conduct periodic perimeter area surveillance of routine Class III and Class IV asbestos work to ensure that established procedures control asbestos releases.

c. All barrier air sampling results will be compared to the JSC "safe occupancy" level of 0.01 f/cc. (Reference 40 CFR 763.90(i)(5) and 29 CFR 1926.1101(g)).

12.8.6 Work area air sampling

The SMOD may perform air sampling inside Regulated Areas where critical barriers are not used, or may perform air sampling adjacent to glovebag abatement or removal activities. The purpose of this sampling is to "spot check" procedures and to ensure asbestos is being controlled.

12.8.7 Clearance air sampling

12.8.7.1 To clear an asbestos job for completion:

a. The Chief, SMOD, or his or her designee(s), and the SMOD are the only parties at JSC who may declare an area safe for re-occupancy after clearance air sampling on asbestos abatement, repair, or emergency response activities. The decision will be based on the results of visual inspection and clearance air sampling.

b. The SMOD will perform clearance air sampling on all Class I and Class II asbestos abatement activities to ensure that the area is safe for re-occupancy. If enclosures or critical barriers are erected, the SMOD may use aggressive sampling techniques to collect clearance air sampling air samples before the enclosures or critical barriers are disassembled. You shall never disassemble the enclosures or critical barriers until the Chief, SMOD or the SMOD determines that the area is safe for re-occupancy and gives approval to disassemble the enclosures or critical barriers.

c. The SMOD may perform clearance sampling on Class III asbestos activities. The decision to perform this sampling depends on the specific task and the professional judgment of the industrial hygienist about the potential health hazard to other building occupants. This sampling may also be performed to "spot check" procedures and to ensure asbestos is being controlled. If clearance air sampling is conducted, you shall not disassemble the Regulated Area, nor remove the demarcation, until the Chief, SMOD or the SMOD determines that the area is safe for re-occupancy.

d. The SMOD may perform clearance air sampling on emergency response asbestos cleanup activities. The decision to perform this sampling will depend on the amount of asbestos material spilled, whether a room or area was closed off, and the professional judgment of the industrial hygienist regarding the potential health hazard to other building occupants. If clearance air sampling is conducted for emergency response activities, you shall not disassemble the Regulated Area, nor remove the demarcation, until the Chief SMOD or the SMOD determines that the area is safe for re-occupancy.

e. The SMOD will compare all clearance air sampling results against the JSC “safe occupancy” level of 0.01 f/cc. (Reference 40 CFR 763.90(i)(5) and 29 CFR 1926.1101(g)).

Chapter 12.13 Waste Disposal

12.13.1 Introduction

This chapter addresses the handling, packaging, labeling, and disposal of all ACM and asbestos-contaminated waste generated on site. Disposal of the ACM or asbestos-contaminated waste generated by JSC activities shall follow the Texas Administrative Code, Title 30 Environmental Quality, Part 1 Texas Commission on Environmental Quality (TCEQ), Chapter 330 Municipal Solid Waste, Subchapter F, Operational Standards for Solid Waste Land Disposal Sites, Rule 330.171, Disposal of Special Wastes (30 TAC 330.171).

12.13.2 Types of waste

12.13.2.1 In addition to the actual ACM removed during an asbestos-related job or abatement, you shall also dispose of a number of other materials and items as asbestos-contaminated waste. These include, but are not limited to, the following:

a. Cloths and mops used during wet-cleaning operations.

b. Disposable coveralls, hoods, booties, and other clothing items worn in the work area, unless they can be completely decontaminated using a HEPA-filtered vacuum. Work shoes and boots may be cleaned at the end of the project, but shall be removed and stored in labeled plastic bags between projects.

c. Contaminated respirator filters and towels used by workers after showering.

d. Ceiling tiles taken from suspended ceilings where friable asbestos was applied above the tile, unless properly decontaminated.

e. All plastic sheeting used for critical barriers, airlocks, decontamination chambers, and area containments.

f. Excess wastewater generated from wet-wiping or -mopping, along with shower wastewater from the decontamination chamber. JSC permits wastewater to be discarded into a sanitary drain if it has first been filtered to a no-greater-than 5-micron particle.

g. All air and water filters used in control devices.

12.13.3 Waste handling procedures

12.13.3.1 You shall follow these requirements for handling asbestos waste:

a. Package all asbestos waste for disposal using one of the following sealed, leak-tight methods:

   (1) Double-bagged in at least 6-mil clear or transparent polyethylene bags

   (2) Sealed in plastic-lined cardboard or metal or fiber drums, boxes, or containers meeting U.S. Department of Transportation (DOT), TCEQ, and TDSHS specifications

   (3) Double-wrapped in at least 6-mil polyethylene sheeting (e.g., for the removal of ACM-contaminated components or piping)

b. Wet asbestos waste, scrap, debris, bags, containers of asbestos-contaminated equipment, clothing, vacuum cleaner bags, filters, etc., consigned for disposal with amended water until

the waste, etc., is sufficiently wet and to prevent emission of airborne fibers if the container were to break open.

c. When waste is double-bagged in 6-mil plastic bags, use a HEPA-filtered vacuum to remove excess air from the bags.

d. Do not fill bags so that the neck of the bag cannot be tightly gathered, folded over, and securely taped or so that the weight of the bag is too heavy for one person to carry.

e. Cut ACM-containing sharp edges to size, including wire-lath ceilings, and adequately wet and package in a manner to prevent penetration or puncture of the container seal.

f. Filter all asbestos-contaminated water collected from wetting, cleaning, or decontamination to a no-greater-than 5-micron particle size before disposal in the sanitary sewer.

g. If a separate waste-removal airlock system is installed in an enclosure, construct it like a decontamination chamber, using double 6-mil polyethylene plastic floors and walls and triple door flaps. Keep the entrance to this airlock tightly sealed until the airlock is to be used for the transfer of waste material. Attach a JSC Form 1161, “Disposal Inventory for Miscellaneous Hazardous Waste,” to each package, bag, or container of asbestos waste materials.

12.13.4 Labeling waste containers

12.13.4.1 You shall follow these requirements for asbestos waste containers:

a. Label waste packages, bags, and containers with the following:

DANGER

CONTAINS ASBESTOS FIBERS

MAY CAUSE CANCER

CAUSES DAMAGE TO LUNGS

DO NOT BREATH DUST

AVOID CREATING DUST

b. Bags may be preprinted or separate labels affixed to the bags. In all instances, label bags before filling them with waste materials. Assume anything placed into an ACM-labeled bag is ACM or asbestos-contaminated waste and dispose of accordingly.

c. The generator of the asbestos waste shall additionally mark all waste containers with the generator’s name, organization, and removal location, and shall attach the JSC Form 1161.

12.13.5 Disposing of asbestos waste

12.13.5.1 To properly dispose of asbestos waste, you shall:

a. Properly package and label waste asbestos materials generated by JSC organizations and support contractors and dispose of them by calling the Environmental Information Line,

x36207. Make note of the Waste Pickup Ticket number assigned by the Environmental Office on the Asbestos Work Permit.

b. For Construction of Facilities and other large asbestos abatement projects, make special arrangements through the JSC Environmental Office (JE) Environmental Information Line at x36207 for lined, roll-off containers in which to accumulate the packaged asbestos waste.

Chapter 12.14 Emergency and Mishap Procedures

12.14.1 What this chapter covers

This chapter discusses planning for, reporting, and investigating emergencies, injuries, and mishaps that may happen during asbestos-related activities, and also discusses emergency response to asbestos fiber releases.

12.14.2 Requirement for emergency planning

12.14.2.1 To properly plan for asbestos emergencies, you shall follow these requirements:

a. Plan and conduct all asbestos-related activities so as to:

   (1) Take all reasonable and proper actions to prevent or limit exposures and injury to personnel and damage to, or loss of, equipment and property.

   (2) Report such occurrences to appropriate JSC offices in a timely manner and in compliance with Part 12.

   (3) Conduct investigations of all mishaps to determine the actual or probable cause(s), take appropriate actions to avoid reoccurrence, and document and disseminate relevant information.

b. Generally, incidents involving fire or personal safety use the procedures established by JPR 1040.4, “JSC Emergency Preparedness Plan” and chapter 3.8 of this Handbook.

c. Incidents involving an unexpected release or threatened release of asbestos that do not involve personal injury, fire emergencies, or personal safety will be considered an environmental release.

12.14.3 Non-enclosed work area

The existing procedures for reporting medical and fire emergencies and guidelines for general emergency action and planning (Chapter 3.8 of this Handbook) apply to the asbestos-related activities specified in Part 12 that do not require the use of an enclosure.

12.14.4 Enclosed work area

a. The reporting procedures and general guidelines specified above also apply to the asbestos-related activities specified in Part 12 that require an enclosure to control airborne asbestos fibers.

b. In the case of large-scale abatement tasks, emergency procedures shall be in written form and provided with the work plan. Post-emergency procedures shall be displayed prominently in the clean change area of the enclosure, with telephone numbers of emergency response personnel.

c. All employees required to be in the work area shall read and sign these procedures before first entry to acknowledge understanding of the worksite layout, location of emergency exits, and emergency procedures.

d. If the integrity of the enclosure is breached at any time during the project, the work crew shall immediately implement fiber control using a wetting agent, repair the breach with polyethylene sheeting or tape, and call the Space Medicine Operations Division (SMOD) (x36726), APM (x33120), and the Work Control Center (x32038).

12.14.5 Personal injury procedure

12.14.5.1 If an employee is injured while working on an asbestos job, you shall follow these requirements:

a. For non-life-threatening situations, employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the workplace to obtain medical treatment.

b. For life-threatening injury or illness, worker decontamination takes a low priority. Measures necessary to stabilize the injured worker, removal from the workplace, and medical treatment take top priority. Inform emergency response personnel, who are providing medical treatment or transportation, of the existence of asbestos contamination on the injured or ill worker.

c. If the injured or ill worker is to be moved off JSC while wearing contaminated work clothing, a knowledgeable person from the worksite shall accompany the worker to provide information to the receiving medical unit, and to assist in controlling the further spread of asbestos contamination outside the enclosed area.

12.14.6 Emergency reporting

Report a fire, medical, or other emergency associated with an asbestos-related activity specified in Part 12 by calling the JSC EOC at x33333 or (281) 483-3333 for JSC, Sonny Carter Training Facility and Ellington Field.

12.14.7 Mishap notification, investigation, reporting, and recordkeeping

The notification, investigation, reporting, and recordkeeping of mishaps that occur during asbestos-related activities specified in Part 12 shall follow Chapter 2.6 of this Handbook as well as the recordkeeping requirements of all applicable OSHA regulations and standards.

12.14.8 Emergency response to fiber release for environmental cleanup

12.14.8.1 When ACM fiber releases (spills) are located, you shall immediately evacuate personnel and seal off the area. Also contact SMOD at x36726 and the JSC Emergency Dispatch Center (EDC) at x33333 or (281) 483-3333 to request the JSC Spill Team response. The following requirements govern the response:

a. The Environmental Support Contractor and SMOD personnel will determine control measures to be established. SMOD will determine the need to perform clearance air sampling.

b. The Environmental Support Contractor personnel, when responding to a fiber release, shall not proceed with the cleanup until they ensure that SMOD has been notified.

c. Activities for performing site cleanup and decontamination shall be as outlined in JPR IV-4 (see Chapter 12.16, paragraph 12.16.4.2 and Table 12.16-13). The asbestos Competent

Person for the cleanup shall determine whether the cleanup will be conducted under OSHA Class I, II, III, or IV asbestos work procedures.

d. If spills are small and the Environmental Support Contractor personnel establish the Regulated Area, then they shall disestablish the area after final cleanup and inspection, and will be responsible for removing barrier tape and warning signs. If SMOD establishes the Regulated Area or decides that clearance air sampling is required, SMOD will disestablish the area after final cleanup and inspection, and will be responsible for removing barrier tape and warning signs.

e. Since communication with all affected parties in the affected area is very important, the organization responsible for establishing the Regulated Area shall ensure that the facility manager and work area supervisor have been informed about the response activity, the cleanup process and clearance air sampling to be performed (if required), and the approximate duration of the cleanup. This notification may be verbal but shall occur before the start of the cleanup. Ask the facility manager and work area supervisor to inform the occupants of the affected area. Additionally, inform occupants and employees in nearby areas about the cleanup activity and the expected duration.

f. The organization responsible for establishing the Regulated Area and for removing the barrier tape and warning signs shall provide courtesy notification to the EOC security dispatcher at the non-emergency extension (x34658) at the start and completion of the cleanup. Additional notification to JSC management will be made at the discretion of the responders.

g. The organization responsible for removing the barrier tape and warning signs shall also notify the facility manager and work area supervisor when the area is clean and operations may return to normal. These notifications shall be made in writing within 2 hours of the cleanup completion; e-mail notification is acceptable.

Chapter 12.15 Job-Specific Performance Requirements - General Information

12.15.1 General job-specific performance requirements

12.15.1.1 You shall follow these requirements for asbestos jobs:

a. Chapter 12.16 contains individual Job-Specific Performance Requirements (JPRs) for the most common jobs at JSC that potentially involve ACM. Table 12.15-1 below lists the activities by Class of asbestos work as defined in Chapter 12.4 of this Handbook. All JPR numbers reflect the Class of asbestos work being performed. Table 12.15-1 also lists the attachment from Chapter 12.16 that describes the performance requirements. Each description in Chapter 12.16 provides sufficient information to determine which jobs fit within the procedure. The JPR requirement descriptions in this chapter and in Chapter 12.16 are the pre-approved project designs for asbestos Class I and Class II abatement activities involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM and for asbestos Class III activities.

b. Following each job description in Chapter 12.16 is a listing of minimum requirements for completing the described asbestos work. These listings may not be complete, and trained asbestos workers are expected to perform all Classes of asbestos-related work using industry-accepted work practices and controls. Work supervisors and Competent Persons shall exercise discretion on some requirements (e.g., determining the size of containment system or enclosure for Class I asbestos work).

c. Table 12.15-1 also lists the *minimum* training requirements needed to perform each JPR. The training abbreviations shown in the table, and their meanings from Chapter 12.5, paragraph 12.5.3, are:

   (1) **32-hour worker:** training specified in 40 CFR 763, Subpart E, Appendix C, for all Class I work and Class II work, to include the use of critical barriers and negative pressure enclosures.

   (2) **16-hr O&M:** training specified in 29 CFR 1926.1101(k)(9)(v) and 40 CFR 763(a)(2) for Class III operations and maintenance work, involving Class III glovebag or spot abatement activities.

   (3) **JSC 8-hr:** training for Restricted Class III Asbestos Operations and Maintenance work as shown in Chapter 12.5, paragraph 12.5.3. This training does not allow workers to perform removal of any amount of ACM.

   (4) **2-hr:** Class IV awareness training required by 29 CFR 1926.1101(k)(9)(vi) and 40 CFR 763(a)(2) for housekeeping and custodial activities.

   (5) **RFCI:** Training in the methods specified by the Resilient Floor Covering Institute (RFCI) for the removal of resilient floor coverings and adhesives that contain asbestos. The specific methods used may be found in the RFCI document "*Recommended Work Practices for Removal of Resilient Floor Coverings*" at http://www.rfci.com/index.php . See the TDSHS statement concerning RFCI procedures at http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf.

d. If you do not find the asbestos-related work in one of the listed procedures in Table 12.15-1 or in Chapter 12.16, define the job by the Class of asbestos work as found in Chapter 12.4 of this

Handbook or in 29 CFR 1926.1101; then develop an alternative procedure as required by Chapter 12.2 of this Handbook and submit an asbestos project design as required by Chapter 12.6.

e. You shall submit an asbestos project design as required by Chapter 12.6 if:

(1) Your activity will cause the demolition of a building or portion thereof, regardless of whether ACM has been identified or not

(2) You perform asbestos Class I or Class II abatement work using an Alternative Procedure under Chapter 12.2, Paragraph 12.2.2

(3) You perform asbestos Class I or Class II abatement work involving the removal of ACM or PACM in quantities equal to or greater than 260 linear feet, 160 square feet, or 35 cubic feet

f. Plan all asbestos-related work following the procedures in Chapters 12.1 and 12.2 of Part 12 of this Handbook.

12.15.2 Exposure control program

12.15.2.1 The underlying assumptions behind the development of the exposure controls reflected in the JPRs are:

a. All tasks involving potential asbestos exposure require some degree of control. Hence, the removal of even one ceiling tile in a building known to contain asbestos SAI is covered by Part 12. The degree of control is tailored to the potential of exposure to workers and to building occupants.

b. When it is necessary to open an area of suspended ceiling in a building containing SAI, such that a total of 32 square feet or more (i.e., the 4th contiguous ceiling tile) is exposed, you shall erect a small enclosure.

c. Spot removals of any amount of SAI require the erection of an enclosure, but may not require specific decontamination areas (e.g., shower area, clean room, equipment rooms). Place the enclosure under local negative pressure using a HEPA-filtered vacuum cleaner or negative-pressure systems as described within Part 12. “Pop-Up” style mini-enclosures (Klean Kubes® or equivalent units) are commercially available for this purpose. You shall use additional safeguards such as wetting and catching the material close to the scrape.

d. Any job that requires the removal of 3 contiguous square feet or greater of asbestos from a surface (other than a pipe surface if glovebag procedures are used), or which has a sufficient number of small-scale spot removals such that the cumulative amount of insulation removed exceeds 35 cubic feet, 160 square feet, or 260 linear feet of pipe is, under this program, a major asbestos removal operation. Major removals require the submission of a project design to the APM, which details how the enclosure, decontamination, monitoring, record-keeping, and clearance requirements are to be satisfied.

e. The above assumptions represent JSC's best effort in interpreting the OSHA and EPA guidelines, which are based on specific fiber concentrations, and establish a workable program for controlling asbestos exposure. The Space Medicine Operations Division (SMOD) will monitor various jobs to determine whether the degree of control described above provides

adequate environmental and health protection. Therefore, the performance requirements may be revised. For example, it may be necessary to reduce the small enclosure criteria to below 32 square feet, if controls are inadequate.

12.15.3 Waivers to job performance requirements

12.15.3.1 Except for JPR III-13 (see Chapter 12.16, paragraph 12.16.3.8), there will be no waivers issued for the JPR procedures in Chapter 12.16. The following requirements apply.

a. In buildings with SAI, raised computer floors and sub-floors may contain SAI debris from activities performed in the building before asbestos work was regulated at JSC. The entry into any computer floor or sub-floor, in a building containing SAI, is normally considered Class III asbestos work governed by JPR III-13. The JSC Occupational Health Officer, or his designee, may issue a waiver releasing workers from these Class III requirements under the following conditions:

   (1) The area can be easily delineated above and below the raised flooring into “clean” and “dirty” sections. Normally, the delineation shall be done by rooms defined by hard walls above the floor. The Occupational Health Officer, or his designee, may establish other delineation in special cases.

   (2) Clean the area below the raised floor (as well as any equipment or cabling below the floor), the flooring support structure, and the flooring tiles using wet-wiping and -mopping methods and HEPA vacuuming. Clean any items removed from the sub-floor area by wet-wiping or HEPA vacuuming as they are removed from the floor. Clean following the procedures shown in JPR III-13. Workers performing these activities shall wear protective clothing and respiratory protection.

   (3) The JSC Occupational Health Officer, or his designee, will visually inspect the sub-floor area after cleaning. The basic standard of cleanliness for the sub-floor area is no visible dust or debris.

   (4) When the JSC Occupational Health Officer, or his designee, is satisfied about the cleanliness of the sub-floor area, he or she will issue a JPR III-13 Waiver for the specific area cleaned. The SMOD will post the waivers on the JSC Health home page at https://sashare.jsc.nasa.gov/sd/SD3/SitePages/Occupational%20Health/Asbestos.aspxThe waivers, once issued, do not expire.

   (5) Personnel entering an area with a JPR III-13 Waiver are encouraged to use a HEPA vacuum for periodic housekeeping under the sub-floor.

b. Even though a waiver to JPR III-13 procedures may be issued, there may be other installed suspect ACM beneath the sub-floor. These materials may include, but are not limited to, cementitious pipe chase materials, transite board, sub-floor stanchion mastic, firewalls, floor tiles and mastic, etc. If any sub-floor activities are planned, which may disturb these materials, you shall determine the asbestos content, or presumed asbestos content, and follow other appropriate JPR requirements.

Table 12.15-1

Job Performance Requirements Listing

Asbestos Work Class	Task Title	JPR No.	Reference Paragraph in Chapter 12.16	Min. Req'd Training
Class I				
	Removal of Surfacing Insulation (≥ 10 sq ft cumulative and < 160 sq ft cumulative). Decontamination area (equipment room, shower area, clean room) required.	I-1	12.16.1	32 hr worker
	Removal of Thermal System Insulation (piping: ≥ 25 Lf cumulative and < 260 Lf) (vessel: ≥ 10 sq ft cumulative and < 160 sq ft or < 35 cu ft) or glove bag not feasible. Decontamination area (equipment room, shower area, clean room) required.	I-2	12.16.1	32 hr worker
	Removal of Surfacing Insulation (≥ 3 sq ft contiguous (or one waste bag) and < 10 sq ft cumulative). Decontamination area not required but may be used.	I-3	12.16.1	32 hr worker
	Removal of Thermal System Insulation using glove bags (piping: ≥ 3 Lf contiguous, more than one spot abatement, more than one waste bag and < 25 Lf cumulative) (vessel: ≥ 3 sq ft contiguous, more than one spot abatement, more than one waste bag and < 10 sq ft cumulative) . Decontamination area not required but may be used.	I-4	12.16.1	32 hr worker

Asbestos Work Class	Task Title	JPR No.	Reference Paragraph in Chapter 12.16	Min. Req'd Training
Class II				
	Removal of or modification to wallboard, plaster, transite, ceiling tiles, flooring, roofing, or siding containing asbestos. Airborne concentrations likely to ≥ 0.01 f/cc or a negative exposure assessment not available. Equipment room required for large enclosures.	II-1	12.16.2	32-hr worker
	Removal of or modification to wallboard, plaster, transite, ceiling tiles, flooring, roofing, or siding containing asbestos. Airborne concentrations likely to <0.01 f/cc or a negative exposure assessment is available.	II-2	12.16.2	32-hr worker
	Removal of less than (<) 160 sq ft of resilient sheet flooring using procedures and methods specified by the Resilient Floor Covering Institute (RFCI) to include: (i) ACM sheeting or (ii) sheeting with ACM backing or mastic; and where the waste exceeds the capacity of one standard waste bag.	II-3	12.16.2	32-hr worker plus RFCI
	Removal of less than (<) 160 sq ft of flooring using procedures and methods specified by the Resilient Floor Covering Institute (RFCI) to include: (i) any ACM vinyl or asphalt tile or (ii) any vinyl or carpet tile with ACM mastic; and where the waste will exceed the capacity of one standard waste bag.	II-4	12.16.2	32-hr worker plus RFCI

Table 12.15-1 (continued)

Asbestos Work Class	Task Title	JPR No.	Reference Paragraph in Chapter 12.16	Min. Req'd Training
Class III				
Class III Glovebag	Repair of steam, chilled water, hot waterlines, and valves with TSI when less than (<) 3 linear feet of ACM or PACM is disturbed. Waste limited to one standard waste bag or one glovebag.	III-1	12.16.3.1	16-hr O&M
Class III Barrier & Floor Covering	Activities which meet one or more of the following: a. Any entry into a ceiling plenum below surfacing or spray-applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is less than (<) 32 square feet; b. Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is < 32 square feet. c. Only in a mechanical room, any activity in close proximity (i.e., within 36 inches) of surfacing ACM or PACM. d. Other than in mechanical rooms, any activity in close proximity (i.e., within 24 inches) of surfacing ACM or PACM- e.g. changing lights where acoustic ceiling is present.	III-2	12.16.3.2	JSC 8-hr O&M Restrict.
	Removal of ACM or PACM, where the waste generated does not exceed the capacity of a standard asbestos waste bag, and which involve the: a. Spot removal of ACM or PACM wallboard, joint tape, or joint compound. b. Removal, replacement and disposal of ACM or PACM ceiling tiles below a plenum which does not contain surfacing or SAI ACM or PACM and where the ceiling opening is < 32 square feet.	III-3	12.16.3.2	16-hr O&M
Class III Enclosure	Spot removal of surfacing ACM and PACM less than (<) 3 sq ft contiguous at a single spot. Limit one standard waste bag.	III-4	12.16.3.3	16-hr O&M
	Activities which meet one or more of the following: a. Any entry into a ceiling plenum below surfacing or spray-applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is greater than or equal to (≥) 32 square feet; b. Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is ≥ 32 square feet.	III-5	12.16.3.3	JSC 8-hr O&M Restrict.

	Removal of non-ACM ceilings (plaster or sheetrock) below ceiling plenum in buildings with spray-applied asbestos insulation or fireproofing (SAI)	III-6	12.16.3.4	16-hr O&M

Table 12.15-1 (Continued)

Asbestos Work Class	Task Title	JPR No.	Reference Paragraph in Chapter 12.16	Min. Req'd Training
Class III Other	Repair or maintenance of equipment that has ACM insulation or ACM gaskets.	III-7	12.16.3.5	16-hr O&M
	Repair or maintenance of equipment used in asbestos work. Does not apply to changing filters on HEPA vacuum(s) with a self-sealing or self-contained filter pack.	III-8	12.16.3.6	16-hr O&M
	Removal of (i) ACM vinyl or asphalt floor tile; (ii) non-ACM floor tile with ACM mastic; or (iii) carpet tiles with ACM mastic, using procedures and methods specified by the Resilient Floor Covering Institute (RFCI). Waste limited to one standard waste bag.	III-9	12.16.3.7	16-hr O&M plus RFCI
	Any activity below raised computer floor and sub-floor in buildings with spray-applied fireproofing or ACM acoustical ceilings	III-13	12.16.3.8	JSC 8-hr O&M Restrict.
Class IV				
	Changing air filters in HVAC system air handling units	IV-1	12.16.4	2-hr
	Emergency response action to an asbestos fiber release	IV-4	12.16.4	32-hr worker
Custodial				
	Custodial work in areas with exposed, friable ACM	C-1	12.16.5	Aware-ness
	Custodial work involving ACM flooring	C-2	12.16.5	Aware-ness

Chapter 12.16 Job-Specific Performance Requirements (JPRs) – Detailed Descriptions

12.16.1 JPRs for Class I Asbestos Work

12.16.1.1 Class I asbestos work involves the removal of structural or ceiling Spray Applied Insulation (SAI), ceiling or acoustical decorative material, other surfacing material, or Thermal System Insulation (TSI) (i.e., piping and vessel insulation) that is considered Asbestos Containing Material (ACM) or is Presumed Asbestos Containing Material (PACM). The following requirements apply:

a. If you perform asbestos Class I abatement work involving the removal of equal to or more than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM, you shall (as required by Chapter 12.6):
   (1) Submit an asbestos project design
   (2) Provide the JSC Environmental Office, at least 15 working days prior to beginning work, all information required to make notification to the TDSHS

   NOTE: The JPR descriptions listed in paragraph 12.16.1 are the pre-approved project designs for asbestos Class I abatement activities involving less than 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM.

b. A decontamination area is required for Class I removal involving over 25 linear feet or 10 square feet of TSI or surfacing ACM and PACM (Reference: 29 CFR 1926.1101 (j)(1)). The decontamination area shall consist of an equipment room, shower area, and clean room in series. The asbestos workers shall enter and exit the Regulated Area through the decontamination area.

c. The following are descriptions of JPRs I-1 through I-4:
   (1) **JPR I-1:** Removal of SAI, acoustical or decorative materials, or other surfacing material with a cumulative total of greater than or equal to (>) 10 square feet but less than (<) 160 square feet of materials that have been identified ACM or PACM. A decontamination area is required.
   (2) **JPR I-2:** Removal of Thermal System Insulation (TSI) with a cumulative total of greater than or equal to (>) 25 linear feet and less than (<) 260 linear feet of materials that have been identified ACM or PACM. For vessels, a cumulative total of greater than or equal to (>) 10 square feet but less than (<) 160 square feet or less than (<) 35 cubic feet of materials that have been identified ACM or PACM. Or, because of the size or geometry of the equipment involved, a glove bag is not a technically feasible method for removal. A decontamination area is required.
   (3) **JPR I-3:** Removal of Surfacing (Spray Applied Insulation (SAI) or acoustical) or other surfacing material of greater than or equal to (>) 3 square feet of contiguous area (i.e., greater than one waste bag) and a cumulative total of spot removals less than (<)10 square feet cumulative of materials that have been identified ACM or PACM. A decontamination area is not required but may be used.

(4) **JPR I-4:** Removal of Thermal System Insulation (TSI) of greater than or equal to (>) 3 linear feet of contiguous area (i.e., more than one waste bag) but less than (<) 25 linear feet of materials that have been identified ACM or PACM using glove bag methods. For vessels, greater than or equal to (>) 3 square feet of contiguous area, more than one spot abatement, more than one waste bag, and less than (<) 10 square feet cumulative of materials that have been identified ACM or PACM. Never slide glovebags along piping. A decontamination area is not required but may be used.

d. To accomplish Class I asbestos work activities in JPR I-1 through JPR I-4, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 1216-1. You will find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-1, Activities for JPRs I-1 through I-4

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify training, medical, and PPE requirements for the asbestos workers are complete and current.
3	Notify and coordinate task with proper officials (facility manager, work area supervisor, Space Medicine Operations Division (SMOD), Environmental Office) as needed.
4	Notify SMOD at least 2 weeks before job start to coordinate inspections and air sampling.
5	Establish Regulated Area, post warning signs, and rope off area with barricade tape.
6	Shut down and isolate the HVAC system. Control operation/energy with a JSC Form 19A, “WARNING – DO NOT OPERATE” tag.
7	Secure and isolate the electrical system and control its operation/energy with a JSC Form 19A, “WARNING – DO NOT OPERATE” tag. Disable the fire alarm systems as necessary and obtain approval for outages from the Fire Protection Coordination Office.
8	Clean and remove furniture and fixtures, if possible.
9	Pre-clean work area.
10	Seal stationary items, and any remaining furniture/fixtures, and surfaces with polyethylene.
11	Install containment system enclosure, critical barriers, floor coverings, and airlocks (airlocks are mandatory for large enclosures; a double entrance curtain (“Z” flap) is mandatory for small enclosures).
12	Secure work area.
13	Install decontamination area (equipment room, shower area, clean room) and waste load-out facilities, as required. .
14	Install negative-pressure air system (large-scale enclosure).
15	Install negative-pressure air or HEPA-vacuum system for negative pressure (small-scale enclosure).
16	Arrange for SMOD to pre-inspect the enclosure.
17	Don protective equipment and clothing and respiratory protection.

Table 12.16-1, Activities for JPRs I-1 through I-4

Step #	Activity
18	Maintain HEPA vacuum system in standby mode (spot-removal surfacing).
19	Wet ACM.
20	Remove ACM
21	Conduct personnel and area sampling concurrently with removal of ACM.
22	Bag removed ACM.
23	Prepare bagged ACM for disposal. Decontaminate outside of bag.
24	Clean and inspect following procedures in Chapter 12.
25	Arrange for SMOD to perform initial inspection.
26	Re-clean, as necessary.
27	Conduct final cleanup following procedures in Chapter 12.
28	Apply encapsulant/“lockdown” to abatement and contiguous areas.
29	Arrange for SMOD to conduct clearance visual inspection and clearance air sampling.
30	Decontaminate personnel and equipment by HEPA vacuum. Remove disposable protective clothing and bag as asbestos waste. Shower and exit through decontamination area as appropriate.
31	Disassemble enclosure/decontaminated system after approval from SMOD.
32	Call Work Control Center to dispose of all ACM and asbestos-contaminated waste. Record Work Control Pickup Ticket number on Asbestos Work Permit.
33	Disestablish Regulated Area.
34	SMOD provides written notification to facility manager that area can be returned to routine activities.
35	Abatement contractor writes report or provides records to Environmental Office, as required.

12.16.2 JPRs for Class II Asbestos Work

12.16.2.1 Class II asbestos work involves the removal of, or modification to, wallboard systems, asbestos concrete materials (e.g., pipe, siding, roofing, transite board), ceiling tiles, wall tiles, floor tiles and sheeting, construction mastics, and roofing and siding shingles that are considered Asbestos Containing Material (ACM) or Presumed Asbestos Containing Material (PACM). The following requirements apply:

a. If you perform asbestos Class II abatement work involving the removal of equal to or greater than 160 square feet you shall (as required by Chapter 12.6):
   (1) Submit an asbestos project design
   (2) Provide the JSC Environmental Office, at least 15 working days prior to beginning work, all information required to make notification to the TDSHS

   NOTE: The JPR requirement descriptions listed in Paragraph 12.16.2 are the pre-approved project designs for asbestos Class II abatement activities involving less than 160 square feet of ACM or PACM.

b. Class II asbestos work operations, where exposures exceed a PEL, or where there is no negative exposure assessment approved by SMOD before the operation starts, require an equipment room or area adjacent to the Regulated Area for the decontamination of employees and their equipment. The area shall be covered by an impermeable drop cloth on the floor or horizontal working surface and shall be of sufficient size as to accommodate cleaning of equipment and removing personal protective equipment without spreading contamination beyond the area (as determined by visible accumulations). (Reference 29 CFR 1926.1101(j)(2)).

c. Tasks under Class II consist of removing wallboard, asbestos concrete materials (e.g., pipe, siding, roofing, transite board), ceiling tiles, wall tiles, floor tiles and sheeting, roofing, and siding shingles (i.e., ACM or PACM other than TSI and surfacing materials), regardless of quantity, where these materials have been identified as containing greater than 1% asbestos. Although these materials contain in excess of 1% asbestos, they are typically classified as non-friable. The removal of these materials is separated into two categories based on exposure plus two specific tasks for the removal of resilient flooring using Resilient Floor Covering Institute (RFCI) methods.

d. The following are descriptions of JPRs II-1 through II-2:
   (1) JPR II-1: The first exposure category is where work activities will destroy the integrity of the ACM and cause the release of asbestos fibers. The materials being removed constitute a significant source of ACM, and abatement could reasonably be expected to contaminate adjoining facilities and create airborne concentrations if proper controls are not followed. The airborne exposures are likely to exceed (>) 0.01 f/cc, or an approved negative exposure assessment is not available. These removal projects will require the use of small or large enclosures. Enclosures will require the use of an equipment room.
   (2) JPR II-2: The second exposure category is where work activities will not compromise or damage the integrity of the ACM. The materials being removed do not constitute

potentially significant airborne fibers if removed intact and controlled. The airborne exposures are likely to be less than (<) 0.01 f/cc, or an approved negative exposure assessment is available. An enclosure may be necessary, but is not always required.

e. To accomplish JPR II-1 and JPR II-2 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-2. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-2, Activities for JPRs II-1 and JPR II-2

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify training, medical, and PPE requirements for the asbestos workers are complete and current.
3	Notify and coordinate task with proper officials (facility manager, work area supervisor, SMOD, Environmental Office, as needed).
4	For routine and scheduled O&M work, notify SMOD at least 2 weeks before job start to coordinate inspections and air sampling.
5	Establish Regulated Area, post warning signs, and rope off area with barricade tape.
6	Shut down and isolate the HVAC system. Control operation/energy with a JSC Form 19A, “WARNING - DO NOT OPERATE” tag.
7	Secure and isolate the electrical system and control its operation/energy with a JSC Form 19A, “WARNING - DO NOT OPERATE” tag. Disable the fire alarm systems as necessary and obtain approval for outages from the Fire Protection Coordination Office.
8	Clean and remove furniture and fixtures.
9	Pre-clean work area.
10	Seal stationary items with polyethylene.
11	Install containment system, critical barriers, coverings, and airlocks (airlocks are mandatory for large enclosures; a double entrance curtain (“Z” flap) is mandatory for small enclosures).
12	Secure work area.
13	Install equipment room (as necessary).
14	Install negative-pressure air or HEPA-vacuum system for negative pressure (as necessary).
15	Arrange for the SMOD to pre-inspect the enclosure.
16	Don protective equipment and clothing and respiratory protection.
17	Wet ACM.
18	Remove ACM.
19	Conduct personnel and area sampling concurrently with removal of ACM.
20	Bag removed ACM.
21	Prepare bagged ACM for disposal. Decontaminate outside of bag.
22	Clean and inspect following procedures in Chapter 12.12.
23	Arrange for SMOD to conduct initial visual inspection.

Table 12.16-2, Activities for JPRs II-1 and JPR II-2

Step #	Activity
24	Re-clean, as necessary.
25	Conduct final cleanup following procedures in Chapter 12.12.
26	Apply encapsulant/"lockdown" to abatement and contiguous areas.
27	Arrange for SMOD to conduct clearance visual inspection and clearance air sampling.
28	Decontaminate personnel and equipment by HEPA vacuum. Remove disposable protective clothing and bag as asbestos waste. Shower and exit through change room as appropriate.
29	Disassemble enclosure/decontamination system after approval from SMOD.
30	Call Work Control Center to dispose of all ACM and asbestos-contaminated waste.
31	Disestablish Regulated Area. Record Work Control Pickup Ticket number on Asbestos Work Permit.
32	SMOD provides written notification to facility manager that area can be returned to routine activities.
33	Abatement contractor writes report or provides records to Environmental Office, as required.

f. The following are descriptions of JPRs II-3 through II-4:

(1) JPR II-3: Removal of less than (<) 160 square feet of resilient sheet flooring using methods and procedures specified by the RFCI to include: (i) ACM sheeting or (ii) sheeting with ACM backing felt or adhesive. Sheeting must be cut with a box-cutter or linoleum-knife into narrow strips and rolled up without breaking using wet methods. Since the removal of the resilient sheet flooring will most likely involve an entire room or rooms, critical barriers and entry curtains are mandatory, as is polyethylene sheeting on the lower half of the walls. If the RFCI procedures are not strictly followed, removal must be conducted under JPR II-1.

(2) JPR II-4: Removal of resilient flooring using methods and procedures specified by the RFCI to include: (i) any ACM vinyl or asphalt tile or (ii) any vinyl or carpet tile with ACM mastic, where the area exceeds 40 ft2 , or where waste will exceed the capacity of one standard glove bag, but involves less than 160 square feet. Critical barriers and entry curtains are mandatory, as is polyethylene sheeting on the lower half of the walls. Tiles must be removed intact. Removal procedures must not use spud bars or mechanical chippers. If these conditions are not or cannot be met, removal must be conducted under JPR II-1.

NOTE: The RFCI document, "Recommended Work Practices for Removal of Resilient Floor Coverings," may be found at http://www.rfci.com/index.php. See the TDSHS statement concerning RFCI procedures at: http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf. RFCI procedures prohibit sanding, sawing, drilling, grinding, abrasive blasting, bead blasting, dry sweeping, dry scraping, and mechanical chipping or pulverizing of resilient flooring, lining, backing felt, and adhesive materials.

g. To accomplish JPR II-3 and JPR II-4 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-3. Workers will wear

protective clothing and respiratory protection. Find specific details for performing all required activities by referring to the accepted RFCI industry practices and procedures.

Table 12.16-3, Activities for JPRs II-3 and JPR II-4

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify training, medical, and PPE requirements for the asbestos workers are complete and current.
3	Notify and coordinate task with proper officials (facility manager, work area supervisor, SMOD, Environmental Office, as needed).
4	For routine and scheduled O&M work, notify SMOD at least 2 weeks before job start to coordinate inspections and air sampling.
5	Notify JSC Environmental Office (JE) at least 15 working days before the job if the project exceeds EPA (Clean Air Act/NESHAP) criteria of greater than 160 ft^2 for removal of ACM for them to make required regulatory notifications to the TDSHS.
6	Establish Regulated Area, post warning signs, and rope off area with barricade tape.
7	Clean and remove furniture and fixtures.
8	Pre-clean work area.
9	Seal stationary items with polyethylene.
10	Install containment system, critical barriers, coverings, and airlocks (airlocks are mandatory for large enclosures; a double entrance curtain (“Z” flap) is mandatory for small enclosures).
11	Secure work area.
12	Install equipment room (as necessary).
13	Install negative-pressure air or HEPA vacuum system for negative pressure (as necessary).
14	Arrange for the SMOD to pre-inspect the Regulated Area.
15	Prepare amended water/detergent solution using RFCI directions.
16	Don protective equipment and clothing and respiratory protection.
17	Remove resilient sheet flooring using RFCI methods: • If sheeting is fully-adhered, cut into strips that are 4 to 8 in. wide. Use these narrow strips for the bonded areas/edges of peripherally adhered sheeting. • If sheeting has not adhered or is peripherally adhered, cut areas that are not bonded into strips that are 18 in. wide. • While one worker rolls up the strip, a second worker keeps the sheeting, and especially the backing felt, wet with water/detergent solution. • For fully adhered sheeting, the backing felt will separate from the wear layer. If separation does not occur easily, use wet-scraping to achieve separation. • After removing a 12- to 18-in. width of sheeting, thoroughly saturate any residual backing felt and remove by wet-scraping. Rewet backing felt if water/detergent solution has not completely penetrated. • Place rolled-up flooring and wet backing felt into ACM waste bags. • After the 12- to 18-in. width is free of backing felt, HEPA-vacuum the cleaned area.

Table 12.16-3, Activities for JPRs II-3 and JPR II-4

Step #	Activity
	• Repeat a–g, above, until sheeting and backing felt have been removed from the entire floor.
18	Remove floor tiles using RFCI methods: • Wet floor tile with water/detergent solution. • Using one of the RFCI methods, carefully remove floor tiles one at a time, keeping them intact. The RCFI methods are: ▪ Wet floor tile with water/detergent solution; work a short- or long-handled scraper beneath a floor tile to exert pressure in a twisting action. ▪ Thoroughly heat tile with a hot air gun or radiant heat source to soften tile and adhesive, then remove by hand or with scraper.
19	Remove carpet tiles that have been adhered to floor with ACM mastic. Pry or peel up carpet tiles; keep mastic wet with water/detergent solution. Place contaminated carpet tiles into ACM waste bags with water/detergent solution.
20	Remove residual ACM mastic using RFCI wet-scraping methods and/or adhesive solvents and place into ACM waste bags. RFCI methods allow the use of adhesive solvents with a slow-speed (i.e., less than 300 rpm) floor machine and a 3M black floor pad. If using an adhesive solvent, exhaust ventilation will be required.
21	Conduct personnel and area sampling concurrently with removal of ACM.
22	Prepare bagged ACM for disposal.
23	Clean and inspect following procedures in Chapter 12.12.
24	Arrange for SMOD to conduct initial visual inspection.
25	Re-clean, as necessary.
26	Conduct final cleanup following procedures in Chapter 12.12.
27	Arrange for SMOD to conduct clearance visual inspection and clearance air sampling, as required.
28	Decontaminate personnel and equipment by HEPA vacuum. Remove disposable protective clothing and bag as asbestos waste.
29	Disassemble enclosure/decontamination system after approval from SMOD.
30	Call Work Control Center to dispose of all ACM and asbestos-contaminated waste.
31	Disestablish Regulated Area. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
32	SMOD provides written notification to facility manager that area can be returned to routine activities.
33	Abatement contractor writes report or provides records to Environmental Office, as required.

12.16.3 JPRs for Class III Asbestos Work

12.16.3.1 JPR III-1 applies to Class III asbestos involving removal of piping insulation using a glovebag to control the expected airborne asbestos. The following requirements apply.

a. Removal or repair of ACM or PACM insulation of less than (<) 3 linear feet at a single spot from steam, chilled water, and hot water lines and valves. Waste is limited to the amount of ACM or PACM that can be safely contained within one glovebag or within one standard waste bag. This job consists of conducting repairs and maintenance to pipes, lines, and valves. To gain access to the defective part of the pipe, line, or valve, it may be necessary to remove asbestos insulation from the item. The normal high asbestos content of these materials makes it reasonable to expect airborne concentrations of asbestos in potentially significant levels when these materials are disturbed. If the item to be worked on is small enough to fit in a glovebag and there is sufficient room for tools and necessary manipulation, use the glovebag method.

   NOTE: If the operation cannot be conducted in one glovebag, or if the total asbestos waste exceeds the capacity of one glovebag or one standard asbestos disposal bag, the work must be done following procedures under Class I Asbestos Work, JPR I-2 or I-4.

b. Accomplishing JPR III-1 activities requires a number of sequential and concurrent steps. The most prominent of these are listed in Table 12.16-4. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-4, Activities for JPRs III-1

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
3	Notify and coordinate job task with proper officials (facility manager, work area supervisor, and SMOD).
4	Secure electrical systems, if possible without undue disruption to others in the area. Coordinate with the Fire Protection Office to disable fire alarms, as necessary.
5	Pre-clean the work area.
6	Seal stationary items with polyethylene.
7	Cover surface areas under abatement area with 6 mil polyethylene.
8	Establish Regulated Area, post warning signs, and rope off area with barricade tape.
9	Don protective equipment and clothing and respiratory protection.
10	Perform glovebag operations. a. Install glovebag. b. Establish containment negative-pressure air flow with HEPA vacuum. c. Remove ACM using wet methods. d. Scrub and wipe down exposed piping/valves. e. Use encapsulant or "lockdown" on abatement and contiguous areas. f. Remove glovebag.

Table 12.16-4, Activities for JPRs III-1	
Step #	**Activity**
11	Clean area.
12	Perform inspection and conduct final cleanup following procedures in Chapter 12.12.
13	Decontaminate and remove protective equipment.
14	Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
15	Disestablish Regulated Area.
16	Notify facility manager of job completion.

12.16.3.2 JPR III-2 and JPR III-3 apply to Class III asbestos work involving a regulated area defined by a barricade with floor covering.

a. This set of asbestos Class III activities require a Regulated Area defined by barrier or tape and warning signs. The Regulated Area does not require an enclosure but does require appropriate covering of horizontal surfaces with polyethylene sheeting.

b. If at any time during the JPR III-2 and JPR III-3 activities described below, ACM is noted as delaminating or creating airborne fibers, stop the project and immediately upgrade it to Class I or Class II asbestos work.

c. JPR III-2 jobs may consist of modifying building components (e.g., steel or concrete structural members; steel or concrete decking) that is in close proximity to SAI for which drilling, hammering, or similar activities could be reasonably expected to disturb the ACM. When it is necessary to drill through or hammer steel that is in proximity to ACM that could be disturbed by the construction or maintenance activity, take precautions to minimize the quantity of asbestos released. Precautions would include evacuating nonessential personnel within the area of the activity, and wetting ACM before work to prevent fiber release. These jobs may also consist of removing and/or replacing wall partitions in close proximity to asbestos materials and could be reasonably expected to disturb the ACM. Airborne asbestos concentrations are expected to be minimal if proper control procedures are followed. JPR III-2 activities meet one or more of the following:
   (1) Any entry into a ceiling plenum below surfacing or spray-applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is less than (<) 32 square feet.
   (2) Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is < 32 square feet.
   (3) Only in a mechanical room, any activity in close proximity (i.e., within 36 inches) of surfacing ACM or PACM.
   (4) Other than in mechanical rooms, any activity in close proximity (i.e., within 24 inches) of surfacing ACM or PACM; e.g., changing lights where acoustic ceiling ACM is present.

d. JPR III-3 activities involve the removal of ACM or PACM where the waste generated does not exceed the capacity of a standard asbestos waste bag. The materials being removed have

been identified as containing (or are presumed to contain) greater than 1% asbestos, constitute a potential source of ACM, and abatement could reasonably be expected to contaminate adjoining areas if proper work practices are not followed. Wet methods are mandatory and the ACM or PACM must be captured close to the removal activity and transferred to a waste bag. If waste exceeds the capacity of a standard asbestos waste bag, then Class II Asbestos work, JPR II-1 or II-2 must be used. JPR III-3 activities meet one or more of the following:

(1) Spot removal of ACM or PACM wallboard, joint tape, or joint compound.

(2) Removal, replacement and disposal of ACM or PACM ceiling tiles below a plenum which does not contain surfacing or SAI ACM or PACM and where the ceiling opening is < 32 square feet.

e. To accomplish JPR III-2 and JPR III-3 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-5. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-5, Activities for JPRs III-2 and III-3

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify that training, medical and PPE requirements of the asbestos workers are complete and current.
3	Notify and coordinate job tasks with proper officials (facility manager, work area supervisor, and SMOD).
4	Establish Regulated Area. Place barricades and signs around work area. Barricades must be placed a sufficient distance beyond the work zone to capture all debris from work activities and to ensure that no asbestos concentration exceeds applicable limits.
5	Move employees out of the Regulated Area.
6	Shut down HVAC system if possible without undue disruption to others in the area. HVAC system must be shut down when disturbance of ACM or ACM debris could reasonably be expected to migrate to other areas.
7	Don protective equipment and clothing and respiratory protection.
8	Conduct personnel and area sampling as required.
9	Place one layer of 6-mil polyethylene beneath work area. Polyethylene must extend beyond the work zone a sufficient distance to catch/trap any asbestos debris that may fall. If removing ceiling tiles, place polyethylene sheeting at least one ceiling tile beyond the opening in each direction. Move the boundary of the Regulated Area as necessary to ensure the polyethylene sheeting does not extend beyond the boundary.
10	When removing ceiling tiles: a. Place ladder below first ceiling tile. b. As tile is lifted, HEPA vacuum the tile grid supports. c. Remove one ceiling tile. Lower carefully, maintaining horizontal orientation. d. HEPA vacuum and wet wipe surface facing plenum and exposed side(s). e. Wet wipe and HEPA vacuum tile hanger assembly.

Table 12.16-5, Activities for JPRs III-2 and III-3	
Step #	**Activity**
	f. HEPA vacuum next tile to be removed, remove next tile, and wet wipe and HEPA vacuum tile hanger assembly. g. Repeat for a maximum of three tiles (less than 32 square feet). h. If unable to decontaminate tile, or if ACM or PACM tiles are being removed/disposed, place in asbestos waste disposal bag.
11	If performing spot removals/abatements of SAI, or acoustical decoration, or wallboard, tape, and mud: a. Spray spot and surrounding area with amended water and let it soak into the ACM. b. Cut with sharp knife or other tool so as not to generate asbestos fibers. Use a HEPA vacuum adjacent to the cutting tool to capture asbestos fibers/dust. c. Catch asbestos waste in container held close to removal spot/area. d. Clean substrate, as applicable. e. Spray/mist substrate and exposed side(s) of ACM with approved encapsulant.
12	If applicable, modify structural components so as not to disturb surrounding ACM.
13	If applicable, carefully remove wall partitions or plaster ceiling materials so as not to disturb surrounding ACM. Remove material and dispose of as normal waste or as directed.
14	As applicable, perform work in plenum above suspended ceilings.
15	When the plenum area is below surfacing or SAI ACM or PACM, wet wipe all cables, wires, conduit, and piping as they are removed from plenum area. HEPA vacuum all other items as they are removed from plenum area.
16	HEPA vacuum work area.
17	Visually inspect above ceiling and/or around work area to ensure that there is no remaining visible ACM or PACM dust/debris.
18	Replace ceiling tiles, as applicable
19	Visually inspect and clean the Regulated Area and all equipment to ensure there is no visible ACM dust/debris. Follow cleaning and inspection procedures of Chapter 12.12.
20	Decontaminate personnel and all equipment by HEPA vacuum.
21	HEPA vacuum and wet wipe polyethylene placed beneath work area. If unable to decontaminate, carefully gather plastic and dispose as asbestos-contaminated waste. Follow cleaning and inspection procedures of Chapter 12.
22	Conduct final visual clearance inspection. Re-clean as necessary.
23	Decontaminate disposable coveralls; remove, and dispose of as asbestos-contaminated waste.
24	Remove respirator.
25	Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit. Notify area supervisor that task is complete.
26	Remove barricades and signs and disestablish Regulated Area.
27	Notify Facility Manager of job completion.

12.16.3.3 JPR III-4 and JPR III-5 involve Class III Asbestos Work require a regulated area defined by an enclosure.

a. JPR III-4 applies to spot removal of surfacing ACM or PACM (e.g., SAI or acoustical or decorative) of less than 3 square feet in contiguous area at a single spot, and the waste generated does not exceed the capacity of one standard asbestos waste bag per individual spot. The materials being removed have been identified as, or are presumed as, containing greater than 1% asbestos, constitute a potential source of ACM, and abatement could reasonably be expected to contaminate adjoining areas if proper work practices are not followed. Wet methods are mandatory and the ACM must be captured close to the removal activity and transferred to a waste bag.

b. JPR III-5 applies to activities which meet one or more of the following:
   (1) Any entry into a ceiling plenum below surfacing or spray-applied insulation/fireproofing (SAI) ACM or PACM where the ceiling opening is greater than or equal to (>) 32 square feet.
   (2) Any activity that disturbs (e.g., moves) ACM or PACM ceiling tiles below a plenum that does not contain surfacing or SAI ACM or PACM where the ceiling opening is > 32 square feet.

c. If at any time ACM is noted as delaminating or creating airborne fibers during the JPR III-4 or JPR III-5 activities, stop the project and immediately upgrade it to Class I or Class II asbestos work.

d. To accomplish JPR III-4 and JPR III-5 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-6. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-6, Activities for JPRs III-4 and JPR III-5

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify that training, medical and PPE requirements of the asbestos workers are complete and current.
3	Notify and coordinate job tasks with proper officials (Facility Manager, Work Area Supervisor, and SMOD).
4	Place barricades and signs around work area.
5	Move employees in the immediate work area out of the Regulated Area.
6	Shut down HVAC system if possible without unduly interrupting facility work force. The HVAC system must be shut down when disturbance of ACM or ACM-containing debris could reasonably be expected to migrate to other areas.
7	Don protective equipment and clothing and respiratory protection.
8	Conduct personnel and area sampling as required.

Table 12.16-6, Activities for JPRs III-4 and JPR III-5

Step #	Activity
9	Construct mini-enclosure with polyethylene, incorporate an airlock or double entrance curtain ("Z" flap). A "pop-up" (e.g., "Kontrol-Kube™") enclosure will meet this requirement.
10	Pre-clean area as necessary.
11	As necessary, use HEPA vacuum to create a negative pressure inside enclosure.
12	If removing ceiling tiles: a. Place ladder below first ceiling tile. b. As tile is lifted, HEPA vacuum the tile grid supports. c. Remove one ceiling tile. Lower carefully, maintaining horizontal orientation. d. HEPA vacuum and wet wipe surface facing plenum and exposed side(s). e. Wet wipe and HEPA vacuum tile hanger assembly. f. HEPA vacuum next tile to be removed, remove next tile, and wet wipe and HEPA vacuum tile hanger assembly. g. Wet wipe and HEPA vacuum tile hanger assembly. h. Repeat as necessary for all tiles to be removed. i. If unable to decontaminate tile, or if ACM or PACM tiles are being removed/disposed, place in asbestos waste disposal bag.
13	If applicable, modify structural components so as not to disturb surrounding ACM.
14	If applicable, carefully remove wall partitions so as not to disturb surrounding ACM. Remove material and dispose of as normal waste or as directed.
15	As applicable, perform work in plenum above suspended ceilings.
16	When the plenum area is below surfacing or SAI ACM or PACM, wet wipe all cables, wires, conduit, and piping as they are removed from plenum area. HEPA vacuum all other items as they are removed from plenum area.
17	HEPA vacuum work area.
18	Visually inspect above ceiling, around work area, to ensure that there is no remaining visible ACM dust/debris.
19	Replace ceiling tiles.
20	Perform first visual inspection of the Regulated Area and all equipment below ceiling to ensure there is no visible ACM dust/debris.
21	Decontaminate personnel and all equipment by HEPA vacuum.
22	Clean, inspect, decontaminate enclosure following Chapter 12.12 procedures.
23	Conduct visual clearance inspection. Re-clean as necessary.
24	Disassemble enclosure, perform final visual inspection of area, clean as necessary.
25	Decontaminate disposable coveralls; remove, and dispose of as asbestos-contaminated waste.
26	Remove respirator.
27	Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
28	Remove signs and disestablish Regulated Area.
29	Notify Facility Manager of job completion.

12.16.3.4 JPR III-6 applies to removal of plaster and sheetrock ceilings below the ceiling plenum in buildings with ACM or PACM surfacing or spray-applied insulation/fireproofing (SAI).

a. The JPR III-6 work consists of activities to remove plaster and sheetrock ceilings below the ceiling plenums in buildings with asbestos containing spray-applied insulation (SAI). The plaster is most often used with a wire-mesh support. The wire mesh or sheetrock supports may be suspended by wires from the overhead deck. The top side of the plaster or the sheetrock is assumed to be contaminated with asbestos debris. Removal of the plaster or sheetrock will create significant amounts of dust and debris, which could contain some asbestos debris. Partial to whole-body entry into the plenum is required for some or all of the plaster/sheetrock ceiling removal. Asbestos concentrations are reasonably expected to be low if proper precautions and procedures are incorporated into job planning. This task does not include the abatement of any ACM SAI, but has the potential to disturb the ACM SAI if precautions are not taken.

b. JPR III-6 work requires a regulated area defined by an enclosure.

c. If at any time ACM is noted as delaminating or creating airborne fibers during the JPR III-4, JPR III-5, or JPR III-6 activities, stop the project and immediately upgrade it to Class I or Class II asbestos work.

d. To accomplish JPR III-6 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-7. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-7, Activities for JPR III-6

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify that training, medical and PPE requirements of the asbestos workers are complete and current.
3	Notify and coordinate job tasks with proper officials (Facility Manager, Work Area Supervisor, and SMOD).
4	Place barricades and signs around work area.
5	Move employees in the immediate work area out of the Regulated Area.
6	Shut down HVAC system if possible without unduly interrupting facility work force. The HVAC system must be shut down when disturbance of plaster/sheetrock dust and ACM-containing debris could reasonably be expected to migrate to other areas.
7	Remove furniture and fixtures. Pre-clean area as necessary. Seal stationary items with polyethylene if they cannot be removed.
8	Construct enclosure with polyethylene sheeting. a. Seal edges of enclosure and cover HVAC system vents to prevent escape of dust and debris. b. Install an airlock vestibule. c. Install a waste load-out area if needed.

Table 12.16-7, Activities for JPR III-6	
Step #	**Activity**
	d. If ceiling is being removed from an entire room, cover the walls with a single layer of at least 6-mil polyethylene. e. Cover the floor of the enclosure with two layers of at least 6-mil polyethylene.
9	Install negative-pressure air machine (large enclosure) or HEPA vacuum (small enclosure) to create a negative pressure of at least -0.02 inches H2O inside enclosure.
10	Arrange for SMOD to inspect enclosure before work begins.
11	Don protective equipment and clothing and respiratory protection before entering the enclosure.
12	Conduct personnel and area sampling as required.
13	Remove ceiling: a. Gain entry to ceiling through hatch, if one exists. b. Otherwise, select a location to cut an opening and place ladder/work stand below. Wet the cut-line, then cut opening through ceiling. Use a HEPA vacuum (with a design used for wet application to mitigate shock hazard) to catch/collect dust generated during the cutting process. Carefully lower the cut out piece of ceiling, maintaining horizontal orientation. HEPA vacuum the surface facing plenum. c. HEPA vacuum the top of the next ceiling area to be removed and then cut it out. • Minimize generation of plaster/sheetrock dust and debris. • Wet top and bottom surfaces to be cut. • Catch or collect dust generated by the cutting process with a HEPA vacuum. • Avoid, as much as possible, partial cutting and/or tearing down the ceiling since this creates more plaster/sheetrock dust and debris. d. Repeat as necessary for all of ceiling area being removed. e. Control plaster/sheetrock dust inside enclosure with water mist.
14	Double bag and dispose of all plaster and sheetrock waste as asbestos waste. Wet all debris as it is being bagged. Place a JSC Form 1161, "Disposal Inventory for Miscellaneous Hazardous Waste," on each waste bag. See waste disposal procedures/process in Chapter 12.14.
15	If applicable, modify structural components so as not to disturb surrounding ACM.
16	Wet wipe all cables, wires, conduit, and piping as they are removed from plenum area. HEPA vacuum all other items as they are removed from plenum area.
17	Clean, inspect, decontaminate enclosure following Chapter 12.12 procedures.
18	Conduct visual inspection of the enclosure and all equipment below the ceiling plane. Re-clean as necessary.
19	Arrange for SMOD to conduct a visual clearance inspection.
20	Install new ceiling and perform other construction work. a. As long as the ceiling remains open to the ACM SAI, then all work will be conducted using Class III Asbestos Work procedures as described in JPRs III-4 or III-5.

Table 12.16-7, Activities for JPR III-6	
Step #	**Activity**
	b. Removal/Abatement of any surfacing, SAI, or TSI ACM or PACM SAI will be conducted using JPRs I-1through I-4, as appropriate. If the abatement activities involve amounts equal to or greater than (>) 260 linear feet, 160 square feet, or 35 cubic feet of ACM or PACM, then submit an asbestos project design and provide the JSC Environmental Office, at least 15 working days prior to beginning work, all information required to make notification to the TDSHS.
21	After new ceiling is completely installed, conduct visual inspection and clean/re-clean as necessary.
22	Arrange for SMOD to perform a final visual clearance visual inspection and clearance air sampling.
23	Disassemble the enclosure and perform final visual inspection of area, clean as necessary.
24	Decontaminate equipment by HEPA vacuuming and wet wiping.
25	Decontaminate personnel and disposable coveralls; remove and dispose of as asbestos-contaminated waste.
26	Remove respirator.
27	Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit and on the JSC Form 1161.
28	Remove signs and disestablish Regulated Area.
29	Notify Facility Manager of job completion.

12.16.3.5 JPR III-7 applies to repair or maintenance of equipment with ACM or PACM to include equipment that has ACM or PACM insulation, or replacement and removal of ACM or PACM gaskets.

a. JPR III-7 activities include:
   (1) The repair and maintenance of equipment (motors, engines, relays, ovens, file cabinets, etc.) that has ACM or PACM inside the unit. It does not cover equipment with ACM insulation on the outside, which must be removed before gaining access to the interior of the unit. Airborne concentrations of asbestos fibers are reasonably expected to be less than 0.1 f/cc. If equipment is known to contain asbestos and there is no intention of servicing the equipment or removing the asbestos, the equipment must be disposed of as asbestos waste (i.e., it cannot be disposed of or declared excess through the JSC Logistics Division).
   (2) Removing ACM or PACM gasket materials from valves and pipe flanges. This job does not include removing ACM or PACM from the outside of the valve or pipe joint. (Removing ACM from outside of the valves and pipe joints will be conducted under Class I asbestos work, JPRs I-2 and I-4, or Class III asbestos glovebag work, JPR III-1, as appropriate). Airborne concentrations of asbestos fibers are reasonably expected to be less than 0.1 f/cc if proper controls are followed.

b. To accomplish JPR III-7 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-8. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-8, Activities for JPR III-7

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person.
2	The assigned Competent Person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
3	Notify proper offices.
4	Establish Regulated Area.
5	Place barricades and signs around work area.
6	Place one layer of 6-mil polyethylene under (around, if equipment is floor-mounted) equipment to be repaired.
7	Don protective clothing and respirator. a. As appropriate, disassemble valve or pipe flange. b. HEPA-vacuum/wet-wipe valve-gasket interfaces. c. Scrape off and collect ACM gasket materials using wet methods. d. Bag ACM. e. HEPA-vacuum/wet-wipe flange surfaces. f. Install new gasket. g. Reassemble valve piping. h. HEPA-vacuum/wet-wipe outside of valve and surrounding area.
8	As appropriate, open equipment. a. HEPA vacuum interior. b. Wet ACM material. c. Remove ACM (if necessary) and place in ACM waste bag, if being discarded. Replace with non-ACM if feasible. d. Repair equipment. e. HEPA-vacuum interior. f. Close up equipment.
9	HEPA-vacuum polyethylene and visually inspect Regulated Area.
10	Clean and inspect work area following procedures in Chapter 12.12.
11	Place all rags, materials, polyethylene, and vacuum cleaner bags into ACM waste bags.
12	HEPA-vacuum disposable work clothes. Remove protective clothing and dispose of as asbestos-contaminated waste.
13	Remove, clean, and store respirator.
14	Call Work Control Center to dispose of asbestos-contaminated waste. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
15	Notify supervisor that task is complete.
16	Remove barricades and signs and disestablish Regulated Area.

12.16.3.6 JPR III-8 applies to maintenance of equipment used in asbestos abatement or decontamination work.

a. JPR III-8 activities includes replacing filters and maintaining equipment used in ACM abatement and decontamination operations. This would generally include negative-pressure air filtration, water filters, and HEPA-equipped vacuum cleaners. These filters would generally be expected to contain significant quantities of ACM; consequently, these units may need to be serviced within a small enclosure. When not in service, secure HEPA vacuum cleaners and negative-pressure, air filtration equipment with plastic on each inlet and exhaust opening to the unit.

b. To accomplish JPR III-8 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-9. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-9, Activities for JPR III-8

Step #	Activity
1	Ensure supervision by a properly qualified, Competent Person
2	The assigned Competent Person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
3	Coordinate job tasks with proper officials.
4	Secure HVAC and electrical systems, as necessary. Ensure equipment is de-energized. Perform LO/TO procedures as appropriate.
5	Move employees in the immediate work area out of the controlled area.
6	Place barricades and signs around work area. Build enclosure as needed. Place polyethylene sheeting on work surface.
7	Don protective clothing and respirator.
8	Open filter unit.
9	HEPA-vacuum/wet-wipe filter unit covers and duct.
10	Spray filter with mist of water or a tack coating.
11	Ensure complete filter surface is covered.
12	Place filter into plastic bag, seal bag, and label as asbestos waste.
13	HEPA-vacuum/wet-wipe filter installation area.
14	Install new filter.
15	Close unit.
16	Clean and inspect work area following procedures in Chapter 12.12.
17	HEPA-vacuum work area including plastic sheeting placed beneath work area.
18	Disassemble enclosure.
19	Collect decontaminated plastic sheeting placed beneath work area, place in waste bags, and dispose of as normal refuse.
20	Conduct visual clearance inspection.
21	HEPA-vacuum work area and protective clothing. Remove protective clothing and dispose of as asbestos-contaminated waste.
22	Remove, clean, and store respirator.

Table 12.16-9, Activities for JPR III-8	
Step #	**Activity**
23	Call Work Control Center to dispose of asbestos-contaminated waste. Record Work Control Pickup Ticket Number on Asbestos Work Permit.
24	Notify area supervisor that task is complete.
25	Remove barricades and signs.

12.16.3.7 JPR III-9 applies to removal of one standard waste bag of (i) ACM vinyl/asphalt floor tile; (ii) non-ACM floor tile with ACM mastic; or (iii) carpet tiles with ACM mastic using procedures and methods specified by the RFCI.

Note: The RFCI document, "Recommended Work Practices for Removal of Resilient Floor Coverings," may be found at http://www.rfci.com/index.php. See the TDSHS statement concerning RFCI procedures at: http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf. RFCI procedures prohibit sanding, sawing, drilling, grinding, abrasive blasting, bead blasting, dry sweeping, dry scraping, and mechanical chipping or pulverizing of resilient flooring, lining, backing felt, and adhesive materials.

a. Waste is limited to one standard waste bag. If more than one waste bag will be generated, removal must be conducted under JPR II-1.

b. Tiles must be removed intact. Removal procedures must not use spud bars or mechanical chippers. If these conditions are not or cannot be met, removal must be conducted under JPR II-1.

c. To accomplish JPR III-9 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-10. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-10, Activities for JPR III-9	
Step #	**Activity**
1	Ensure supervision by a properly qualified Competent Person
2	The assigned Competent Person shall verify training, medical, and PPE requirements of the asbestos workers are complete and current.
3	Notify proper offices.
4	Ensure supervision by a properly qualified Competent Person.
5	Establish Regulated Area, post warning signs, and rope off area with barricade tape.
6	Pre-clean work area.
7	Prepare amended water/detergent solution using RFCI directions.
8	Don protective clothing and respiratory protection.
9	Remove floor tiles using RFCI methods: a. Wet floor tile with water/detergent solution. b. Using one of the RFCI methods, carefully remove floor tiles one at a time, keeping them intact. The RCFI methods are:

Table 12.16-10, Activities for JPR III-9	
Step #	**Activity**
	• Wet floor tile with water/detergent solution; work a short- or long-handled scraper beneath a floor tile to exert pressure in a twisting action. • Thoroughly heat tile with a hot air gun or radiant heat source to soften tile and adhesive, then remove by hand or with scraper. • Place removed tiles into ACM waste bags with water/detergent solution.
10	Remove carpet tiles that have adhered to floor with ACM mastic. Pry or peel up carpet tiles; keep mastic wet with water/detergent solution. Place contaminated carpet tiles into ACM waste bags with water/detergent solution.
11	Remove residual ACM mastic using RFCI wet-scraping methods and/or adhesive solvents and place into ACM waste bags. RFCI methods allow use of adhesive solvents with a slow-speed (i.e., less than 300 rpm) floor machine and a 3M black floor pad.
12	Prepare bagged ACM for disposal.
13	Visually inspect and clean the Regulated Area and all equipment to ensure that there is no visible ACM dust/debris. Follow cleaning and inspection procedures in Chapter 12.12.
14	Decontaminate personnel and all equipment by HEPA vacuum.
15	Conduct final visual clearance inspection. Re-clean as necessary.
16	Decontaminate, remove, and dispose of disposable coveralls as asbestos-contaminated waste.
17	Remove respirator.
18	Call Work Control Center to dispose of all ACM and ACM-contaminated materials. Record Work Control Pickup Ticket Number on Asbestos Work Permit. Notify area supervisor that task is complete.
19	Remove barricades and signs and disestablish Regulated Area.
20	Notify facility manager of job completion.

12.16.3.8 JPR III-13 applies to Activities required to be performed under raised computer floor and sub-floor areas (i.e., system inspections, system repairs, system installations, cable installations or removals, and sub-floor cleaning) in buildings with SAI/fireproofing or exposed acoustical decoration.

a. This job consists of removing and/or replacing raised computer floor tiles for activities to be performed in sub-floor areas where the potential for asbestos dust exists. If proper control measures are followed, airborne asbestos concentrations are expected to be minimal.

b. Requirements of this JPR do not apply if activities do not require physical entry into sub-floor areas (physical entry is defined as happening when any part of a human body (arm, foot, head) breaks the plane of the flooring). For example, inspections of sub-floor areas from above the floor surface are not regulated under either this JPR or Part 12.

c. To accomplish JPR III-13 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-11. Find specific details for performing

all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-11, Activities for JPR III-13

Step #	Activity
1	A Competent Person shall verify that training, medical, and PPE requirements are complete and current.
2	Notify and coordinate job tasks with proper officials.
3	When feasible, shut down under-floor HVAC systems in the area. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook).
4	Don protective clothing and respirator.
5	Remove floor tile panel and HEPA vacuum underside of panel.
6	Wet-wipe and/or HEPA-vacuum floor tile support assembly.
7	HEPA-vacuum the under-floor area where work is to be performed.
8	If activity is for removal of any under-floor equipment or cabling, HEPA-vacuum and/or wet-wipe all items as they are removed from the floor cavity.
9	Replace tiles as necessary.
10	Conduct visual clearance inspection.
11	HEPA-vacuum work area and protective clothing. Remove protective clothing and dispose of as asbestos-contaminated waste.
12	Remove, clean, and store respirator.
13	Call Work Control Center to dispose of asbestos-contaminated waste. Record Work Control Pickup Ticket Number on the Asbestos Work Permit.
14	Notify area supervisor that task is complete.

12.16.4 JPRs for Class IV Asbestos Work

12.16.4.1 JPR IV-1 applies to activities to change air filters in comfort cooling or clean room systems in buildings with SAI/fireproofing.

a. Air-conditioning systems contain filters that must be routinely replaced. Comfort units usually have a 1- to 2-inch-thick polyethylene pad media. Some units have roll media that is advanced automatically based upon pressure differential. Units serving computers and electronics usually have a polyethylene-pad pre-filter and a 65% efficiency secondary filter. Clean room units usually have a pre-filter, a 65 % efficiency secondary, and a HEPA final filter. All pre-filters are changed on a periodic schedule established in the FSS contractor's preventive maintenance procedure. Secondary and HEPA filters are changed at established pressure differential points.

b. If units are above ceilings in a building with SAI, perform this activity using the appropriate Class III asbestos procedures, JPR III-2 through JPR III-6 described above.

c. To accomplish JPR IV-1 tasks, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-12. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-12, Activities for JPR IV-1

Step #	Activity
1	A Competent Person shall verify that training, medical and PPE requirements are complete and current.
2	Coordinate job tasks with proper officials.
3	Secure HVAC and electrical systems. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook).
4	Open air-handling unit filter bank/holder(s).
5	HEPA-vacuum/wet-wipe filter unit covers.
6	Wet-mist/spray filters as they are removed from the filter holders.
7	Place filters from building air-conditioning systems or similar applications in plastic bags and seal; you can dispose of them as normal refuse, since they would not be expected to contain ACM.
8	HEPA-vacuum/wet-wipe filter installation area and duct.
9	Install new filter and close unit.
10	HEPA-vacuum work area outside air-handling unit.
11	Reestablish air-conditioning unit operation.

12.16.4.2 JPR VI-4 applies to emergency response actions in response to an asbestos fiber release.

a. This job consists of the cleanup and/or decontamination of an area that has been subjected to an incidental minor or major fiber release of either a known ACM or a material that is

reasonably expected to contain more than 1% asbestos. Immediate control measures can prevent further contamination of surrounding areas or adjoining facilities.

b. Responding Environmental Cleanup and SMOD personnel will determine control measures to be established. SMOD will determine the need to perform clearance air sampling.

c. The Environmental Cleanup contractor personnel responding to a fiber release will not proceed with the cleanup until they ensure that SMOD has been notified.

d. The Competent Person for the cleanup will determine whether the cleanup will be conducted under Class I, II, III, or IV asbestos work procedures.

e. If spills are small and the Environmental Cleanup contractor personnel establish the Regulated Area, then they will disestablish the area after final cleanup and inspection and will be responsible for removing barrier tape/warning signs. If SMOD establishes the Regulated Area or decides that clearance air sampling is required, SMOD will disestablish the area after final cleanup and inspection and will be responsible for removing barrier tape/ warning signs.

f. Communication with all parties in the affected area is very important. Therefore, the organization responsible for establishing the Regulated Area will ensure that the facility manager and work area supervisor have been informed about the response activity, the cleanup process and clearance air sampling to be performed (if required), and the approximate duration of the cleanup. This notification may be verbal but must occur before the start of the cleanup. The facility manager and work area supervisor should be asked to inform the occupants of the affected area. Additionally, occupants/employees in nearby areas should be informed about the cleanup activity and the expected duration.

g. The organization responsible for establishing the Regulated Area and removing the barrier tape and warning signs will provide courtesy notification to the EOC Security Dispatcher at non-emergency x34658 at the start and completion of the cleanup. Additional notification to JSC management will be made at the discretion of the responders.

h. The organization responsible for removing the barrier tape and warning signs will also be responsible for notifying the facility manager and work area supervisor that the area is clean and operations may return to normal. These notifications must be made in writing within 2 hours of the cleanup completion; e-mail notification is acceptable.

i. To accomplish JPR IV-4 emergency response cleanup, a number of sequential and concurrent steps are required. The most prominent of these are listed in Table 12.16-13. Find specific details for performing all required activities by referring to accepted industry practices and procedures based on requirements found in 29 CFR 1926.1101, 29 CFR 1910.1001, and 40 CFR 763, as amended.

Table 12.16-13, Activities for JPR IV-4

Step #	Activity
1	Ensure supervision by a properly qualified Competent Person.
2	Evacuate personnel and establish Regulated Area.

Table 12.16-13, Activities for JPR IV-4	
Step #	**Activity**
3	Notify Environmental Support Contractor and SMOD (SD3229) of the contamination. Provide courtesy notification to EOC Security Dispatcher at non-emergency x34658.
4	Responding Environmental Support Contractor and SMOD personnel will determine control measures to be established and will establish the requirements for SMOD clearance air sampling and will determine between them the Competent Person for the cleanup activity.
5	The Competent Person will determine whether the cleanup will be conducted as OSHA Class I, II, III, or IV asbestos-related work.
6	The assigned Competent Person shall verify that training, medical, and PPE requirements of the asbestos workers are complete and current.
7	Establish the Regulated Area. Place barricades and signs around the area.
8	Build small or large enclosure as needed/as appropriate, seal all entrances and exits with 6-mil polyethylene, construct airlock or "Z-flap" entrance, and install negative pressure on containment, if needed.
9	Shut down and isolate HVAC system. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook).
10	Secure electrical and fire alarm systems. Perform operation/energy control procedures as needed (see Chapter 8.2 of this handbook). If necessary, disable fire alarm system by coordinating with the Fire Protection Coordination Office.
11	Don protective equipment and clothing and respiratory protection.
12	Conduct personnel and area sampling as directed by the SMOD.
13	Apply the appropriate JPR to abate or repair ACM fiber release source, as needed.
14	HEPA-vacuum and wet-wipe contaminated area(s) and contaminated furnishings.
15	Bag contaminated items that cannot be decontaminated.
16	Perform gross and final cleaning as appropriate (see procedures in Chapter 12.12).
17	Visually inspect and re-clean as required (see procedures in Chapter 12.12).
18	Contact SMOD as required for clearance visual inspection. Re-clean as required.
19	Decontaminate personnel and equipment with HEPA vacuum, and package contaminated materials-i.e., suits, cartridges, rags, etc.-for disposal.
20	Prepare bagged ACM for disposal.
21	Remove bagged ACM from the area.
22	Contact SMOD to conduct clearance air sampling, as required.
23	Environmental Support Contractor or SMOD personnel will disestablish Regulated Area and remove barrier tape and warning signs, as agreed upon (see statements above).
24	The Competent Person, as agreed upon (see statements above), will provide written notification within 2 hours to the facility manager and the work area supervisor of task completion and return of area to normal operations. Provide courtesy notification to EOC security dispatcher that cleanup is complete.

12.16.5 Custodial Work

12.16.5.1 JPR-C1 applies to custodial work performed in rooms/areas with exposed or encapsulated spray-applied asbestos insulation or acoustical decoration.

a. Some administrative work areas, conference/meeting rooms, and building lobbies have exposed ACM materials.

b. While this ACM is not normally expected to delaminate or cause airborne asbestos fibers, take precautions to ensure that custodial staff cleaning these areas are protected and do not cause any debris to become airborne.

c. All of these areas are posted with notifications about the hazard.

d. The custodial staff must follow the following steps/procedures:
   (1) Verify that asbestos awareness training requirements are complete and current.
   (2) Do not poke at, dust, or disturb the exposed SAI or acoustical material.
   (3) Use a properly maintained HEPA vacuum, with attachments, to clean floors and furniture. Do not, REPEAT DO NOT, use a regular vacuum in these areas.
   (4) For Building 2S, use a dedicated vacuum cleaner, change the vacuum bag using specified procedures, and dispose of the bag as asbestos contaminated waste.
   (5) If you spot any asbestos debris, actual or suspected, in these areas, have the facility manager contact the Environmental Support Contractor or SMOD for an inspection and cleanup.

12.16.5.2 JPR-C2 applies custodial work involving asbestos-containing flooring (sheeting or floor tiles).

a. Some buildings at JSC have floor tile or sheeting that contains asbestos.

b. While this material is normally non-friable, take care to avoid disturbing the surface of the material in a manner that would generate asbestos fibers and cause exposures to custodial staff.

c. If you are custodial staff, follow the following steps/procedures:
   (1) Verify that asbestos awareness training requirements are complete.
   (2) Do not sand, abrade, or grind on floor material.
   (3) When stripping old wax off the floor, use a wetted stripping agent to prevent dry rubbing of the floor surface, and use a machine that rotates with a speed of less than 300 rpm. (Reference OSHA 29 CFR 1910.1001(j) and 1910.1001(k)).
   (4) Ensure there is a heavy coat of wax on the floor before polishing with a polishing machine. When polishing the flooring with a polishing machine, spray the floor with a water mist to prevent dry rubbing of the floor surface. It is desirable to use a machine that turns with a speed of less than 300 rpm.
   (5) If you spot any asbestos debris, actual or suspected, in these areas, have the facility manager contact the Environmental Support Contractor or the SMOD for an inspection and cleanup.

APPENDIX A. TERMS AND DEFINITIONS

TERM	DEFINITION
Abatement (for Part 12 only)	Procedures to control fiber release from any materials containing more than 1% asbestos, such as surfacing materials, thermal insulating materials, and building and miscellaneous materials (roofing, siding, flooring, ceiling tiles, etc). It includes encapsulation, permanent enclosure, or removal of ACM during renovations and demolitions of facilities containing ACM.
Administrative control	Any procedure that limits hazard exposure (such as noise) by control of work schedules
Affected employee	An employee who operates or directly uses equipment that is serviced or maintained under lockout/tagout
AIHA Accredited Laboratory	A certification given by the AIHA to an analytical laboratory that has been examined for quality control and proficiency and meets AIHA Laboratory Accreditation Program standards of performance and operation.
Air, makeup	Outdoor air supplied to replace exhaust air
Airborne	Pertaining to materials that have been dispersed and are suspended or slowly falling in the air.
Airlock	An opening through an installed barrier system, usually consisting of two polyethylene curtained doorways at least 3 ft apart, at an asbestos abatement activity that allows ingress and egress of workers and materials and restricts the movement of airborne material from the contaminated area to the clean area. (Ref Part 12)
Air-purifying respirator (APR)	A canister, cartridge, dust mask, or the like, used to remove contamination from an atmosphere that contains a normal oxygen level
Air Sampling/Air Monitoring	The process of measuring the fiber content/concentration of a specific volume of air in a stated time. (Ref Part 12)

Amended Water	Water to which a chemical wetting agent (surfactant) has been added to improve penetration into asbestos-containing material. (Ref Part 12)
Anchorage	A secure point of attachment for lifelines, lanyards, or deceleration devices
Asbestos Program Manager (APM)	The individual responsible for managing all aspects of the Asbestos Control Program. At JSC this individual is the Environmental Officer . (Ref Part 12)
Approved Respirator	Respiratory protection equipment tested and listed as satisfactory according to standards established by either NIOSH or the Mine Safety and Health Administration to provide respiratory protection.
Article	A material that meets the following criteria: • It is in a specific shape or design as a result of its manufacture. • It has an end-use function(s) dependent, in whole or in part, upon its shape or design during end use. • It doesn't release, or otherwise result in exposure to, a hazardous chemical under normal conditions of use.
Asbestos	The generic name for a variety of naturally occurring hydrated mineral silicates that possess a unique crystalline structure, are incombustible in air, and are separable into fibers. Six asbestos species were used commercially in large amounts: chrysotile, amosite, crocidolite, anthophyllite, tremolite, and actinolite. For purposes of Part 12, "asbestos" includes PACM, as defined below.
Asbestos abatement	See Abatement above
Asbestos Containing Material (ACM)	Any material that contains 1% or more, by weight, of any type or mixture of types of asbestos (Ref Part 12)
Asbestos-Containing Building Material (ACBM)	ACBM is surfacing ACM, TSI ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building. A term used by the EPA. (40 CFR 763) (Ref Part 12)

Asbestos Fibers	Fibers longer than 5 microns (length-to-width ratio of 3:1) generated from an ACM (Ref Part 12)
Asbestos Program Manager	The individual responsible for managing all aspects of the Asbestos Control Program. At JSC this individual is the Environmental Officer (JE) (Ref Part 12).
Asbestos Removal	The physical removal of ACM or PACM from an area.
Asbestos worker	A person engaged in the abatement of asbestos or performing a task who is routinely exposed to asbestos fiber concentration levels in excess of the of 0.1 f/cc 8-hour TWA PEL (Ref Part 12)
Attendant	An individual stationed outside one or more permit-required confined spaces who monitors the authorized entrants and who performs the attendant's duties
Audiogram	A chart, graph, or table resulting from an audiometric test; an audiogram shows an individual's hearing threshold level as a function of frequency.
Authorized employee	A person who locks out or tags out machines or equipment to service or maintain that machine or equipment. An affected employee becomes an authorized employee when that employee's duties include servicing or maintenance covered under this section.
Authorized entrant	An employee who is authorized by the employer to enter a permit-required confined space
Authorized Person (User)	Employee required to use fall protection in performance of their work and trained and certified to use fall protection PPE and systems
Barrier	Any surface, warning tape, or sign that separates the asbestos-regulated area to inhibit the movement of fibers or unauthorized personnel (Ref Part 12)
Battery	One or more cells in a single package to provide direct current (DC) power source

Blanking or blinding	The absolute closure of a pipe, line, or duct by fastening a solid plate (such as a spectacle blind or a skillet blind) that completely covers the bore and that can withstand the maximum pressure of the pipe, line, or duct with no leakage beyond the plate
Bloodborne pathogens	Pathogenic microorganisms that are present in human blood and can cause disease in humans; these pathogens include hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
Body Harness	Straps secured about the employee in a manner that shall distribute the fall arrest forces over the thighs, pelvis, waist, chest, and shoulders with means for attaching it to other components of personal fall arrest system
Bonding	Minimizing the potential difference between conductive objects to prevent static discharge
Browncoat	A layer of plaster-like material, usually brown, covering the plaster ceiling to which the ACM coating is applied (Ref Part 12)
"Capable of being locked out"	An energy-isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be attached, or it has a locking mechanism built into it. Other energy-isolating devices are capable of being locked out if lockout can be achieved without the need to dismantle, rebuild, or replace the energy-isolating device or permanently alter its energy control capability
Cell	Basic unit for conversion of chemical energy to electrical energy and also for the reverse for rechargeable cells
Certification	The process to determine that criteria established by a designated standard have been met and the documentation that records that the criteria were met. The process includes testing and is performed under the supervision of a qualified trainer or entity.

Certified Industrial Hygienist (CIH)	A person having a college or university degree in industrial hygiene, chemistry, engineering, physics, or medicine or related biological sciences who, by virtue of special studies or training, has acquired competence in the practice of industrial hygiene ***and*** who has successfully completed examinations administered by the American Board of Industrial Hygiene
Certifying officer	The person designated by the cognizant JSC line organization to administer the certification program
Certified Safety Professional (CSP)	A person having a bachelor's or associate's degree in safety, health, or the environment who, by virtue of special studies or training, has acquired competence in the practice of safety ***and*** who has successfully completed examinations administered by the Board of Certified Safety Professionals
Chemical	Any element, compound, or mixture of elements or compounds
Class I Asbestos Work	Activities involving the removal of TSI, surfacing ACM, and presumed ACM (PACM) (29 CFR 1926.1101) (Ref Part 12)
Class II Asbestos Work	Activities involving the removal of ACM that is not TSI or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, asbestos concrete or asbestos cement items, transite, roofing and siding shingles, and construction mastics (29 CFR 1926.1101) (Ref Part 12).
Class III Asbestos Work	Means repair and maintenance operations where ACM, including TSI and surfacing ACM and PACM, is likely to be disturbed (29 CFR 1926.1101) (Ref Part 12)
Class IV Asbestos Work	Maintenance and custodial activities during which employees contact but do not disturb ACM or PACM and activities involving the cleanup of dust, waste, and debris from Class I, II, and III activities (29 CFR 1926.1101) (Ref Part 12)

Classes of fires	• Class A - a fire involving ordinary combustible materials such as paper, wood, cloth, and some rubber and plastic materials • Class B - a fire involving flammable or combustible liquids, flammable gases, greases and similar materials, and some rubber and plastic materials • Class C - a fire involving energized electrical equipment • Class D - a fire involving combustible metals such as magnesium, titanium, zirconium, sodium, lithium, and potassium
Clean Area	See Clean Room. (Ref Part 12)
Clean Change Room	See Clean Room. (Ref Part 12)
Clean Room (for Part 12 only)	A clean room is an uncontaminated room/area having facilities for the storage of asbestos workers' street clothing and uncontaminated materials and equipment. The clean room must be equipped with a locker or appropriate storage container for each employee's use. Following showering, employees change into street clothing in the clean room area
Clearnce	Before release of an area upon completion of asbestos-related activities, visual inspections and/or clearance air sampling will be performed to ensure that no residual asbestos debris or airborne asbestos fibers remain (Ref Part 12).
Clearance Air Sampling/Air Monitoring	Air sampling, performed to verify that the airborne fiber concentration is less than 0.01 f/cc, done before releasing a regulated asbestos removal area (Ref Part 12)
Close call	An occurrence in which there is no injury, no property or equipment damage, and no significant interruption of productive work, but which possesses a high potential for any of the mishaps as defined in paragraph 106.3; for JSC, this will include mishaps resulting in only property damage less than $1,000 in value.

Combustible liquid	Any liquid having a closed cup flash point at or above 100°F (37.8°C), but below 200°F (93.3°C), except any mixture having components with flash points of 200°F (93.3°C) or higher, the total volume of which makes up 99% or more of the total volume of the mixture; combustible liquids are subdivided as follows: • Class II - those having flash points at or above 100°F (37.8°C) and below 140°F (60°C) • Class IIIA - those having flash points at or above 140°F (60°C) and below 200°F (93.4°C) • Class IIIB - those having flash points at or above 200°F (93.4°C)
Compensation	Compensation payable under the Federal Employees Compensation Act; includes lost wage replacements, scheduled awards, medical expenses, money paid on account of death, and payments for approved vocational rehabilitation to employees who are disabled as a result of their employment
Competent Person (OSHA definition)	A *competent person* is one who is capable of identifying existing and predictable hazards in the work area or unsanitary, hazardous, or dangerous working conditions, and who has authority to take prompt corrective measures
Competent person (for Chapter 7.2 only)	A person who has demonstrated the knowledge and skills necessary to administer certain aspects of JSC's respiratory protection program, such as emergency rescue from confined spaces, hazard assessments, air monitoring, fit-testing, and training
Competent person (for Chapter 8.8 only)	Employee trained and certified in fall protection and who is capable of identifying hazards, has the authority to take corrective actions, is knowledgeable of applicable regulations, standards, equipment, and systems, and understands the mandatory requirements for fall protection equipment and systems
Competent Person (for Part 12 only)	A person who meets the requirements in Chapter 12.7 of this handbook and is designated as such by the employer to oversee asbestos work

Confined space	A space of any size or shape that meets all the following conditions: • It is large enough and so configured that an employee can enter and perform assigned work. • It has limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may limit means of entry). • It isn't designed for continuous employee occupancy.
Contaner	Any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like, that may contain a hazardous chemical; in Chapter 9.2, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle that aren't considered to be containers
Contaminated	Having the presence, or the reasonably anticipated presence, of blood or other potentially infectious materials on an item or surface
Continuation of pay (COP)	Payment of employee's regular wages by the employing agency for time lost due to job-related, disabling traumatic injuries, with no charge to the employee's sick or annual leave; this period must never exceed 45 calendar days and doesn't need to be consecutive days; in cases where there is no immediate time loss, the first time loss following, due to the injury, is the first day of COP; this time loss must be taken within 90 days from the date of injury to begin using any balance of the 45 COP days.
Contracting Officer	A designated person who performs administrative functions listed in the NASA Procurement Regulations
Contractor	A non-federal employer working under a NASA contract, whether as prime contractor or subcontractor

Controlled Area (for Chapter 6.10 only)	A controlled area is one that a. An employee can completely enter and work in the area, but is not, by definition, a confined space b. Periodically contains, or can, after a single point failure, contain a hazardous atmosphere where employees are present that may expose them to the risk of death, or acute illness, injury, incapacitation, and impairment of ability to self rescue c. Contains any other condition that is immediately dangerous to life or health.
Cooling tower	A system used to dissipate heat from a building; it removes heat from water-cooled condensers of air-conditioning systems; the water in a closed loop is usually cooled by contact with outside air or by spray ponds.
Costs (for Chapter 2.7 only)	Direct costs of repair, retest, program delays, replacement, or recovery of NASA materials, including hours, material, and contract costs, but excluding indirect costs of cleanup, investigation (either by NASA, contractor, or consultant), and injury, and by normal operational shutdown; materials or equipment replaced by another organization at no cost to NASA will be calculated at “book” value, including those mishaps covered by insurance.
Credible failure	A failure that can occur and is reasonably expected to occur; in this handbook, failures of structure, pressure vessels, and pressurized lines and fittings aren’t considered credible failure modes if those elements follow applicable safety factor requirements.
Critical system	Any facility support system or test system the loss of which could result in injury to test personnel, property damage, or failure to detect or shut off a hazardous condition
Cumulative trauma disorder (CTD)	A health disorder from repeated biomechanical stress due to ergonomic hazards; CTDs are a class of musculoskeletal disorder involving damage to the tendons, tendon sheaths, and the related bones, muscles, and nerves of the hands, wrists, elbows, shoulders, neck and back or synovial lubrication of the tendon sheaths.

Custom Containment Bag	See Glovebag. (Ref Part 12)
Decibel (dB)	A unit of measurement of sound pressure level; the decibel level of a sound is the logarithm of the ratio of sound pressure to a reference pressure; dB has meaning only when the reference is known; the internationally accepted reference pressure used in acoustics is 20 micropascals.
Decibels, A-weighted (dBA)	A sound level reading in decibels made on the A-weighted network of a sound pressure level meter (SLM) at slow response
Decontamination	The process of removing contaminants that have accumulated on personnel and equipment to prevent exposure of the people or contamination of otherwise uncontaminated people, areas, or equipment (Ref Part 12)
Decontamination Area	A decontamination area is an enclosed area adjacent and connected to the regulated area consisting of an equipment room, a shower area, and a clean room, used to decontaminate workers, materials, and equipment that are contaminated with asbestos. The enclosure for this area is typically constructed of plastic, with curtained doorways between adjacent rooms; however, it may be a portable, prefabricated unit (Ref Part 12).
Demolition	The wrecking or removing of any component, system, finish, or assembly of a facility together with any related handling operations.
Disability	Loss of ability to perform work; such loss may be partial or total and temporary or permanent.
Disinfect	To remove contaminants and inhibit the action of agents that cause infection or disease
Disturb/Disturbance	An activity that disrupts the matrix of ACM or PACM, crumbles or pulverizes ACM or PACM, or generates visible debris from ACM or PACM. A disturbance includes cutting away small amounts of ACM and PACM no greater than the amount that can be contained in one standard-sized glovebag or waste bag to access a building component (29 CFR 1926.1101) (Ref Part 12).

Dive team	Underwater swimmers and support employees involved in an underwater operation, including the designated person in charge
Diver	An employee swimming in water using underwater apparatus that supplies compressed breathing gas at the ambient pressure
Double block and bleed	To close a line, duct, or pipe by: • Closing and locking or tagging two in-line valves • Opening and locking or tagging a drain or vent valve in the line between the two closed valves
Drop line	A vertical line from a fixed anchorage, independent of the work surface, to which a lanyard is affixed
Emergency (for Chapter 6.10 only)	Any occurrence, including any failure of hazard control or monitoring equipment, internal or external to the permit-required confined space, that could endanger entrants
Emergency Preparedness Plan	A written document intended to: mitigate the effects of a hazard; prepare (including preplanning) measures to be taken that will preserve life and minimize damage; describe responses to emergencies requiring the use of JSC resources and provide necessary assistance; and establish a recovery system that returns the Center to normal operations after an incident
Emergency rescue services	The personnel designated to rescue employees from permit-required confined spaces
Employee	A JSC civil servant or an individual working for a contractor
Employee representative	Any official of any labor bargaining unit (such as a union) that represents civil service or contractor employees
Employer	Under the JSC safety and health program, an “employer,” as used by OSHA, is the company for contractor employees and the supervisor for civil service employees

Encapsulant (for Part 12 only)	A liquid material that can be applied to ACM that controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (a bridging encapsulant) or by penetrating the material and binding its components together (a penetrating encapsulant). By TCEQ guidance an encapsulant must be advertised and marketed for asbestos work. Using regular paint over ACM does not encompass formal encapsulation under TCEQ rules.
Encapsulation (for Part 12 only)	The treatment of ACM with a material that surrounds or embeds asbestos fibers in an adhesive matrix to prevent the release of fibers; a bridging encapsulant or a penetrating encapsulant. By TCEQ guidance an encapsulant must be advertised and marketed for asbestos work. Using regular paint over ACM does not encompass formal encapsulation under TCEQ rules.
Enclosed environment	A test environment in a closed structure that has no venting, flow-through, or introduction of outside gases
Enclosure (1)	As used in Part 12 and by OSHA, means the construction of an airtight, impermeable, temporary barrier around a regulated area to control the release of asbestos fibers into the air where they could migrate into an adjacent area (Ref Part 12)
Enclosure (2)	As used by the EPA for asbestos response actions, means the construction of an airtight, impermeable, permanent barrier around ACM and ACBM to control the release of asbestos fibers into the air (Ref Part 12)

Energized	Connected to an energy source or containing residual or stored energy; any energy level above the magnitude listed below is automatically energized; any lesser magnitude or form of energy not listed must be evaluated on a case-by-case basis to determine whether this procedure is necessary to ensure safety: • Electrical - 50 volts • Thermal - 130°F • Radiation - any regulated source of ionizing or nonionizing radiation • Chemical - explosive, flammable, corrosive, or toxic solids, liquids, or gases • Mechanical - flywheels, springs, suspended weights must be evaluated • Hydraulic or Pneumatic - 150 psi
Energy control	An energy-isolating device placed on a system to isolate that system from operation. This form of energy control is used on various occasions to include long-term shutdown of the system for maintenance, construction, mothball, or demolition of the system. [Note: Energy control will not be accepted as the lockout protection for any employee. Each employee must use his or her own lock and tag to provide personal protection.]
Energy isolating device	A mechanical device that physically prevents the transmission or release of hazardous energy, including, but not limited to: • A manually operated electrical circuit breaker • A disconnect switch • A manually operated switch where the circuit conductors can be disconnected from all ungrounded supply conductors and no pole can be operated independently • A slide gate • A slip blind • A line valve • A block • Any similar device used to block or isolate energy Devices not included: • Pushbuttons • Selector switches • Other control circuit-type devices

Energy source	Any source of electrical, hydraulic, pneumatic, chemical (toxic, flammable, or corrosive material), thermal, or other energy
Engineering controls (for Chapter 7.2 only)	Any method of controlling employee exposures to toxic materials by eliminating or modifying the source or reducing the quantity of contaminants released into the work environment
Engineering controls (for Chapter 7.4 only)	Any method for isolating or removing a hazard from the workplace
Engineering controls (for Chapter 5.5 only)	Engineered CTD risk control measures that include, but aren't limited to, devices such as workstations, tables, chairs, equipment, tools, and physical modifications to workstations, equipment, tools, production processes, or any other aspect of the work environment
Engulfment	The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing
Entry	The action by which a person passes through an opening into a permit-required confined space; entry includes work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
Entry permit	The written document JSC Form 1476, which is a checklist that provides a systematic review of operational exposures in confined spaces
Entry procedure	The written document that details the required procedures and equipment required for safe entry into a specific confined space

Entry supervisor	The person who is responsible for determining whether acceptable entry conditions are present at a permit-required confined space where entry is planned, for authorizing entry, and overseeing entry operations, and for terminating entry as required by this program. (Note: An entry supervisor may also serve as an attendant or authorized entrant, as long as that person is trained and equipped as required by this program for each role that he or she fills. Also, the duties of an entry supervisor may be passed from one individual to another during the course of an entry operation.)
Environmental Office (Mail Code: JE)	The office at JSC that is responsible for ensuring compliance with federal, state, and local environmental regulations
Equipment	A tangible asset that is functionally complete for its intended purpose, durable, and nonexpendable. Equipment is not intended for sale and does not ordinarily lose its identity or become a component part of another article when put into use. Equipment includes all items of NASA personal property that are configured as mechanical, electrical, or electronic machines, tools, devices, and apparatuses that have a useful life of two years or more and are not consumed or expended in an experiment (Per NPR 4200.1).
Equipment Room	A contaminated room located within the asbestos decontamination area that is supplied with impermeable bags or containers for the disposal of asbestos-contaminated protective clothing and equipment (Ref Part 12)
Ergonomic hazard	Any workplace condition that poses a biomechanical stress to the worker; such hazardous workplace conditions include faulty workstation layout, improper work methods, improper tools, excessive tool vibration, and job design problems that include aspects of workflow, line speed, posture and force required, work/rest regimens, and repetition rate

Ergonomics	A multidisciplinary activity dealing with the interactions between a person and his or her total working environment, plus such traditional environmental elements as atmosphere, heat, light, and sound as well as all tools and equipment of the workplace
Explosive	A chemical compound, mixture, or device that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature; the term includes, but isn't limited to, dynamite, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord, and igniters, any material determined to be within the scope of Title 18, United States Code, Chapter 40, "Importation, Manufacture, Distribution, and Storage of Explosive Materials," and also includes any material classified as an explosive by the Hazardous Materials Regulations of the U.S. Department of Transportation (NFPA 495, "Explosive Materials Code").
Exposure or Exposed	Means that an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes potential (e.g., accidental or possible) exposure
Facility organization (for Chapter 6.9 only)	An organization that is responsible for operating and maintaining a test facility and that conducts tests for test-requesting organizations
Fall Arrest System	A system designed to stop one or more persons from striking a lower level or obstructions if a fall occurs. Fall Arrest Systems require the use of a Full Body Harness, a Connecting Means, a suitable Anchorage, planned rescue procedures, and proper training of all users.
Fall Protection	Any equipment, device, or system that prevents an accidental fall from elevation or mitigates the effect of such a fall

Fall Restraint System	A fall protection system that prevents a person from reaching an unprotected edge. The system is comprised of a body harness along with an anchorage, connectors, and other necessary equipment. The other components typically include a lanyard and may include a lifeline and other devices
Fiber Count	A total number of fibers, of specified diameter and length, obtained by microscopic examination of a filter through which air has been drawn (Ref Part 12)
Fire area	An area of a building separated from the rest of the building by construction with a fire resistance of at least 1 hour and having all communicating openings properly protected by an assembly having a fire resistance rating of at least 1 hour
Fire extinguisher	A portable device containing powder, liquid, or gases that are expelled under pressure to suppress a fire
First aid	Any one-time treatment, and any follow-up visit for the purpose of observation, for minor scratches, cuts, burns, splinters, etc., that don't ordinarily require medical care; such one-time treatment, and follow-up visit for the purpose of observation, is considered first aid even when it is provided by a physician or registered professional personnel.
Fit factor	A quantitative measure of the fit or sealing performance of a particular respirator to a particular individual; usually expressed as the ratio of challenge concentration outside the respirator to the concentration inside the respirator

Fit test	A test that usually exposes a person wearing a respiratory protection device to a gaseous or aerosol test mixture in a test environment to determine the fit or integrity of the facepiece-to-face seal of the respirator. The test may be qualitative, where the person tested determines by smell or taste whether the mask is leaking. The test may be quantitative, where the concentration of the test mixture inside and outside the mask is determined by instrumentation or where the pressure differential between the inside and the outside is measured. . The outcome determines whether the required fit factor was achieved under a given set of physical conditions
Fixed anchorage	A secure point of attachment, not part of the work surface, for attaching drop lines, lifelines, or lanyards

Flammable	A chemical that falls into one of the following categories: • Aerosol, flammable - an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening • Gas, flammable - (1) a gas that ignites at ambient temperature and pressure when in a mixture of 13% by volume or less of air; or (2) a gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12% by volume, regardless of the lower limit • Liquid, flammable - any liquid with a flash point below 100°F (37.8°C), except any mixture of components with flash points of 100°F (37.8°C) or higher, the total of which make up 99% or more of the total volume of the mixture (see classes below) • Solid, flammable - a solid, other than a blasting agent or explosive, as defined in 29 CFR 1910.109(a), that could cause a fire through friction, absorbing moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or that can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard; a chemical must be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

Flammable liquid	A liquid having a closed cup flash point below 100°F (37.8°C) and having a vapor pressure not exceeding 40 psia (2068 mmHg) at 100°F (37.8°C) must be known as a Class I liquid with subdivisions as follows: • Class IA - those having flash points below 73°F (22.8°C) and having a boiling point below 100°F (37.8°C) • Class IB - those having flash points below 73°F (22.8°C) and having a boiling point at or above 100°F (37.8°C) • Class IC - those having flash points at or above 73°F (22.8°C) and below 100°F (37.8°C)
Flash point	The temperature at which a liquid gives off vapor sufficient to form an ignitable mixture with the air near the surface of the liquid or within the vessel used (as determined by appropriate test procedure and apparatus specified in NFPA 30) but insufficient to sustain a flame. It is also the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows: • Tagliabue Closed Tester (see "American National Standard Method of Test for Flash Point by Tag Closed Tester," Z11.24-1979 [ASTM D 56-79]) for liquids with a viscosity of less than 45 Saybolt University Seconds (SUS) at 100°F (37.8°C), that don't contain suspended solids and don't have a tendency to form a surface film under test • Pensky-Martens Closed Tester (see "American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester," Z11.7-1979 [ASTM D 93-79]) for liquids with a viscosity equal to or greater than 45 SUS at 100°F (37.8°C), or that contain suspended solids, or that have a tendency to form a surface film under test • Setaflash Closed Tester (see "American National Standard Method of Test for Flash Point by Setaflash Closed Tester" [ASTM D 3278-78]); organic peroxides, which undergo auto-accelerating thermal decomposition, are excluded from any of the flash point determination methods specified above.
Flight hardware	Hardware intended to be used in space flight

Food	Any raw, cooked, or processed edible substance, ice, beverage, or ingredient used or intended for use or for sale in whole or in part for human consumption
Food contact surface	Those surfaces of equipment and utensils with which food normally comes in contact, and those surfaces from which food may drain, drip, or splash back onto surfaces normally in contact with food
Food service employee	An individual having supervisory or management duties and any other person working in a food service establishment
Food service establishment	Any place where food is prepared and intended for individual portion service, and includes the site at which individual portions are provided
Free Fall	The act of falling before a personal fall arrest system begins to apply force to arrest the fall
Free Fall Distance	The vertical displacement of the fall arrest attachment point on the employee's body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.
Friable	A material that crumbles, pulverizes, or reduces to powder from hand pressure.
Globally Harmonized System (GHS)	United Nations (UN) Globally Harmonized System of Classification and Labeling of Chemicals
Glovebag	A sack, typically constructed of 6-mil transparent polyethylene or polyvinyl chloride plastic, with two inward-projecting long sleeve gloves, that is designed to enclose an object from which an ACM is to be removed.
Government vehicle	A commercially leased or U.S. government agency-owned motor vehicle that is being used in support of federal operations

Grade D Air	Breathing air that contains 19.5% to 23.5% oxygen (the balance is predominantly nitrogen), no more than 5 milligrams per cubic meter (mg/M3) of condensed oil, no more than 10 ppm of carbon monoxide, no pronounced odor, and a maximum of 1000 ppm carbon dioxide. The Compressed Gas Association, Specification G-7.1, is the consensus standard for Grade D breathing air criteria.
Grounding	Minimizes potential difference between object and ground to prevent static discharge
Ground-level ambient atmosphere	The normal pressure and gas composition of the air surrounding the test facility or any other building
Group lockout/tagout (LO/TO)	When one individual, the group task representative, has placed red LO/TO tags and red LO/TO locks at all necessary points of energy isolation. All energy-isolation lock keys are placed in a group lockbox. The group task representative then places a red LO/TO tag and red LO/TO lock on the lockbox and maintains control of the lockbox for the duration of the maintenance or service task. All authorized personnel will install their individual red LO/TO locks and tags on the lockbox to maintain their control during work. The task group representative is responsible for control of the lock box and key. The control responsibility of the task group representative can be transferred between shift changes and job reassignments
Guardrail System	A barrier to prevent employees from falling to lower levels
Hazard assessment	An evaluation by the Occupational Health and Human Test Support Office of the potential health hazards posed by a specific task or operation
Hazardous activity	One that involves credible risks or dangers to personnel or facilities and equipment of JSC; includes, but isn't limited to, activities associated with human-tended hypobaric chambers, zero-g testing, and the Energy Systems Test Area

Hazardous atmosphere (for Chapter 6.10 only)	An atmosphere that may expose employees to the risk of death, incapacitation, impairment of ability to escape unaided from a permit-required confined space, injury, or acute illness from one or more of the following causes: • Flammable gas, vapor, or mist in excess of 10% of its lower explosive limit (LEL) • Airborne combustible dust at a concentration that meets or exceeds its LEL • Atmospheric oxygen concentration below 19.5% or above 23.5% • Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published in 29 CFR 1910 Subpart G, "Occupational Health and Environmental Control," or in 29 CFR 1910 Subpart Z, "Toxic and Hazardous Substances," and that could result in employee exposure in excess of its dose or permissible exposure Note: An atmospheric concentration of any substance that isn't capable of causing death, incapacitation, impairment of ability to escape unaided, injury, or acute illness due to its health effects isn't covered by this provision. • Any other atmospheric condition that is immediately dangerous to life or health Note: For air contaminants for which OSHA hasn't determined a dose or permissible exposure limit, other sources of information, such as Material Safety Data Sheets (MSDS)/Safety Data Sheets (SDS), can provide guidance in establishing acceptable atmospheric conditions
Hazardous chemical	Any chemical that is a physical danger or a health danger
Hazardous material	Any element, chemical compound, or mixture of elements or compounds that poses a physical or health threat to personnel, the environment, or the general public through planned or unplanned events; included in this definition are articles that fail any of the three tests under the definition of "Article" above.

Hazardous material (for Chapter 9.1 only)	A substance that poses a danger to human health, safety, or the environment, or that meets the definition of a "hazardous chemical" under the hazard communication program (see OSHA 29 CFR 1910.1200 and Chapter 9.2 of this handbook)
Hazardous noise	A danger from noise exists whenever an operation, process, or procedure generates noise of sufficient duration and intensity to be capable of producing a permanent loss of hearing in an unprotected person.
Hazardous operation	An operation that involves materials, conditions, or equipment that could result in personnel or property damage if special precautions aren't followed
Hazardous test	A test where any test subject, test team member, observer, or member of the public is exposed to or has the potential to be exposed to a hazardous condition
Health hazard	A material "for which there is statistically significant evidence based on at least one study conducted per established scientific principles that acute or chronic health effects may occur in exposed employees; includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes" (29 CFR 1910.1200, Nov. 1983)
HEPA Filter	A filter that is capable of trapping and retaining 99.97% of particulates greater than 0.3 micron in size (Ref Part 12)
HEPA Filtered Vacuum	A vacuum cleaner with an HEPA filter that is capable of trapping and retaining 99.97% of all particulates larger than 0.3 microns (Ref Part 12)
Holding Area	Airlock between the shower room and the clean room in an asbestos worker decontamination system (Ref Part 12)
Hot-tap	A procedure that involves welding a piece of equipment while under pressure to install connections or appurtenances

Hot work permit	JSC Form 1475, "Hot Work, Welding, Cutting Permit" (Appendix 3B), which provides written authorization to perform operations (such as welding, riveting, cutting, burning, and heating) that could provide an ignition source
Human test facility	A facility testing hardware or procedures involving a human test subject
Hygiene Facility	The incorporation into an asbestos-removal enclosure of clean rooms, equipment rooms, shower rooms, and decontamination rooms (Ref Part 12)
Hyperbaric environment	Any atmosphere at an absolute pressure greater than ground-level ambient pressure by more than 0.1 psia
Hypobaric environment	See "Vacuum environment"
Immediately dangerous to life or health (IDLH)	Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit-required confined space. Note: Some materials—e.g., hydrogen fluoride gas and cadmium vapor—may produce immediate transient effects that, even if severe, may pass without medical attention, but are followed by sudden, possible fatal collapse 12 to 72 hours after exposure. Such materials in hazardous quantities are considered to be "immediately" dangerous to life or health.
Imminent danger	Conditions or practices in any NASA/JSC or contractor workplace where a risk exists that could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such risk can be eliminated through normal procedures; these will be identified by Risk Assessment Code (RAC) 1 (see Chapter 3.2).
Impulse or impact noise	Variations in noise levels that involve peaks of intensity that occur at intervals of greater than 1 second; if the noise peaks occur at intervals of 1 second or less, the noise is considered continuous.

Infeasible	It is impossible to perform the work using a conventional fall protection system, (i.e., guardrail system or fall arrest/restraint system) or it is technologically impossible to use any one of these systems to provide fall protection.
Infectious waste	Blood and blood products, contaminated sharps, pathological refuse, and microbiological refuse
Inspection	A comprehensive survey of all or part of a workplace by qualified employees to detect safety or health hazards; inspections are normally performed during the regular work hours of the agency, except as special circumstances may require.
Institutional program	A distinct institutional activity or task conducted on JSC or contractor property and that requires the use of government or contractor ground-based resources; examples include facility design, construction, modification, demolition, repair, facility operations, test operations, manufacturing (fabrication) operations, service operations, and maintenance operations; space flight program operations conducted on orbit are excluded from this definition.
Isolation	The process by which a permit-required confined space is removed from service and completely protected against the release of energy and material into the space by such means as blanking or blinding; misaligning, or removing sections of line, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages
Johnson Space Center (JSC)	As used in this handbook, the term Johnson Space Center is inclusive of the facilities, employees and activities at JSC, Sonny Carter Training Facility (SCTF), and Ellington Field (EF); and JSC field sites unless otherwise noted.
JSC “safe occupancy” level (for Part 12 only)	An asbestos air concentration of 0.01 f/cc. This is the acceptable concentration of asbestos fibers in the public areas of a building, where ACMs are present, occupied by employees who are not asbestos workers. This is based on the EPA “clearance” level to return areas of a building back to unrestricted use after an asbestos abatement.

JSC Team Member	A JSC civil service or contractor employee.
Label	Any written, printed, or graphic material that is displayed on or affixed to containers of hazardous chemicals
Label (for Chapter 9.3)	The written, printed, or graphic matter on or attached to a pesticide or device or any of its containers or wrappers
Labeling	A paper or written, printed, or graphic matter prepared by a registrant: • Accompanying the pesticides or device at any time; or • To which reference is made on a printed paper or tag or in literature accompanying or referring to a pesticide or device, except accurate, non-misleading references made to a current official publication of a federal or state institution or agency authorized by law to conduct research in the field of pesticides
Laboratory	A facility concerned with the analysis of or experimentation with materials, substances, and equipment; also included are certain equipment, repair, and calibration operations and the processing of materials.
Laboratory (for Chapter 6.6 only)	A facility in which individually operated, small-scale chemical operations are conducted or performed
Lagging	Strips of insulating materials with which boilers, cylinders, or pipes are covered. Sometimes it also refers to insulating mud and final overlays (cloth or metal) (Ref Part 12).
Lanyard	A flexible line of rope, wire rope, or strap which has a connector at each end for connecting a body harness to a deceleration device, lifeline, or anchorage
Large Enclosure (for Part 12 only)	An enclosure providing an airtight, impermeable barrier around a job involving the removal of more than 260 lf, 160 ft^2, or 35 ft^3 of ACM. Large enclosures will most likely incorporate airlocks, negative air-filtering systems, hygiene facilities, contaminated equipment rooms, and waste load out rooms.

Lead	A heavy, soft, malleable, bluish-gray metal that may be in its metallic state, in inorganic compounds, and in organic soaps; excluded are all other organic compounds (e.g., the standard isn't designed to protect you from exposure to leaded gasoline).
Lifeline	A component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage
Line Manager	A general term for a manager (civil service or contractor) within a line organization or contract at any level.
Line Organization	A functional organization outside of S&MA.
Lockout	Placing a lockout device on an energy isolating device under established procedures and ensuring that the energy-isolating device and the equipment being controlled cannot be operated until the lockout device is removed.
Lockout device	A device that uses a positive means such as a lock, either key or combination type, to hold an energy-isolating device in the safe position and prevent the energizing of a machine or equipment; included are blank flanges and bolted slip blinds.
Lockout/Tagout (LO/TO)	The process of ensuring that an item of equipment is secured, isolated, or shut down and to prevent its being energized. If such equipment were energized, it would present a safety hazard to workers. Building systems most often affected by LO/TO procedures at JSC are water distribution, electrical, HVAC, and fire alarm systems.
Lockout/tagout lock (red LO/TO lock)	Red-colored lock that is individually keyed and numbered. Used by an authorized employee to provide for securing energy isolation devices and isolating energy from their active work area; also used by the task group representative for group LO/TO

Lockout/tagout tag	Red-colored form JF1291, specifically used for energy isolation. Wording: “DANGER, LOCKOUT TAGOUT”
Lost time case	A nonfatal traumatic injury that causes any loss of time from work beyond the day or shift on which it occurred; or a nonfatal nontraumatic illness or disease that causes disability at any time; for civil service employees, the time lost may be less than a full, 8-hour workday; for all other employees, only a full workday lost is counted.
Lost workday cases	Injuries and illnesses that involve days away from work or days of restricted work activity; this classification applies to contractor or private sector employees, not to civil service employees.
Lost workday cases	Away from work - the number of workdays (consecutive or not) during which the employee would have worked but couldn’t because of an occupational injury or illness
Lost workday cases	Restricted work activity - the number of workdays (consecutive or not) during which, because of injury or illness: • The employee was assigned to another job on a temporary basis. • The employee worked at a permanently assigned job less than full time. • The employee worked at a permanently assigned job but couldn’t perform all duties normally connected with the job.
Low Slope Roof	A roof having a slope less than or equal to 4 in 12 (vertical to horizontal)
Lower explosive limit (LEL)	The minimum concentration of a combustible or flammable gas or vapor that will ignite if an ignition source is present; the terms “lower explosive limit” and “lower flammable limit” have the same meaning.
Major Fiber Release	The falling or dislodging of more than 3 ft^2 or 3 lf of friable ACM/ACBM (40 CFR 763.91(f)) (Ref Part 12)

Material Safety Data Sheet (MSDS)	Written or printed material about a hazardous chemical that describes the characteristics, properties, associated hazards, and other relevant material. This term has been replaced by “Safety Data Sheet” (SDS) under GHS.
Medical care	For civil service employees, if an injury is accepted as compensable under FECA, the injured employee is entitled to all medical care that is required to cure, give relief, or reduce the degree or period of disability; it will be provided as long as the evidence indicates that it is needed for the effects of the job-related injury.
Medical examination	An evaluation of a person’s health status conducted by a medical doctor
Medical history	A person’s past health record, including all of the hazardous materials to which he or she has been exposed and any injuries or illnesses that might dictate future health status or work abilities
Medical treatment	Treatment administered by a physician, or by licensed or registered professional personnel under the standing orders of a physician, for an occupational injury or illness that doesn’t result in days away from work or days of restricted work activity; doesn’t include first-aid treatment, even though provided by a physician or licensed or registered professional personnel; this definition applies to all employees, both civil servant and private sector.
Method 7400	This is an NIOSH sampling and analytical method for evaluating airborne fiber concentrations using phase-contrast microscopy (Ref Part 12).
Method 7402	This is an NIOSH sampling and analytical method for evaluating airborne fiber concentrations using transmission electron microscopy. Asbestos fibers are counted using the same fiber definitions as Method 7400 (Ref Part 12).
Micron	A measurement of length equal to one millionth of a meter
Minor Fiber Release	The falling or dislodging of 3 ft^2 or 3 lf or less of friable ACM/ACBM (40 CFR 763.91(f)) (Ref Part 12)

Mishap	Any unplanned occurrence, event, or anomaly that meets one of the definitions below; injury to a member of the public while on JSC facilities is also defined as a NASA mishap: • Type A mishap - Occupational injury and/or illness that resulted in: a fatality, ***or*** a permanent total disability, ***or*** the hospitalization for inpatient care of 3 or more people within 30 workdays of the mishap. Total direct cost of mission failure and property damage is $2,000,000 or more, ***or*** crewed aircraft hull loss has occurred, ***or*** occurrence of an unexpected crewed aircraft departure from controlled flight (except high performance jet/test aircraft, such as F-15, F-16, F/A-18, T-38, OV-10, and T-34, when engaged in flight test activities). • Type B mishap - Occupational injury and/or illness has resulted in permanent partial disability. ***or*** the hospitalization for inpatient care of 1-2 people within 30 workdays of the mishap. Total direct cost of mission failure and property damage of at least $500,000 but less than $2,000,000. • Type C mishap - Nonfatal occupational injury or illness that caused any workdays away from work, restricted duty, or transfer to another job, beyond the workday or shift on which it occurred. Total direct cost of mission failure and property damage of at least $50,000 but less than $500,000. • Type D mishap - Any nonfatal OSHA recordable occupational injury and/or illness that does not meet the definition of a Type C mishap. Total direct cost of mission failure and property damage of at least $1,000 but less than $50,000. • Close Call (NASA Headquarters)- An event in which there is no injury or only minor injury requiring first aid, but which possesses a potential to cause a mishap. An event in which there is no equipment/property damage or minor equipment/property damage (less than $1000), but which possesses a potential to cause a mishap.

Mist	Finely divided liquid suspended in air, usually generated by condensation or by dispersion of a liquid (e.g., by splashing, foaming, or atomizing)
Mixture	Any combination of two or more chemicals if the combination isn't, in whole or in part, the result of a chemical reaction
Modification	A basic or functional change made to an equipment item to give it a new orientation or allow it to serve a new purpose
Motor vehicle	A motor-propelled conveyance of a commercial design that provides transportation (personnel and cargo) and is capable of being licensed by the state or local authority having jurisdiction (e.g., automobiles, pickup trucks, buses, stake-bed trucks, and vans)
NASA employee	Any person other than detailed members of the Armed Forces and contractor employees required to work by NASA
Negative Pressure Enclosure (NPE) (for Part 12 only)	A NPE is one where one or more machines provide at least 4 air changes per hour and maintain a pressure differential of at least -0.02 column inches of water inside the NPE relative to outside pressure (Ref OSHA 29 CFR 1926.1101(g)(5)(i)(A)).
Negative Air Filtration Unit	A piece of equipment consisting of an air mover, usually electrically powered, and an HEPA filter. The unit maintains a negative pressure inside the regulated work area, a constant airflow from adjacent areas into the regulated work area, and exhausts that air to the outside (Ref Part 12).
Negative Pressure Respirator	A respirator in which the air pressure inside the respirator-inlet covering is positive during exhalation (in relation to the air pressure of the outside atmosphere) and negative during inhalation (in relation to the air pressure of the outside air)

Negative Pressure System	A local exhaust system that is capable of maintaining a constant, low-velocity air flow into the decontamination enclosure systems and work area from adjacent unsealed areas (Ref Part 12)
Neutral Buoyancy Facility	Test facility designed for simulating weightless conditions underwater involving personnel either in a pressure suit or wearing scuba gear
Noise hazard area	Any work area with a noise level of 85 dBA or greater
Nominal	The root mean square (RMS) of the voltage; the RMS is a value assigned to represent the effective voltage and current levels of a power system.
Non-Engineered Anchorage	An anchor point for which no engineering calculations have been performed
Non-open water operations	Underwater operations conducted in controlled environments under carefully prescribed laboratory or test conditions (such as swimming pools) that don't exceed depths beyond the no-decompression limit and that meet the exemption criteria of OSHA 29 CFR 1910.401(a)(2), Subpart T
Non-permit-required confined space	A confined space that doesn't contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm
Non-roof Work	Preventive maintenance (PM), repair of equipment on roofs, such as heating, ventilation, and air conditioning (HVAC), lightning protection systems, rigging of fall protection systems, etc.

Occupancy	Any of the following: • Assembly - includes, but isn't limited to, all buildings or portions of buildings used for gathering together 50 or more persons for such purposes as deliberation, entertainment, amusement, or awaiting transportation • Business - facilities used for the transaction of business, for the keeping of accounts and records, and for similar purposes • Industrial - facilities devoted to operations, such as processing, assembling, mixing, packaging, finishing or decorating, and repairing, including, among others, laboratories, power plants, pumping stations, and hangars (for servicing or maintenance) • Storage - all buildings or structures used primarily for the stocking or sheltering of goods, merchandise, products, or vehicles; included, among others, are warehouses, freight terminals, and hangars (for storage only).
Occupational illness	An abnormal condition produced by systemic infection, continued or repeated stress or strain, exposure to toxins, radiation, high noise levels, etc., or other continued and repeated exposure to conditions of the work environment over a period of time longer than 1 day or work shift
Open water operations	Operations conducted under any of the following conditions: • In uncontrolled environments, such as the open sea, in waterways, in lakes, and in rivers, which are strongly influenced by changes in the local environment • At depths beyond the no-decompression limit • Not otherwise exempt by OSHA 29 CFR 1910.401(a)(2), Subpart T, "Commercial Diving Operations" (see paragraph 220.4.2)
Opening	A gap or void 30 inches (76 centimeters) or more high and 18 inches (46 centimeters) or more wide, in a wall or partition, through which employees can fall to a lower level

Occupational Safety and Health Administration(OSHA) recordable mishaps	An occupational death, injury, or illness that must be recorded subject to OSHA requirements in 29 CFR 1960 and 29 CFR 1904 on OSHA Form 300, the "Log of Occupational Injuries and Illnesses;" these are occupational deaths, nonfatal occupational illnesses, and those nonfatal occupational injuries that involve one or more of the following: loss of workdays – loss of consciousness; restriction of work or motion; transfer to another job; or medical treatment other than first aid; by OSHA definition, hospitalization of an employee for observation purposes only, without subsequent injury determination, isn't a recordable injury
Other employee	An employee whose duties are routinely performed in an area or a facility where energy or material control procedures are used, but neither service nor operate the equipment requiring energy or material controls
Other potentially infectious materials	Includes: • Semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, and any body fluid that is visibly contaminated with blood • Any unfixed tissue or organ (other than dead skin) from a human (living or dead) • HIV- or HBV-containing cells or tissue cultures, organ cultures, and culture medium; and blood, organs, or other tissues from experimental animals infected with HIV or HBV
Oxygen-enriched environment	From ASTM G 63-99 1999, a fluid (gas or liquid) that contains more than 25 mol % oxygen (oxygen greater than 25% by volume)
Permissible Exposure Limit (PEL)	The maximum time-weighted average (TWA) concentration of a substance generally considered or recognized as having no adverse long- or short-term effects.
Permissible Exposure Limit (PEL) for Part 12 only	As established by OSHA, the PEL for asbestos exposures is 0.1 f/cc, expressed as an 8-hour TWA concentration, as stated in 29 CFR 1910.1001 and 29 CFR 1926.1101

Permit-required confined space	A confined space that has one or more of the following characteristics: • Contains, or has the potential to contain, a hazardous atmosphere • Contains a material that has the potential for engulfing an entrant • Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section • Contains any other recognized serious safety or health hazard
Personal Air Sampling/Air Monitoring	The sampling of a substance (e.g., chemicals, asbestos fibers) to determine the concentration within the breathing zone of a worker
Personal Fall Arrest System	A system (Type I) used to arrest a person in a fall from a working level. It consists of an anchorage, connectors, body harness, and may include a lanyard deceleration device, lifeline, or suitable combinations of these.
Personal Protective Equipment (PPE)	Clothes, padding, gloves, devices, equipment, or other items worn on or attached to the body that are used for the purpose of protecting a worker from injury (lumbar supports aren't PPE)
Pesticide	A substance or mixture of substances intended to prevent, destroy, or mitigate any pest, or any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant
Phase Contrast Microscopy (PCM)	A technique that uses a light microscope adapted with phase contrast optical elements to provide enhanced contrast between the fibers and the background, to count fibers on filters through which a volume of air has been pulled. The technique does not distinguish fiber types. This is the standard technique recognized by OSHA (Ref Part 12).
Physical hazard	A chemical for which there is scientifically valid evidence that it is a combustible liquid, a gas, an explosive, a flammable, an organic peroxide, an oxidizer, a pyrophoric, unstable (reactive), or water-reactive

Physiological training	Training to familiarize personnel who are exposed to a lowered or increased barometric pressure with the physiological stresses encountered and the means for overcoming these stresses
Plenum	An air compartment connected to one or more ducts as part of an air distribution system. In many buildings, the space between the building structure and a false ceiling is used as a return air plenum in the building HVAC system.
Polarized Light Microscopy (PLM)	A technique that uses polarized light to interact strongly with the sample and so generates contrast with the background. Polarized light microscopy is capable of providing information on absorption color and optical path boundaries between minerals of differing refractive indices, in a manner similar to brightfield illumination, PLM is commonly used when analyzing bulk materials for asbestos content (Ref Part 12).
Positive Fall Protection	Fall protection by the use of a guardrail system or personal fall protection to include harness with a fall arrest/restraint system or the use of other means, such as vehicle mounted platforms and/or scaffolding
Powered air-purifying respirator (PAPR)	An air-purifying respirator that supplies cartridge-filtered breathing air to the facepiece by means of a battery-operated pump
Presumed Asbestos-Containing Material (PACM)	Material presumed to be ACM. PACM most often is TSI and surfacing material found in buildings constructed no later than 1980 (Ref Part 12).
Primary	Cell or battery that isn't to be recharged
Primary cause	The major anomalous event immediately preceding a mishap in the absence of which the mishap wouldn't have occurred
Probability	The likelihood that an identified hazard will result in a mishap based on an assessment of such factors as location, exposure in terms of cycles or hours of operation, and affected population
Produce	To manufacture, process, formulate, or repackage

Program Administrator (fall protection)	A person designated in writing to manage the Fall Protection Program
Prohibited conditions	Any condition in a permit-required confined space that isn't allowed during the period when entry is authorized
Prohibited material	A hazardous material that is extremely hazardous to human health, safety, or the environment and must never be purchased or used for any purpose without a waiver from the Hazardous Review Subcommittee
Propellants	Explosive substances that normally function by deflagration and are used for propulsion purposes; such substances may be Class A or Class B explosives, depending on susceptibility to detonation (Class A explosives pose detonating or otherwise maximum hazard, such as dynamite or desensitized nitroglycerin; Class B explosives pose flammability hazards, such as smokeless propellants or photographic flash powders).
Protection Factor	The ratio of the ambient concentration of an airborne substance to the concentration of the substance inside the respirator at the breathing zone of the wearer. The protection factor is a measure of protection provided by a respirator to the wearer.
Protective clothing	An article of clothing worn essentially for personal safety and protection while performing work assignments in hazardous areas, under hazardous conditions, or under controlled environmental conditions of clean rooms, laboratories, etc. Typical items of protective clothing are steel-toe shoes, hardhats, fire-retardant and acid-resistant clothing, cryogenic handler suits, gloves, aprons, etc.
Protective equipment	A device or item that is worn or used for the safety and protection of personnel or the public when entering or working in hazardous areas or under hazardous conditions; devices or items include, but aren't limited to, respirators and gas masks, welding helmets and shields, safety goggles and spectacles, safety belts and lifelines.
Pyrophoric	A chemical that will ignite spontaneously in air at a temperature of 130°F (54.4°C) or below

Qualified person (for Chapter 8.2 only)	For purposes of verifying isolation, this is an employee that an employer has specifically identified as having sufficient training to verify previously energized parts are free of energy.
Qualified person (for Chapter 8.8 only)	A person in possession of a recognized engineering degree and a formal training certificate from an industry recognized trainer, training center, or an equivalent OSHA training program, who has successfully demonstrated their extensive knowledge and experience to perform structural engineering for design, evaluation, and approval of fall protection systems
Reactive	A chemical that, in the pure state or as produced or transported, will vigorously polymerize, decompose, condense, or become self-reactive under conditions of shock, pressure, or temperature
Regulated Area (for Part 12 only)	An established area that identifies where airborne concentrations of asbestos fibers exceed, or may be expected to exceed, the PEL. Specific controls are required by OSHA regulation in conducting activities in these areas.
Removal (for Part 12 only)	Taking out or stripping substantially all ACM/ACBM from a damaged area, a functional space, or a homogeneous area in a building (40 CFR 763)
Repair (for Part 12 only)	Returning damaged ACM/ACBM to an undamaged condition or intact state so as to prevent fiber release (40 CFR 763)
Reprisal	Any act of restraint, interference, coercion, or discrimination against any employee for exercising his or her rights under Executive Order 12196, 29 CFR 1960, or for participating in JSC's safety and health programs

Resilient Floor Covering Institute (RFCI)	OSHA has accepted that certain RFCI procedures for removing floor coverings will not cause exposures above the OSHA PEL. For a copy of these procedures, see the RFCI Web site at http://www.rfci.com/index.php . See the TDSHS statement concerning RFCI procedures at http://www.dshs.state.tx.us/asbestos/pdf/ARC022.pdf . (Ref Part 12)
Respirator	A respiratory protection device consisting of a facepiece connected either to an air source or to an air-purifying device
Respirator users	Personnel who use any type of respirator for any purpose, regardless of frequency (includes routine, emergency, and escape-only users)
Response Action (for Part 12 only)	A term from EPA that means a method, including removal, encapsulation, permanent enclosure, repair, operations and maintenance, that protects human health and the environment from friable ACBM (40 CFR 763)
Restricted material	A hazardous material that is identified as posing a significant risk to human health and safety or the environment, therefore requiring the special attention of management
Retrieval equipment	The equipment (including rescue line, chest or full-body harness, wristlets, if appropriate, and a lifting device or anchor) used for non-entry rescue of persons from permit-required confined spaces
Roof Work	The hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, vapor barrier work, and leading edge work
Safety and Health Inspector	A safety or occupational health specialist or other trained person authorized to carry out inspections and who has the equipment and competence to recognize safety or health hazards in the workplace

Safety and health training	Imparting safety and health knowledge or skills to an individual or group of individuals; this may be done by various methods, such as classroom instruction, safety meetings, videotape or multimedia programs, etc.
Safety belt or harness	A device for the specific purpose of securing, suspending, or retrieving a worker in or from a hazardous work area; examples include the following: • Body belt - a simple or compound strap with means for securing it about the waist and attaching a lanyard to it • Body harness - a design of simple or compound straps that may be secured about the wearer in such a manner as to distribute the stopping forces over the thighs, buttocks, chest, and shoulders, or any combination thereof, and with provisions for attaching a lanyard in the back between chest and shoulder level • Chest harness - a design of simple or compound straps with means for securing it about the rib cage, with shoulder straps to ensure proper chest strap positioning, and with provisions for attaching a lanyard in the back between chest and shoulder level • Suspension belt - a design of simple or compound straps that may be secured about the wearer's body as an independent work support; these are commonly referred to as saddle belts, bosun's chairs, or tree trimmers' belts
Safety Data Sheet (SDS)	Written or printed material about a hazardous chemical that describes the characteristics, properties, associated hazards, and other relevant material. Under GHS, this term replaces "Material Safety Data Sheet" (MSDS).
Spray-applied insulation (SAI) (for Part 12 only)	Spray-applied insulation, insulating materials containing one or more types of asbestos sprayed on, generally to the interior surfaces of buildings.
Scanning Electron Microscopy (SEM)	A method of microscopic analysis that uses an electron beam directed at a sample and then collects the beams that are reflected to produce an image from which fibers can be identified and counted

SCUBA diving	A diving mode independent of surface supply in which the diver uses open-circuit, self-contained underwater breathing apparatus
Sealant	A chemical agent applied to ACM to fix the material and reduce the potential for fiber release into the ambient environment (see encapsulant) (Ref Part 12)
Sealed	Free of cracks or other openings that allow moisture to enter or leave
Secondary	Cell or battery that is rechargeable
Self-Contained Breathing Apparatus	A respiratory protection device usually consisting of a facepiece connected by a hose and a regulator to an air source (compressed air, compressed oxygen, or an oxygen-generating chemical) carried by the wearer
Self-contained underwater breathing apparatus (SCUBA)	A respirator that supplies breathing air from a compressed air cylinder carried by the user when the user is working below the surface of water
Self-Retracting Lifeline/Lanyard	A deceleration device containing a drum-wound line that can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall
Serious	As used in “serious hazard,” “serious violation,” or “serious condition;” means a hazard, a violation, or conditions such that there is a substantial probability that death or life-threatening or long-term or permanent disabling physical harm could result, should a mishap occur while the hazard, violation, or conditions exist
Servicing or maintenance	Constructing, installing, setting up, adjusting, inspecting, modifying, maintaining, or servicing equipment or machines. These activities include lubrication, cleaning, un-jamming, making adjustments to machines or equipment, or tool changes where an employee is exposed to unexpected energizing or startup of the equipment or release of hazardous energy

Shift change (Chapter 8.2)	The period during which one group of workers is replaced by another group of workers. This can also be when an individual no longer remains in the work area, leaving to work elsewhere, or leaves the site or facility for the day. At these times, the individual must remove the individual red LO/TO tags and locks. Tags may be put in place or may already be in place through group LO/TO and controlled by the group task representative. Note: Other organizations may define shift change differently in their health and safety plan policies and procedures.
Should	Indicates that the rule is a recommendation, the advisability of which depends on the facts in each situation; implementation of a “should” statement is at the discretion of the local officials.
Small Enclosure (for Part 12 only)	An enclosure providing a control around an asbestos job larger than what a glovebag will accommodate, or that is needed to provide more protection than a barrier system. The small enclosure is generally limited in size and used for small-scale, short-duration activities. A small enclosure may not involve the use of negative-pressure systems, but will have an entrance chamber or multiple entry flaps. Small enclosures rely on HEPA-filtered vacuums and wet methods to control fiber concentrations.
Sound level meter (SLM)	An electronic instrument for measuring sound levels that conforms to the requirements for a Type II sound level meter as specified in ANSI S1.4, “
Steep Roof	A roof having a slope greater than 4 in 12 (vertical to horizontal)
Surfacing Material	Includes ACM that is sprayed, troweled on, or otherwise applied to surfaces of ceilings, structural members, and other surfaces for fireproofing, acoustical, and other purposes
Surfactant	A chemical wetting agent added to water to improve penetration, thus reducing the quantity of water required for a given operation or area.

Supervisor	A manager who directly oversees employee work.
Supplied air respirator (SAR)	A respirator that supplies breathing air under positive pressure from a clean source to the face piece
Survey Report	A report of administrative action taken to investigate and review the loss, damage, destruction, or theft of government property and to assemble pertinent facts and determine the extent of such loss, damage, destruction, or theft
Survivor benefits	Survivors of employees who die as a result of job-related injuries or illnesses are entitled to income continuation and reimbursement for medical and burial expenses; the portion of the employee's salary that is awarded to survivors depends on the survivor number and dependency status; annual cost of living adjustments are provided.
System (for Chapter 8.2 only)	Equipment such as piping, wiring, or ducting designed to store, process, or deliver utilities or commodities. Some examples of hazards associated with systems are fluid pressure, temperature, hazardous liquids and gases, and electricity.
Tagout	Placing a tagout device on an energy-isolating device according to procedure to indicate that the energy-isolating device and equipment being controlled may not be operated until the tagout device is removed
Tagout device	A prominent warning device such as a tag and means of attachment that can be securely fastened to an energy-isolating device under an established procedure to indicate that the energy-isolating device and the equipment being controlled may not be operated until the tagout device is removed

Test	An activity conducted to accomplish any of the following where persons or hardware are subjected to one or more test environments: • Acquire data • Evaluate, qualify, or certify hardware • Train space flight crews • Demonstrate capabilities Laboratory analysis, research, and experimentation that doesn't involve human subjects, flight hardware, prototype hardware, explosives, and oxygen-enriched atmospheres isn't considered testing.
Test chamber	Altitude chambers, vacuum chambers, and hyperbaric chambers, together with their ancillary systems and equipment, that provide an atmosphere deviating from ground-level ambient pressure or oxygen content or that involve a closed-loop life support system
Test environment	A condition to which a test system or test subject is subjected; a test environment may involve deviation from normal ground-level ambient atmosphere, the application of higher forces or energy levels (i.e., acoustic, potential, thermal, etc.) than normally experienced, or exposure to hazardous materials.
Test equipment	Portable hardware that is unique to a specific test or training exercise, does not require integration into the test facility (i.e., plug-in versus hard-wired), and is removed immediately after the test
Test facility	Structures in which testing operations are conducted; the test facility includes the housing structure and all permanently installed systems specifically for test support; not included are generic utilities servicing other parts of the building or other facilities.
Test facility support systems	Permanently installed equipment that support testing operations
Testing	The process by which the hazards that may confront entrants of permit-required space are identified and evaluated, including specifying the tests that are to be performed in the space

Test subject	A human being who is subjected to a test environment, often with little or no control over the test process
Texas Department of State Health Services (TDSHS) (Ref Part 12)	The TDSHS mission is to protect and promote the physical and environmental health of the people of Texas from asbestos. The TDSHS Asbestos Programs Branch has two programs to meet these concerns. The Licensing Program issues licenses to persons qualified for asbestos-related work in public buildings. The Enforcement Program has regional inspectors available to monitor asbestos removal in buildings, and to respond to community concerns to ensure that public exposure is minimized. The TDSHS has established rules and regulations for asbestos in the Texas Administrative Code, Title 25, Health Services, Part I, Texas Department of Health, Chapter 295, Occupational Health (25 TAC 295). These regulations and other information can be found at the TDSHS Web site for asbestos programs URL: http://www.TDSHS.state.tx.us/beh/asbestos/. The TDSHS has also been designated as the Texas regulatory agency to ensure compliance with the Clean Air Act, NESHAP, and associated EPA standards and regulations. Asbestos emissions from abatement activities and building demolitions are regulated under NESHAP.
Threshold Limit Value (TLV)	An exposure guideline developed by the ACGIH to assist in the control of health hazards. The TLV refers to airborne concentrations of substances and represents conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects.
Time Weighted Average (TWA)	The average concentration of a contaminant in air during a specific time interval.
Time-weighted-average (TWA) sound level	The sound level that, if constant over an 8-hour workday exposure, would result in the same noise dose as the varying sound levels continuously measured with a noise dosimeter or sound level meter.

Transmission Electron Microscopy (TEM)	A method of microscopic analysis that focuses an electron beam onto a thin sample. As the beam penetrates (transmits) through the sample, the difference in densities produces an image on a fluorescent screen from which asbestos fibers can be identified and counted.
Unprotected edge	Any side or edge (except at entrances to points of access) of walking/working surface (e.g., floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches high. Mid-rails shall be installed at a height approximately midway between the top edge of the guardrail system and the platform surface.
Users of hazardous material	Personnel who open the incremental hazardous material shipping container and thereby expose the material for the purpose of mixing, transferring, burning, freezing, pouring, venting, reacting, disposing of, or otherwise using or altering the material
Vacuum environment	Any atmosphere at an absolute pressure less than ground-level ambient pressure by 0.5 psia; also known as hypobaric environment
Vapor	A gaseous form of a substance that is normally in the solid or liquid state at standard temperature and pressure
Waiver	Documented and approved permission to perform some act contrary to established requirements
Walking/Working Surface	Any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, ramps, bridges, runways, formwork, and concrete reinforcing steel. Does not include ladders, vehicles, or trailers on which employees are located to perform their work duties
Warning Line	A barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of a guardrail or personal fall protection system to protect employees in the area

Wet Cleaning (for Part 12 only)	The process of eliminating asbestos contamination from building surfaces and objects by using cloths, mops, and other cleaning tools that have been dampened with amended water and of disposing of these cleaning tools as asbestos-contaminated waste
Work Area	A room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present
Work Area (for Part 12 only)	The room or space where asbestos-related work or removal operations are performed that is defined and/or isolated to prevent the spread of asbestos dust, fibers, or debris and to prevent entry by unauthorized personnel (see regulated area)
Worker (for Part 12 only)	A person engaged in the abatement of asbestos or performing a task in which asbestos exposure is likely; distinguished from an asbestos worker, who is routinely exposed to asbestos fiber concentration levels in excess of the action level of 0.1 f/cc on an 8-hour TWA
Workplace	A physical location where NASA's work or operations are done
Workplace (for Chapter 9.2 only)	An establishment, job site, or project, at one geographical location, containing one or more work areas

APPENDIX F. MISCELLANEOUS GUIDELINES AND INSTRUCTIONS

The attachments in this appendix are related to individual chapters and provide additional guidelines or instructions. The attachment number is the corresponding chapter number and the letters designate the order of attachments for that chapter. For example, Attachment 2.7A is the first attachment related to chapter 2.7. Attachment 2.7B is the second attachment related to chapter 2.7.

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Attachment 1.1A, Records, Documentation, and Reports

1.0 CENTER-LEVEL SAFETY AND HEALTH RECORDS

JSC must keep the records described in the following table. Records are kept in a central location for easy access, and many records have backup copies stored at a federal records retention center. JSC must keep records back to the beginning of the fiscal year of the last OSHA VPP review or longer if required by OSHA or NPR 1441.1, "Records Retention Schedules." Any format that includes the pertinent information is acceptable unless otherwise noted in the table.
JSC must protect all safety and health records under the Privacy Act of 1974.

Record . . .	***Chap-ter***	***NRRS # . . .***	***Retention***	***Custodian & Other requirements . . .***
JSC Management Council minutes to document safety decisions	1.1	1700, 117.5	Handle as permanent	JSC Management Council keeps minutes
Contractor Safety Forum minutes	1.1	1700, 117.5	Handle as permanent	Contractor Safety Forum keeps minutes
Tracking completion of tasks assigned by JSC Management Council or Contractor Safety Forum	1.1	1700, 117.5	Handle as permanent	JSC Management Council and Contractor Safety Forum keep tracking
Tracking completion of Center-level goals	1.1	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps tracking
A commitment statement from the current Director, JSC	1.1	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps; within 60 days after a change of Center Director, a new statement must be sent to OSHA
A letter of support for VPP signed by the current president, AFGE, local 2284	1.1	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps; within 60 days after a change in either the president, AFGE local 2284, or Director, JSC, a new letter must be sent to OSHA
JPR 1700.1 and change records	1.3	1700, 125	10 years or when supersed-ed or obsolete	Safety and Test Operations Division keeps document and change records
Waiver documentation for both center-level and higher-level waivers	1.1	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps until the waiver expires; yearly summary must be sent to NASA HQ, S&MA, of any waivers JSC approves to NASA-level requirements
Center-level financial records showing safety items	1.2	1700, 117.5	Handle as permanent	The Office of the Chief Financial Officer and the Center Operations Directorate keep financial records

Record . . .	***Chap-ter***	***NRRS # . . .***	***Retention***	***Custodian & Other requirements . . .***
Records on JSC contractors to include: Contractor OSHA Form 300, "OSHA Log and Summary of Occupational Injuries and Illnesses," logs and supporting information, documentation on contractor selection that shows safety and health was considered in selecting the contractor Documentation showing contractor evaluation that includes safety and health Disciplinary action taken on a contractor because of safety and health reasons Any other safety and health documentation required by an individual contract such as safety and health plans	1.5	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps current logs. OSHA Form 300 in the format required by OSHA Office of Procurement keeps all other records in format that includes the pertinent information
JSAT minutes	1.6	1700, 117.5	Handle as permanent	JSAT keeps the minutes
Safety and health program self-evaluation	1.7	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps the self-evaluation, format As required by OSHA VPP Region VI
Documentation on tracking self-evaluation actions to closure	1.7	1700, 117.5	Handle as permanent	Safety and Test Operations Division keeps documentation
Information for NASA's annual report to OSHA	1.7	1700, 120	Retire to FRC when inactive. D estroy when 12 years old	The Safety and Test Operations Division will send its information for this report to NASA Headquarters when Headquarters requests it. This must include documentation required by NPR 8715.1 and NPR 8715.3
Safety and Health design comments	2.1	1700, 117.5	Handle as permanent	The Safety and Test Operations Division keeps safety comments; the Space Medicine Operations Division keeps health comments
Design review documentation and acceptance test and inspection records	2.1	1700, 117.5	Handle as permanent	COD keeps the records
Operational Readiness Inspection reports and records	2.1 & 10. 3	1700, 117.5	Handle as permanent	The Safety and Test Operations Division keeps the reports and records indefinitely

Record . . .	***Chap-ter***	***NRRS # . . .***	***Retention***	***Custodian & Other requirements . . .***
Records of the NEPA environmental reviews	2.1	8800, 43	Destroy when 5 years old	Environmental Office keeps the records
Industrial hygiene records – sampling and analysis	2.2	1840	Contact Center Records Manager	Space Medicine Operations Division keeps records
Records on annual Safety and Test Operations Division safety inspections	2.4	1700, 117	Retire to FRC when related property is disposed of by NASA. De stroy 5 years after disposal	The Safety and Test Operations Division keeps records of safety inspections; the Space Medicine Operations Division keeps records of health inspections, recorded in the Hazard Abatement Tracking System
Employee reports of hazards and close calls	2.5	1700, 119.5	Handle as permanent	Safety and Test Operations Division keeps these records, recorded in tracking databases
Log of occupational injuries and illnesses This log records federal employee job-related injuries and illnesses that are OSHA reportable	2.6	1700, 117.5	Handle as permanent	The Safety and Test Operations Division records the information in SRTS within 1 working day after finding out about the injury or illness. The log must include cases reported to the Office of Workers' Compensation Programs. OSHA Form 300, data stored in databases.
Annual Summary of Federal Occupational Injuries and Illnesses	2.6	1700, 117.5	Handle as permanent	The Safety and Test Operations Division will: Post copies of the summary where employee notices are posted by Feb. 1 – Apr. 30 of each year. OSHA Form 300 Take steps to make sure no one alters, defaces, or covers the copies Send a copy of the summary to NASA Headquarters by October 30 of each year
Mishap board reports and records (including supporting evidence, transcripts, and minutes of board meetings)	2.6	1700, 122	Permanent retire to frc when 2 years old. Transf er to nara when 20 years old	Safety and Test Operations Division keeps records, format per NPR 8621.1

Record . . .	***Chap-ter***	***NRRS # . . .***	***Retention***	***Custodian & Other requirements . . .***
Mishap Reports	2.6	1700, 120	Retire to frc when 2 years old. Destroy when 10 years old	Safety and Test Operations Division keeps reports
Records to support Center-level trend analysis, such as minutes where trends are discussed and committee reports on trends are analyzed	2.7	1700, 117.5	Handle as permanent	Safety and Test Operations Division, Space Medicine Operations Division, JSAT keep records as appropriate
Other OSHA-required records at the Center level (e.g., lockout/tagout audit reports, hearing conservation records)	3.2	1700, 117.5	Handle as permanent	Per OSHA requirements, the Safety and Test Operations Division keeps safety records; Space Medicine Operations Division keeps health records
Chemical inventory to show that JSC doesn't fall under the Process Safety Management Standard	3.3	1840	Contact Center Records Manager	Space Medicine Operations Division keeps inventory
Center-level maintenance schedules, procedures, and records	3.4	1700, 117.5	Handle as permanent	The Center Operations Directorate keeps the schedules, procedures, and records
HATS	3.5	1700, 117	Retire to FRC when related property is disposed of by nasa. Dest roy 5 years after disposal	The Safety and Test Operations Division keeps the HATS database
Employee medical records	3.6	1800, 127	See NPR 1441.1, depends on type of employee	Space Medicine Operations Division keeps these records at the JSC Clinic
Log of federal workers' compensation cases	3.6	1800, 127	See NPR 1441.1, depends on type of employee	Space Medicine Operations Division keeps the log, Form CA-1, CA-2, or CA-6
Training attendance records and course documentation for JSC Safety Learning Center and Space Medicine Operations Division classes	4.1 – 4.3	1700, 117.5	Handle as permanent	The Safety and Test Operations Division keeps records for safety training; the Space Medicine Operations Division keeps records for health training

Record . . .	*Chap-ter*	*NRRS # . . .*	*Retention*	*Custodian & Other requirements . . .*
NRC license records	7.3	8700, 40	Destroy 10 years after expiration or renewal of the license, provided all material procured has been disposed of	Radiation Safety Officer keeps records per NRC requirements
Radiation exposure records	7.3	8700, 39	Destroy when 75 years old	
JSC hazardous material inventory and central repository for MSDSs/SDSs	9.2	1840	Contact Center Records Manager	Space Medicine Operations Division keeps MSDSs/SDSs

2.0 ACCESS TO JSC'S SAFETY AND HEALTH RECORDS AND REPORTS

The following individuals may see JSC records and reports on request:

JSC Management Council, JSAT, employees, former employees, and employee representatives may see JSC logs and yearly summaries.

Authorized representatives from the Department of Labor or Health and Human Services may see any JSC safety and health records or reports.

Any employee is authorized access to their medical and exposure records under OSHA 29 CFR 1910.1020.

3.0 SAFETY AND HEALTH DOCUMENTATION FOR LINE ORGANIZATIONS

As a line manager, you must maintain the documentation listed in the following table as it applies to the work your organization does. Documentation may be electronic or hard copy. You may consolidate some documentation at higher levels of management, such as directorate or division, as appropriate. As a minimum, you must keep documentation back to the beginning of the fiscal year of the last OSHA VPP review, or longer if required by OSHA or NPR 1441.1. You are only required to keep a current copy of certain records as indicated in the table. Any format that includes the pertinent information is acceptable unless otherwise noted in the table.

Documentation . . .	***Chapter . . .***	***Remarks***
Organizational safety committee minutes (including construction committee minutes and inspection records as appropriate)	1.1 10.1 for construction	None
Tracking completion of tasks or goals assigned by Directorate Safety Committees or other organization-level committees if assigned	1.1	None
You are encouraged to keep documentation on waivers granted for your organization	1.3	Keep until the waiver expires
Performance plans showing safety and health responsibilities	1.1	Keep current plans only
Performance appraisals that include safety and health	1.4	Keep current appraisals only
Documentation of employee involvement that may include: • Training records that show employees giving or receiving safety and health training • Attendance records for safety and health meetings, especially where employees present safety or health topics • Photographs of employees participating in safety and health activities such as Safety and Total Health Day • Lists of safety and health activities and names • Any other records that show employee involvement in safety and health activities	1.6	None
Design review, ORI, URR, and TRR documentation (hazardous material hazard analyses, other hazard analyses and JHAs – Chapter 2.4 – may also support this element)	2.`	None
Job hazard analyses	2.1	Keep only current analyses and update yearly
Hazard analyses and hazard evaluation reports	2.1	Keep for life of system and update every 5 years
Inspections by your organization	2.2	None
Actions taken on employee reports of hazards or close calls directly to you	2.3	None
You are encouraged to keep completed NASA Form 1627 and supporting documentation	2.6	None
You are encouraged to keep records of any trend analysis you do within your organization	2.7	None

Documentation . . .	***Chapter . . .***	***Remarks***
• Procedures or work instructions that document safe work practices • Directives or other documentation that provide safety and health rules for individual work areas or organizations • PPE hazard analyses and other PPE documentation required by Chapter 5.6 of this handbook • Documentation required for hazard control programs described in the chapters listed in paragraph 3.2.7 of Chapter 3.2 • Hazard analyses and job hazard analyses (Chapter 2.3) that document hazard controls that support this sub-element	3.2	Keep only current procedures, directives, rules, and analyses.
Other OSHA-required records at the organizational level	3.2	Format and timeline as required by OSHA
Process safety management documentation (if required)	3.3	Format and timeline as required by OSHA
Organizational maintenance schedules and procedures	3.4 or 10.4	Keep only current procedures and schedules
Organizational maintenance records to show completed maintenance	3.4 or 10.4	None
Tracking for hazards not tracked in HATS to include work requests or other supporting documentation	3.5	None
Posted JF1240s	3.5	Keep only while posted
Current roster of employees requiring enrollment in medical surveillance and screening programs	3.6	None
Records of disciplinary action for safety violations	3.7	None
Organizational emergency action plans and Facility Evacuation Plans	3.8	Keep current plans only
Training and certification plans and records on training or certification by your organization	4.1 & 5.8	Keep current plans and records only
JSC Form 2150 to document employee participation in fire drills or fire evacuation training	4.2	None
Documentation supporting required organizational emergency drills other than fire drills	4.2	None
Canceled confined space entry permits	6.10	Keep for 1 year only

Documentation . . .	*Chapter . . .*	*Remarks*
Inventory of hazardous chemicals in your facilities	9.2	Keep current inventory only
Facility baseline documentation records	10.4	Keep for life of the facility
Facility and operations records (such as TRR documentation or documentation on engineering controls)	Parts 5–10	None

4.0 SAFETY AND HEALTH RECORDS AND REPORTS MANAGEMENT PROVIDES EMPLOYEES

- Post hard or electronic copies of all safety and health evaluations and inspections, hazard analyses, and job safety analyses in a readily accessible location.
- Place a copy of the work area hazardous material inventory and MSDSs/SDSs in a readily accessible location (see Chapter 9.2).
- Provide employees copies of their individual exposure monitoring results when requested to do so by the Space Medicine Operations Division.

5.0 SAFETY AND HEALTH RECORDS AND REPORTS FOR NASA HEADQUARTERS

JSC must make the following records available to NASA Headquarters, Office of Safety and Mission Assurance:

- Documentation from Center-level safety committees.
- Results of external safety and health reviews.
- Center-level policy and requirements documents that implement headquarters safety and health requirements.
- Copies of waivers to NASA requirements granted at the Center.

Attachment 2.3A, System Safety Program Plan Outline

1.0 WHAT IS A SYSTEM SAFETY PROGRAM PLAN (SSPP)?

An SSPP describes your system safety effort for a project or part of a project. It is part of a formal, disciplined system safety program.

You may tailor your SSPP to your project. It must include the entire life of the project from concept, to operations, to phase-out and disposal.

2.0 SSPP REQUIREMENTS

An SSPP should follow the guidelines in Appendix F of NPR 8715.3, "NASA General Safety Program Requirements."

Each institutional and flight program may have different requirements for an SSPP. This attachment outlines a generic SSPP. See the system safety requirements for the program that you are working on for more details.

An SSPP must:

a. Describe the scope of the project.

b. Describe any relationships between system safety and other project requirements, tasks, and elements. You should cross-reference these to avoid duplication.

c. List any documents and specifications that your system safety effort will use either as directives or as guidance.

d. Identify system safety engineering requirements, tasks, and responsibilities on an item-by-item basis.

e. Be updated as the project direction or requirements change.

SSPP contents

3.0 SYSTEM SAFETY ORGANIZATION

The SSPP must describe:

a. The system safety organization or function. Include charts to show the organizational and functional relationships and lines of communication.

b. The responsibility, authority, and accountability of system safety personnel and other organizations (including contractors and subcontractors) involved in the system safety effort. Assign an organization to be responsible for each task. Identify the authority for resolving all identified hazards. Include the title, address, and telephone number of the System Safety Program Manager.

c. How the system safety organization is staffed for the length of the project. Include labor loading and qualifications of key personnel.

d. The interfaces between the system safety organization and other related disciplines, such as engineering, occupational safety and health, reliability, quality assurance, or medical support at all levels of the project (NASA, contractor, and subcontractor).

4.0 SYSTEM SAFETY PROJECT MILESTONES

The SSPP must:

a. Identify safety milestones. Review the effectiveness of the system safety effort at critical safety checkpoints (e.g., design reviews, self-evaluations, operational readiness reviews, audits, etc.).

b. Schedule safety tasks. Show start and finish dates, report dates, review dates, and labor loading, as they relate to other project milestones.

c. Identify other engineering tasks such as design analyses, tests, or demonstrations that also apply to the system safety program. Include the estimated system safety personnel who will do these tasks as part of this section.

5.0 SYSTEM SAFETY AND RISK MANAGEMENT

The SSPP must:

a. List the safety standards and system specifications the project either must follow or will adopt as a requirement. Include any system safety requirements or definitions that aren't covered in JSC documents.

b. Describe how you will coordinate the system safety efforts of different parts of the project. Include charters of any system safety groups and methods to:

- Distribute system safety requirements to action organizations.
- Coordinate and integrate hazard analyses.
- Hold management and engineering reviews.
- Report program status.

c. Describe the procedures for assessing risk. Include:

- Hazard severity categories.
- Mishap probability (or frequency) levels.
- The method for finding risk levels such as a risk matrix.
- The acceptable risk levels for the project.

d. Describe the management controls to make sure the project follows safety requirements. Include the process for making management decisions and the level of management required

to accept different levels of risk. Include methods to make management aware of and take action on:

- Critical and catastrophic hazards.
- Corrective actions to hazards.
- Mishaps or malfunctions.
- Variances to safety or program requirements.

6.0 HAZARD ANALYSES

The SSPP must describe how you will do hazards analyses for the project, to include:

a. The analysis techniques and format that you will use to identify hazards, their causes, their effects, and recommended corrective actions.

b. What analysis techniques you will use and when you will use them.

c. How you will integrate hazard analyses from different organizations such as contractors and subcontractors.

d. A single closed-loop system for tracking hazards to closure.

7.0 SYSTEM SAFETY DATA

The SSPP must:

a. Describe the approach for researching, distributing, and analyzing historical hazard or mishap data.

b. Identify the data management needs for making risk decisions.

c. Identify the safety-related data that you will reference and how you will keep the data. State how Safety and Mission Assurance may access the data.

8.0 SAFETY VERIFICATION AND AUDITS

The plan must describe:

a. The verification and audit requirements and procedures to make sure that the system safety program has been implemented.

b. The procedures to make sure that safety information is available for management and engineering review and analysis.

c. The review procedures to make sure that hazardous tests, and especially tests involving human test subjects, are conducted safely.

9.0 TRAINING

Describe techniques and procedures to make sure that engineers, test subjects, technicians, operators, and support (including maintenance) personnel understand the objectives and requirements of the system safety program.

10.0 OTHER SAFETY REVIEWS OR SURVEYS FOR YOUR PROJECT

List any other reviews or audits that will help you evaluate the safety of your project during design or operation. These reviews may include any of the following:

a. Special surveys for very hazardous systems or for changes to these systems to make sure that risks are properly identified and managed.

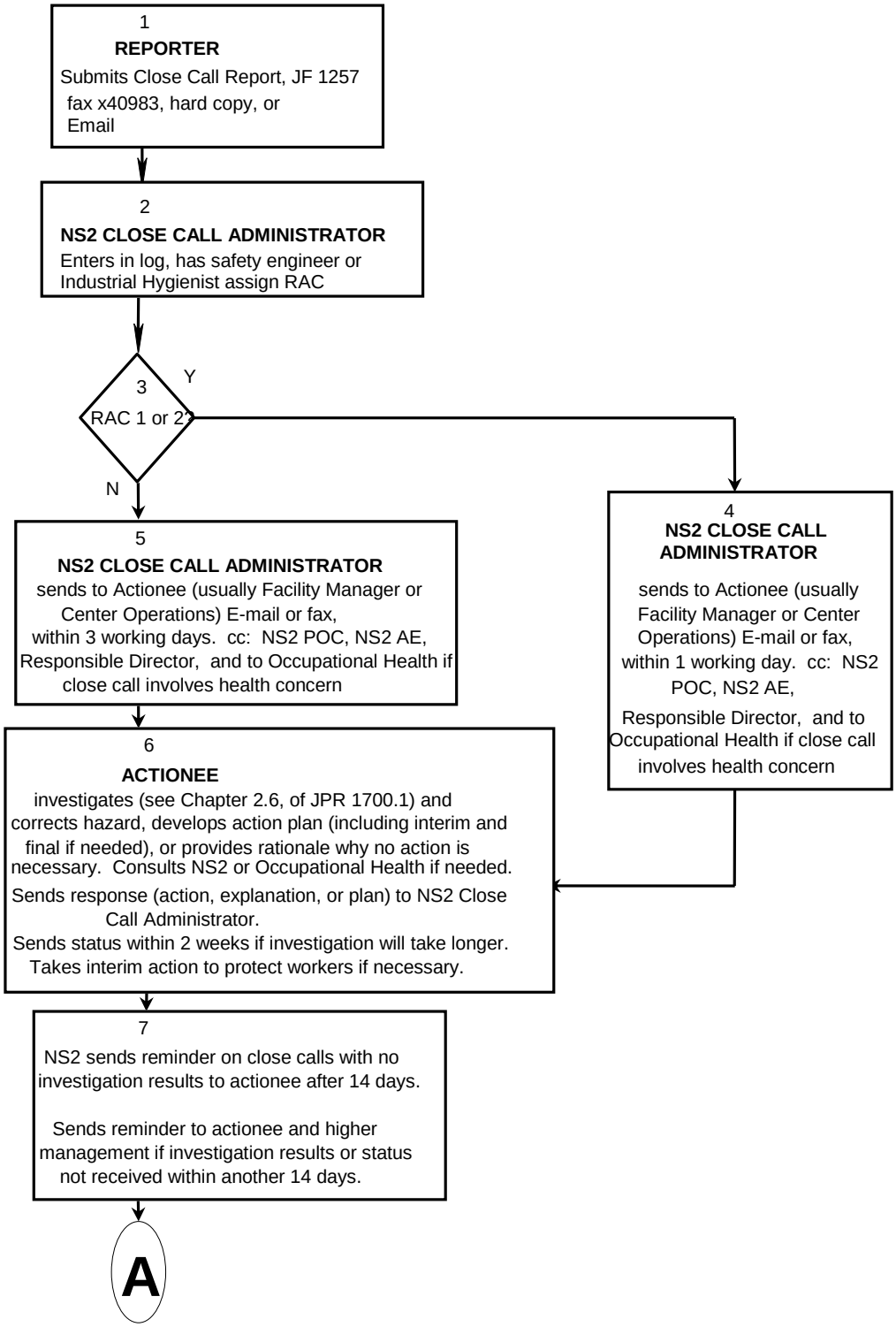
b. A review by experts outside your project during readiness reviews, such as TRRs, operational readiness inspections, or acceptance reviews.

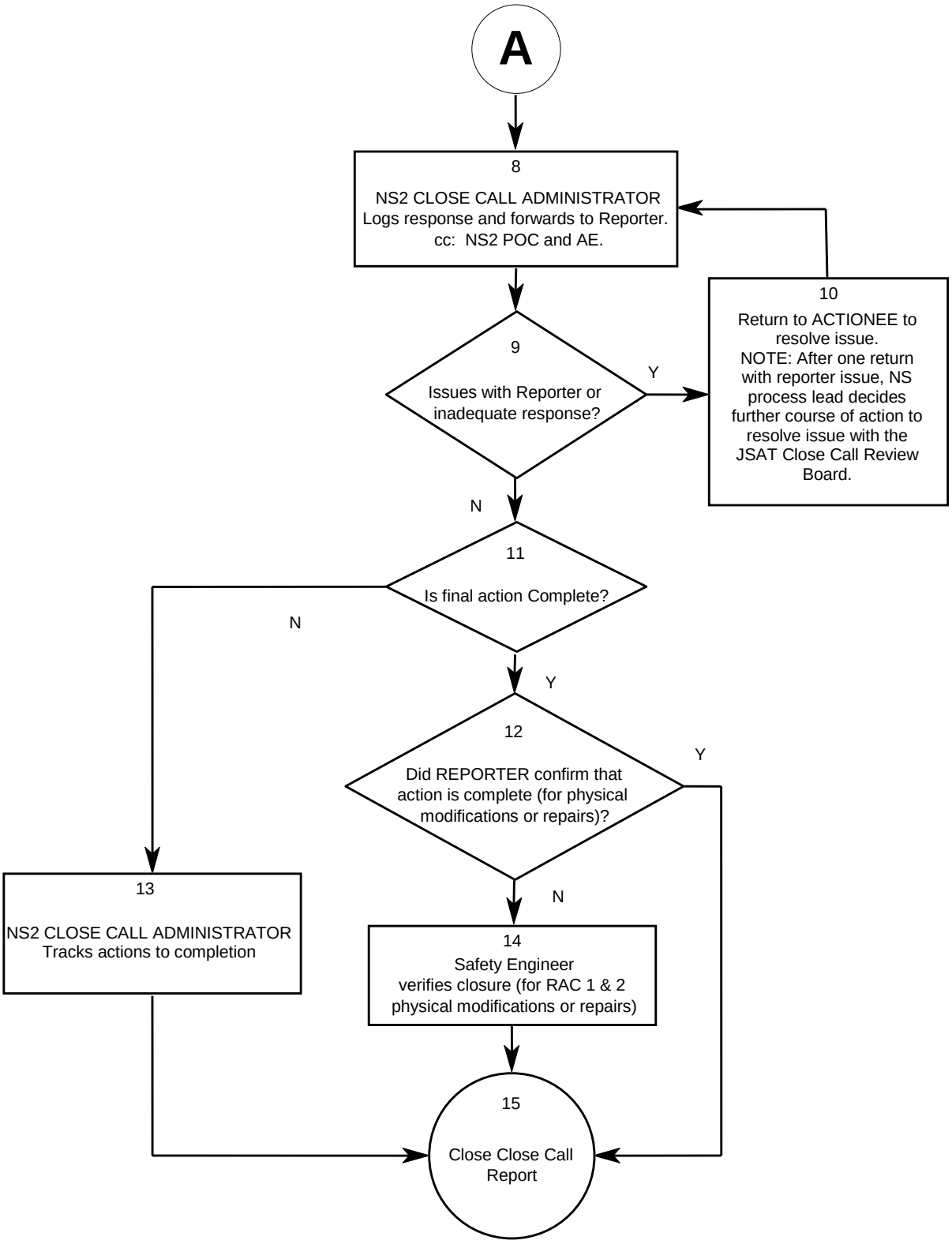
c. System safety audits by JSC organizations or NASA Headquarters for major projects and facilities. These audits should be done periodically and consider:

- Did the system perform as planned?
- Were all hazards identified and controlled effectively?
- Did the hazard and risk analysis result in effective risk decisions?
- Have design or operational changes increased the risk of the system?

d. A review by the Operations and Engineering Panel during the detailed design phase as described in paragraph 1.9.3 of NPR 8715.3, “NASA General Safety Program Requirements,” for major facilities. The Operations and Engineering Board is a NASA Headquarters panel that reviews certain facilities it chooses to, or is required to, review. You will be notified if the Operations and Engineering Board will review your facility.

Attachment 2.5A, Close Call Process




A
8
NS2 CLOSE CALL ADMINISTRATOR Logs response and forwards to Reporter. cc: NS2 POC and AE.
9
Issues with Reporter or inadequate response?
Y
10
Return to ACTIONEE to resolve issue. NOTE: After one return with reporter issue, NS process lead decides further course of action to resolve issue with the JSAT Close Call Review Board.
N
11
Is final action Complete?
N
Y
12
Did REPORTER confirm that action is complete (for physical modifications or repairs)?
Y
N
13
NS2 CLOSE CALL ADMINISTRATOR Tracks actions to completion
14
Safety Engineer verifies closure (for RAC 1 & 2 physical modifications or repairs)
15
Close Close Call Report

Attachment 2.6A, Immediate Response to a Mishap

See list of emergency numbers on next page.

If you are on the scene or the first one to arrive:

1. PULL MANUAL FIRE ALARM BOX or DIAL x33333 for fire, explosion, chemical spills, air emissions (vapor cloud or smoke), personnel rescue, or building evacuation. Give this information to the dispatcher when you telephone:

   - Your name and telephone extension at which you may be called during the emergency
   - Exact location of the emergency
   - Type and extent of emergency

   Stay on the telephone until the dispatcher acknowledges receipt of information.
   If mishap is an on-site vehicle accident, call Security at x34658. If injuries have occurred, call x33333.

2. Help the injured only if you can do so without endangering yourself. Never move an injured person unless failure to do so will result in further injury or death. If you can't help or move the injured or ill person, wait for emergency personnel such as the Fire Department or Incident Response Team to arrive.

3. Limit further injury to people, property damage, and impact to the environment as much as possible only if you can do so without endangering yourself.

4. Take ambulatory injured or ill persons to the JSC Clinic, Building 8.

5. Get names and addresses of witnesses.

6. Restrict access to scene and evidence of mishap until investigator arrives or investigation is complete.

7. Notify your supervisor of the emergency and actions taken; request that he or she notify the Safety and Test Operations Division at x32084.

8. In cases of off-site accidents involving NASA property or JSC or contractor personnel:

   - Seek help from nearest medical or fire facility.
   - Follow other appropriate actions such as items 2, 3, 5, 6, and 7 above.

Emergency numbers

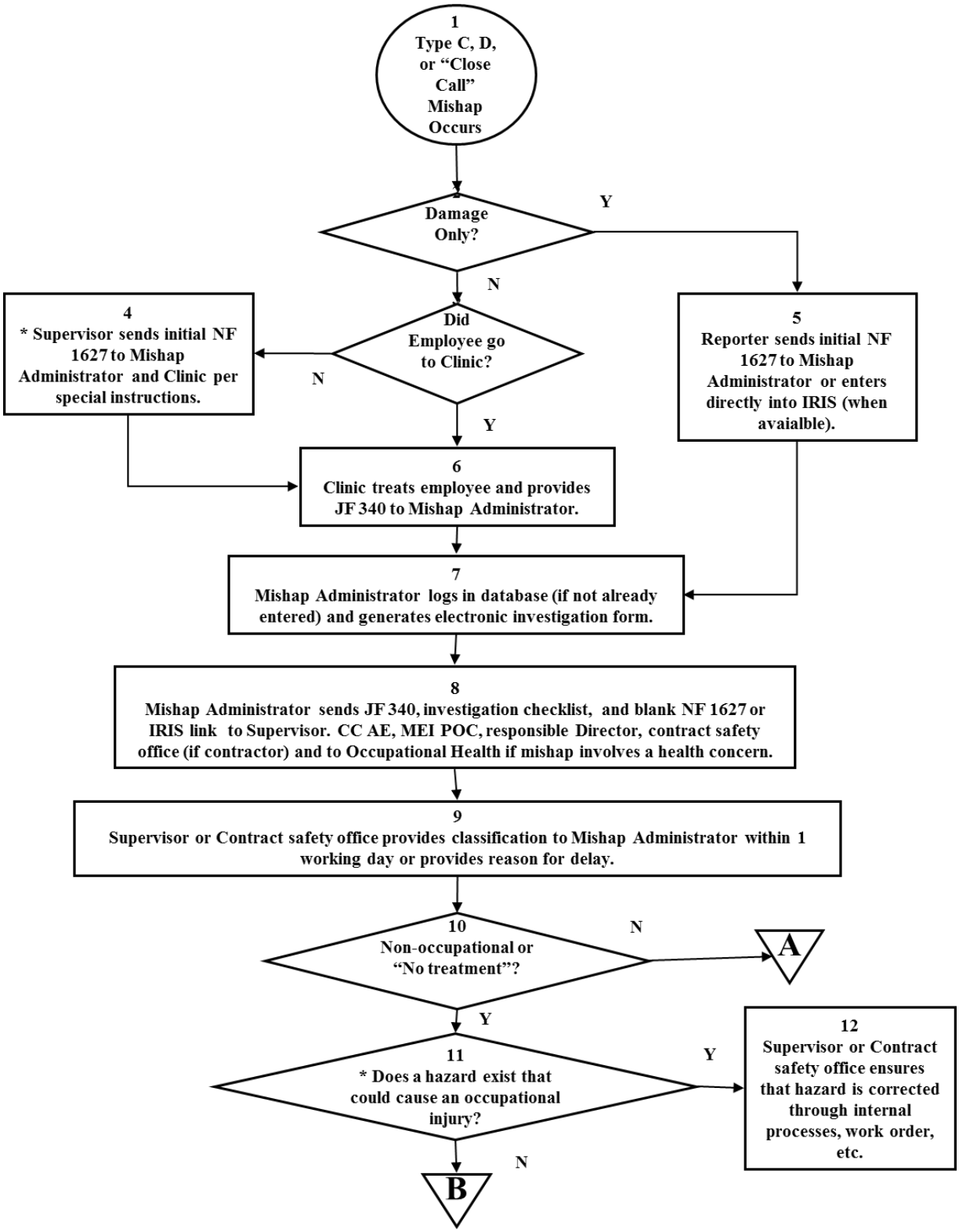
Dial x33333 day or night to report:

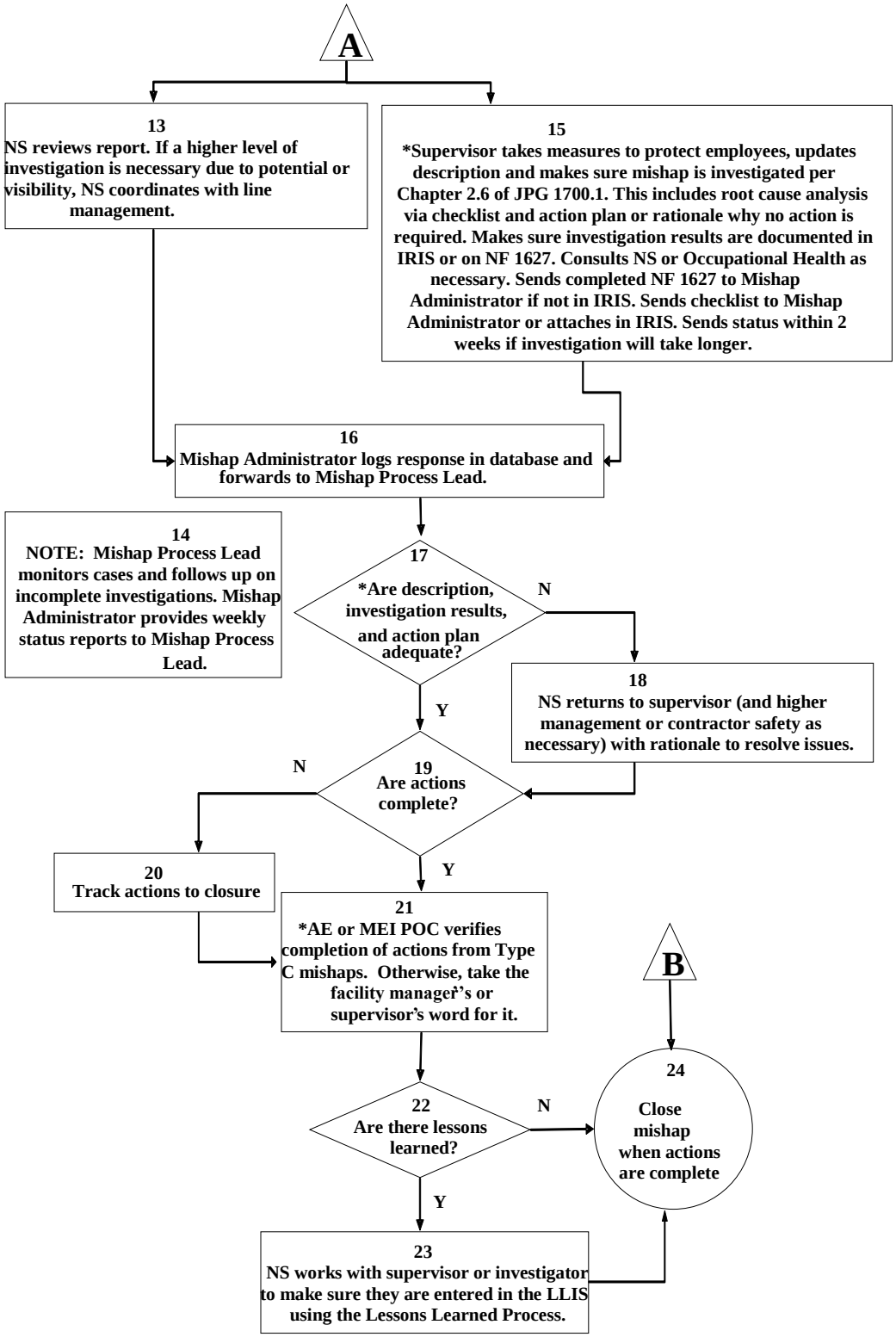
- Injury – Ambulance
- Fire
- Vehicle accident – Security
- Hazardous materials release or spill – Incident Commander

Other important numbers on site include:

- x34111 – Clinic
- x32038 – Facilities Maintenance and Repairs
- x34317 – Space Medicine Operations Division
- x36726 – Occupational Health Department (contractor operated)
- x34900 – Safety and Test Operations Division
- x37084 – Radiological Health Office
- x33061 – Utility interruptions or failure
- x33501 – Environmental Office (daytime only)

Attachment 2.6B, Mishap Investigation Process for Type C, D, and "Close Call" Mishaps




A
13
NS reviews report. If a higher level of investigation is necessary due to potential or visibility, NS coordinates with line management.
15
*Supervisor takes measures to protect employees, updates description and makes sure mishap is investigated per Chapter 2.6 of JPG 1700.1. This includes root cause analysis via checklist and action plan or rationale why no action is required. Makes sure investigation results are documented in IRIS or on NF 1627. Consults NS or Occupational Health as necessary. Sends completed NF 1627 to Mishap Administrator if not in IRIS. Sends checklist to Mishap Administrator or attaches in IRIS. Sends status within 2 weeks if investigation will take longer.
16
Mishap Administrator logs response in database and forwards to Mishap Process Lead.
14
NOTE: Mishap Process Lead monitors cases and follows up on incomplete investigations. Mishap Administrator provides weekly status reports to Mishap Process Lead.
17
*Are description, investigation results, and action plan adequate?
N
18
NS returns to supervisor (and higher management or contractor safety as necessary) with rationale to resolve issues.
Y
19
Are actions complete?
N
20
Track actions to closure
Y
21
*AE or MEI POC verifies completion of actions from Type C mishaps. Otherwise, take the facility manager's or supervisor's word for it.
B
22
Are there lessons learned?
N
24
Close mishap when actions are complete
Y
23
NS works with supervisor or investigator to make sure they are entered in the LLIS using the Lessons Learned Process.

Attachment 2.6C, Mishap Investigation Checklist

Complete this checklist by examining the scene, interviewing witnesses, and examining other evidence. Justify "no" answers to questions 1 and 2. Then go to the list of suggested actions.

1. Were there any unsafe or unhealthful conditions that led to this mishap? Yes No
2. Were there any unsafe acts that led to this mishap? Yes No

   If "No," stop here. If "Yes," answer questions 3–9.
3. Does a Job Hazard Analysis exist? Yes No
   A. If so, are the identified hazards adequately controlled? Yes no
4. Is training necessary for the task? Yes no
   A. If so, were employee(s) involved properly trained? Yes no
5. Are procedures necessary for the task? Yes no
   A. If so, do they exist? Yes no
   B. If so, were employee(s) involved aware of them? Yes no
   C. If so, did the employee(s) involved follow them? Yes no
6. Are safe work practices or requirements necessary for the task? Yes no
   A. If so, do they exist? Yes no
   B. If so, are they easy to understand? Yes no
   C. If so, were employee(s) involved aware of them? Yes no
   D. If so, did the employee(s) involved follow them? Yes no
7. Is ppe necessary for the task? Yes no
   A. If so, did employee(s) involved know it is necessary and how to use it properly? Yes no
   B. If so, did employee(s) involved use it properly? Yes no
8. Are indicators and controls easy to understand and operate? Yes no
9. Are any permits (hazardous operations, confined space, hot work, etc.) required for the task? Yes no
   A. If so, were employee(s) involved aware they are necessary? Yes no
   B. If so, were the permits handled properly? Yes no
10. Were there any other system or management factors that may have contributed to the unsafe act, such as:
   A. Management pressure? Yes No
   B. Inadequate supervision? Yes No
   C. Peer pressure? Yes No
   D. Stress, exhaustion, or workload? Yes No
   E. Boredom or physical discomfort? Yes No
   F. Mismatch of employee to job? Yes No
   G. Off-the-job events that could have affected the mishap? Yes No

Recommended actions

See the list below for suggested actions. Note actions on investigation form. For incomplete actions, note the responsible person (name, phone, and mail code) and expected completion date.

1. If "Yes," correct the conditions using a work order or internal process.

2. If "Yes," take action as suggested for questions 3–10.

3. If "No," do a Job Hazard Analysis. See URL: http://www6.jsc.nasa.gov/safety/hazard/docs/JSC17773C.doc
   A. If "no," provide adequate controls for the identified hazards.

4. If "Yes," take action as suggested for 4a below.
   A. Make sure all employees doing this task are properly trained from now on.

5. If "yes," take action as suggested for 5a–5c below.
   A. If "no," create adequate procedures for the task.
   B. If "no," make sure all employees doing this task are aware of and adequately trained in the procedures.
   C. If "no," determine why the employee(s) failed to follow procedures. If it was an honest mistake, counseling may be in order. If it was a willful disregard for procedures, disciplinary action may be in order.

6. If "yes," take action as suggested for 6a–6c below.
   A. If "no," create adequate safe work practices or requirements for the task.
   B. If "no," make sure all employees doing this task are aware of and adequately trained in the safe work practices or requirements.
   C. If "no," determine why the employee(s) failed to follow safe work practices or requirements. If it was an honest mistake, counseling may be in order. If it was a willful disregard, disciplinary action may be in order.

7. If "Yes," take action as suggested for 7a – 7b below.
   A. If "no," make sure all employees doing this task are aware that ppe is necessary and how to use it properly.
   B. If "no," determine why the employee(s) failed to use ppe or use it properly. If it was an honest mistake, counseling may be in order. If it was a willful disregard, disciplinary action may be in order.

8. If “yes,” take action as suggested for 8a–8b below.
   A. If “no,” make sure all employees doing this task are aware that permits are necessary.
   B. If “no,” determine why the employee(s) failed to handle the permits properly (or didn’t use them). If it was an honest mistake, counseling may be in order. If it was a willful disregard, disciplinary action may be in order.

9. If “no,” redesign indicators or controls to make them easier to understand or operate.

10. Were there any other system or management factors that may have contributed to the unsafe act?
    A. If “yes,” identify the source of the management pressure and remove it.
    B. If “yes,” determine what supervision is necessary to do the job safely and make sure it is provided.
    C. If “yes,” identify the source of peer pressure and remove it.
    D. If “yes,” take measures to reduce excess stress, exhaustion, or workloads.
    E. If “yes,” consider automating tasks to prevent boredom or redesign the job to reduce discomfort.
    F. If “yes,” review job qualifications and assignments. Improve employee qualifications or reassign personnel.
    G. If “yes,” be aware of it. Be sensitive to the employee since the circumstances may not have been preventable.

Attachment 2.6D, OSHA and NASA Mishap Categories

The following table correlates OSHA and NASA definitions.

OSHA Category	NASA category
Death or hospitalization of three or more persons for more than observation is immediately reportable to OSHA within 8 hours.	*Type A Mishap* (one or more of the following): • Death • A permanent total disability • Hospitalization of three or more persons within 30 workdays of the mishap for inpatient care • Damage greater than or equal to $2M
Lost workday case involving days away from work.	*Type B Mishap* (one or more of the following): • Permanent partial disability • Hospitalization of one or two persons within 30 workdays of the mishap for inpatient care • Damage greater than or equal to $500,000 and less than $2M
Days away, restricted, transfer – Cases that involve *days away from work* or *days of restricted work activity*, transfer to another job or any combination of the three. Lost Workdays (consecutive or not) on which the employee would have worked but could not because of an occupational injury or illness, not including the day of the injury. Lost workday case involving restricted duty (restricted work activity) – Workdays (consecutive or not; not including the day of the injury) on which, because of an injury or illness, the employee: (1) Was temporarily assigned to another job; or (2) Worked at a permanent job less than full time; or (3) Worked at a permanently assigned job but could not do all duties normally connected with that job.	*Type C Mishap* (one or more of the following): • Lost workday case • Restricted duty • Transfer to another job • Damage greater than or equal to $50,000 and less than $500,000
No corresponding OSHA category	*Mission or Test Failure* Prevents accomplishing primary mission or test objectives
No corresponding OSHA category	*Environmental Impact* Results in an unplanned and uncontrolled hazardous material spill or release or an environmental violation or fine
Medical Treatment Case as defined by OSHA	*Type D* (one or both of the following): • Injury or illness without lost time that requires “medical treatment” as defined by OSHA • Damage greater than or equal to $20,000 and less than $50,000
First-Aid Case as defined by OSHA Not OSHA-Recordable	*First-Aid Case* Injury or illness that requires only first-aid treatment (NASA Headquarters includes this in the “Close Call” category)
No corresponding OSHA category	*Close Call* (one or both of the following) • An event or a condition that could have resulted in an injury, an illness, or property damage, but did not. • Damage less than $20,000

Attachment 3.6A, Workers' Compensation for Civil Service Employees

1.0 WORKERS' COMPENSATION

This Appendix tells you how to apply for workers' compensation benefits as a civil service employee. The Federal Employee Compensation Act (FECA) provides workers' compensation benefits for civil service employees who are injured or become ill on the job. It also provides benefits to the survivors of those who die from job-related injuries or illnesses. If you are a contractor employee, follow your company's process to apply for workers' compensation benefits.

2.0 APPLYING FOR WORKERS' COMPENSATION AS A CIVIL SERVICE EMPLOYEE

To apply for workers' compensation, you must:

a. Tell your supervisor and go to the JSC Clinic if you have a job-related injury or illness.

b. Complete a JSC Form 340, "JSC Report of Occupational Injury or Illness."

c. Call the compensation specialist at (281) 483-4111 to discuss your benefits and request a Form CA-1. Complete the Form CA-1, have your supervisor sign it, and hand-carry it to the Injury Case Manager at the JSC Clinic, Building 8, room 244-D (or send it to Mail Code SD-32) as soon as possible and within 2 days of the injury or illness.

If you are injured, you must file a written notice of your injury on a Form CA-1 within 30 days of the injury to qualify for continuation of pay.

d. Get prior authorization from the compensation claims specialist before you seek private medical care. If it is an emergency, you may get private medical care without authorization. You must contact the compensation claims officer or specialist during the next working day.

e. Provide all information required to process your claim.

f. Submit to a medical examination if required to determine whether you are medically disabled. If you don't submit to a medical examination, your claim may be denied.

g. Return to your job if you are found fit for full duty.

h. Accept a light duty assignment if you are partially disabled. Your attending doctor will determine your workload and length of time on light duty.

3.0 WHAT TO DO IN AN EMERGENCY

If an employee is injured in an emergency:

a. Call your emergency number. The ambulance personnel will decide whether the injured employee should go to the JSC Clinic or a hospital.

b. If you are the employee's supervisor, you should go with the employee or send a coworker with the employee to the hospital.

c. If you go with an injured employee to the hospital, contact the compensation claims specialist when you arrive. The compensation claims specialist will authorize medical treatment at that time.

d. If you are the employee's supervisor, you should contact the compensation claims specialist immediately after the ambulance personnel begin treating the injured employee and report the following:

- Name of the employee
- Whether the employee is a civil servant or contractor
- The nature of injury
- When, where, and how it happened
- The names of any witnesses
- Where the employee was taken

Remember, your emergency numbers are: x33333 at JSC, Sonny Carter Training Facility, and Ellington Field, 911 at any off-site location, and x5911 at WSTF.

4.0 THE COMPENSATION CLAIMS OFFICER OR SPECIALIST

The compensation claims officer or specialist will:

a. Counsel you and your supervisor about your responsibilities and benefits after an on-the-job injury or illness.

b. Help you and your supervisor complete the necessary forms, process the necessary forms he or she must complete, and submit the forms as soon as possible to the Office of Workers' Compensation Programs.

c. Help you and your management find and correct the cause of your injury or illness.

d. Monitor your claim and medical information after it is approved to determine when you may return to work.

e. Authorize a clinic medical officer, your own doctor, or a hospital of your choice to treat you.

f. Work with your supervisor, the Human Resources Office, and other management officials to provide you light duty assignments and make reasonable accommodations if you are partially disabled by job-related injuries.

g. Contact the Office of Workers' Compensation Program to get the status of your claim, payment for compensation, and medical care.

h. Advise your supervisor, the Safety and Test Operations Division, and the Payroll Office how to charge lost time.

i. Monitor all claims to verify that all requirements are followed and only valid claims are paid. Submit necessary medical reports to the Office of Workers' Compensation Programs.

5.0 FOR MORE INFORMATION ON WORKERS' COMPENSATION

You can find more information in NPR 1800.1, "NASA Occupational Health Program Procedures," Chapter 6.

6.0 RESPONSIBILITIES FOR WORKERS' COMPENSATION

a. As a ***line manager***, you must:

- Make sure that your employees know and fulfill their responsibilities in paragraph 3 above.
- Fulfill your responsibilities in paragraphs 3 and 4 above.
- Help an injured or ill employee complete workers' compensation forms.
- Make sure lost time for injured employees is correctly charged. Contact the compensation claims specialist or Payroll Office for help.
- Contact the compensation claims officer or specialist if you have valid proof that a claim should be denied as soon as possible.
- Support the investigation of mishaps that result in workers' compensation claims.
- Take action to prevent such mishaps from happening again.

b. ***Site clinics*** must:

- Provide emergency or first-aid care for job-related injuries or illnesses.
- Document job-related injuries or illnesses.
- Give the compensation claims specialist any medical information required to support or deny a claim.

Attachment 3.8A, Emergency Actions

You must take the following actions in the following situations as described in the table below.

If you . . .	*Then . . .*
Hear a building fire alarm	• Leave the building immediately using the exit routes shown on the facility evacuation diagram on your floor. • DON'T use elevators to evacuate – ONLY emergency personnel involved in rescue operations are allowed to use the elevators. • If you need rescue assistance or are a designated "buddy" for a person needing rescue assistance, you should follow the procedures established for your building by the facility manager. See paragraph 3.8.8 of Chapter 3.8. • Help others evacuate the facility as needed without delaying your own evacuation or jeopardizing your safety. Use an alternate route if you can't use the primary exit route. • Shut down hazardous operations and secure classified material if you have time. • Go to a "safe area" designated by your supervisor or as stated in the EAP so he or she can account for you. Do not congregate in parking lots, since you may interfere with arriving fire-fighting vehicles. • Move your group to another area if the "safe area" isn't safe. • Remain at least 75 feet from the building in the assembly area until you get further instructions. • NEVER reenter an evacuated area until declared safe by safety personnel on the scene or the ALL CLEAR siren is sounded. • Never use vehicle parking areas as a "safe area" for assembly.
See a fire	• Evacuate people from the building by pulling the lever on a fire alarm pull box. This will ring the building fire alarm bells and signal the dispatcher. • Call your emergency telephone number from a safe location to make sure the dispatcher got the alarm signal. • Say, "I am calling to report a fire..." • Tell the dispatcher where the fire is (building and room number), how big the fire is, and what type of fire it is (e.g., chemical, electrical, or paper). • Stay on the line until the dispatcher says you may hang up. The dispatcher may put your call on hold briefly while emergency units are dispatched. • Give the dispatcher any information you think would help the emergency personnel find the fire. • Tell the dispatcher your name and the extension from which you are calling. • Meet the facility manager or emergency personnel near the building entrance if possible to relay vital information. • Go to a safe area designated by your supervisor so he or she can account for you. • NEVER reenter an evacuated area until declared safe by safety personnel on the scene or the ALL CLEAR siren is sounded.

Table continues on next page.

If you . . .	*Then . . .*
Smell smoke Smoke may come from many sources such as: Fluorescent light ballast Appliances such as coffee makers and stoves Jammed paper in a copy machine Electronics Welding or cutting	• Try to find the source of the smoke as soon as possible if it is only a faint odor. • If you can't find the source of the smoke, call your emergency number to ask for help. • If the smell gets stronger, you see flames, or you see large amounts of smoke, evacuate people from the building by pulling the lever on a fire alarm pull box. • Call your emergency telephone number from a safe location to make sure the dispatcher got the alarm signal. • Say, "I am calling to report that I smell smoke..." • Tell the dispatcher where you smelled the smoke (building and room number). • Stay on the line until the dispatcher says you may hang up. The dispatcher may put your call on hold briefly while emergency units are dispatched. • Give the dispatcher any information you think would help the emergency personnel find the smoke. • Tell the dispatcher your name and the extension from which you are calling. • Meet the facility manager or emergency personnel near the building entrance if possible to relay vital information. • Go to a safe area designated by your supervisor so he or she can account for you. • NEVER reenter an evacuated area until declared safe by safety personnel on the scene or the ALL CLEAR siren is sounded.
See or are involved in a medical emergency on your site – even if it isn't work-related	• Call your emergency telephone number from a safe location. • Say "I am calling to report a medical emergency. Please send an ambulance to..." • Tell the dispatcher where the emergency is (building and room number) and who the injured person is, if you know. • Stay on the line until the dispatcher says you may hang up. The dispatcher may put your call on hold briefly while emergency units are dispatched. • Tell the dispatcher what and how bad the injury is, whether it seems life-threatening, and whether the person is conscious or breathing. • Give the dispatcher any information you think would help the emergency personnel find the injured person. • Tell the dispatcher your name and the extension from which you are calling. • Have someone meet the emergency personnel near the building entrance if possible. • Don't move the injured person unless he or she is clearly in a life-threatening situation. • Stay with the injured person until medical help arrives. • Make sure blood is cleaned up only by trained personnel.

Table continues on next page.

If you . . .	*Then . . .*
See an explosion, leaking gas, or a chemical spill	• Call your emergency telephone number from a safe location. • Don't activate any fire alarms or evacuate any buildings. • Tell the dispatcher what you saw. • Tell the dispatcher what materials are involved, if you know. • Tell the dispatcher where the emergency is and how big the spill, leak, or explosion is. • Stay on the line until the dispatcher says you may hang up. The dispatcher may put your call on hold briefly while emergency units are dispatched. • Give the dispatcher any information you think would help the emergency personnel find the emergency. • Tell the dispatcher your name and the extension from which you are calling. • Stay on the line until the dispatcher says you may hang up. • Stay in your safe location until you get further instructions.

JSC Employee Alarm System

Whoop (low to high siren) - Seek shelter and get more information

3-5 minute Wavering Tone - Attack Warning (nuclear or conventional) (air raid warning)

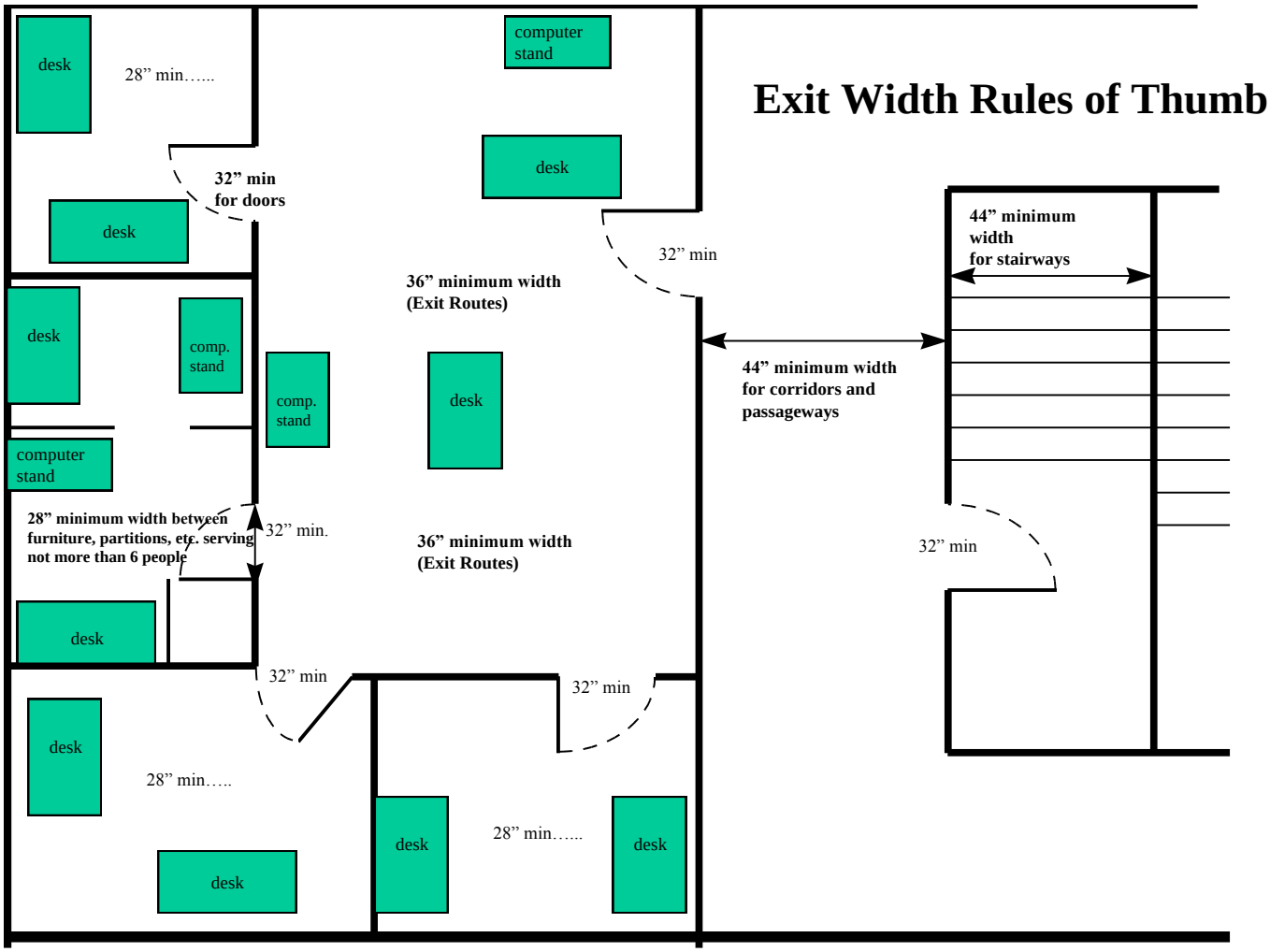
Wail (single, constant tone) - All Clear

Short Wail (like a noon whistle) - Periodic System Test (1st Thursday of every month at noon)

If you hear the employee warning system:

- Get inside a building as soon possible and warn others to stay inside.
- Close all doors and windows.
- Tell your facility manager, supervisor, or Safety Officer.
- Turn off the air handlers (call x33061 or x32038 for help at JSC).
- Call your emergency number if you have important information about the emergency.
- Move cross-wind to any chemical clouds.
- Stay inside until you get further instructions over the employee warning system.

Attachment 5.1A, Exit width rules of thumb



Notes:

1. 32-in. door widths are "clear" widths. (A "clear width" is the width of the opening through the fully open doorway, not the width of the doorframe.)
2. Minimum width of stairways is measured from wall to wall and not from handrail to handrail.

Attachment 5.2A, Guidelines for safe manual lifting and material handling

1.0 THE NEED FOR SAFE LIFTING AND MATERIAL HANDLING

Overexertion in the workplace accounts for a large number of disabling injuries nationwide. Here at JSC, it is one of the most common causes for lost workdays. Most of these injuries involve the acts of manually handling materials. This chapter discusses recommendations regarding the safe load weight, size, location, and frequency of handling along with factors that mitigate these recommendations. You should follow these recommendations both at work and at home.

2.0 LIFTING RISK FACTORS

Most back pain is actually the result of repeated micro-traumas to the tendons and ligaments in the back. If you routinely lift heavy objects (including small children), you may be injuring your back. Look at your activities at work and at home to determine whether you have any of these risk factors. Stressing your back at home can result in back pain at work. Risk factors can include:

a. Lifting an object that is too heavy. A weight that can safely be handled by 90% of the worker population is 45 to 50 pounds for a man and 25 to 30 pounds for a woman

b. Location/site-position of the load center of gravity with respect to you

c. Frequency, duration, and pace

d. Stability of the load

e. Handle size and shape

f. Environmental factors such as temperature, humidity, illumination, noise, vibration, friction, and stability of your footing

3.0 ENGINEERING CONTROLS TO REDUCE THESE RISK FACTORS

Engineering controls that you may use include:

a. Load location—start and end relationship, floor condition, body posture

- Store heavy objects at waist height and not below knee height
- Keep heavy objects off floor
- Minimize the distance from your body
- Avoid deep shelves where two or more bulky containers could be placed back-to-back
- Do not reach across table, etc. to lift

b. Install handles on push-pull containers

c. Install larger wheels on containers to minimize pushing/pulling forces

d. Adjust visual environment

e. Use automatic leveling devices: lift tables, chain hoists, dollies, etc.

4.0 SUPERVISOR AND ADMINISTRATIVE CONTROLS

a. Determine the ability of workers before assigning duties:

- The capacity to perform the physical act of lifting varies considerably not only from individual to individual but also by an individual over time
- Attitude—workers' values and job satisfaction

b. Train all employees in the:

- Risks of lifting
- Mechanics of lifting
- Effects of lifting on the body

c. Provide mechanical lifting aids

d. Institute job rotation

5.0 WORK PRACTICE CONTROLS TO REDUCE THESE RISK FACTORS

You can take the following measures:

a. Before you lift:

- Test the weight of the object. Only you know your limits.
- If you will be lifting something heavy, equip yourself properly. Protect your fingers with gloves and cover your toes with heavy shoes. You could stress your back if you have to move suddenly to avoid injury.
- Position yourself so you do not have to twist any part of your body awkwardly or abruptly.
- Do not reach down to lift an object while you are sitting. Get up and use correct lifting techniques.
- Avoid reaching across counters, tabletops, desks, or other surfaces to pick up an object. If you cannot walk around to get it, slide the object toward you rather than lifting it.

b. Ask yourself:

- "Can I safely slide or push this object, rather than lifting it?"
- "Do I need help?"
- "Do I need to get handling equipment such as a dolly?"
- "Is the path clear?"

- "Is the path level?"
- "Can I see where I'm going?"
- "Do I have a clear landing spot for the object?"

c. When you lift:

- Do not use the small muscles in your back. Instead, use the large muscles in your legs.
- Maintain the natural curves of your back.
- Keep loads close to your body. If the object is too large to fit between your feet, get help.
- Keep heavy objects in your safety zone—between shoulder-height and knuckle-height.
- Avoid lifting objects from the floor.
- Avoid simultaneous lifting and twisting.
- Avoid rapid, jerky motions during lifting.
- Design load packaging for easy worker handling. If possible, reduce weight of load by removing some of the items in the box or package.
- Always lift with two hands.
- To give your back extra support, tighten your abdominal muscles.
- Continue to breathe normally. Never hold your breath.
- Never bend at the waist to pick up an object.
- Look up before you pick up. This will help you maintain the natural curves in your neck and lower back.
- When lifting a heavy or bulky object, grasp it firmly, holding it as close to your body as possible. If it does not have lifting handles or if you cannot grasp it by the corners farthest from you or if you cannot get it close to your body, get help or get the proper handling equipment.
- Do not lift higher than your safety zone. If the object is above your head, mount a sturdy, stable ladder to bring your chest as even as possible with the object.
- If your job requires repeatedly lifting or moving objects, vary your activities, thereby allowing some muscles to rest while others are working.

d. When you carry:

- Take small steps and move slowly.
- If possible, face the direction in which you want to carry the load before lifting it. If you must change directions after you have lifted the load, pivot your feet, do not twist your back.
- Use your lifting skills to set an object down as carefully as you lifted it.

- The farther you must carry an object, the lighter the load should be. Do not carry a heavy load for a long distance. Break it up into several smaller loads, use proper handling equipment, or get help.

6.0 SHOULD I USE A BACK BELT WHEN LIFTING?

NIOSH does not recommend the use of back belts for lifting. If the belt is used properly (tightening the belt before lifting an item), it can prevent your bending at the waist when you lift. However, people frequently believe that the belt can help you safely lift a heavier load… THIS IS NOT THE CASE!!

7.0 WHAT SHOULD I DO IF I AM EXPERIENCING BACK PAIN OR DISCOMFORT?

If you notice any pain or discomfort:

a. Report your discomfort to your supervisor.

b. Evaluate the stresses that you are placing on your back muscles at home and at work.

c. Go to the JSC Clinic for a medical evaluation.

d. Design your work and work area to minimize risk factors.

e. Attend a training class on lifting.

f. Use proper lifting techniques.

Attachment 6.4A, Periodic Cleaning of Water Coolers

Space Medicine Operations Division Recommendations for Periodic Cleaning of Water Coolers

1.0 Purpose: This document provides an acceptable procedure for cleaning bottled-water dispensers. It describes general sanitary practices with the goal of controlling microbiological contamination in water coolers.

2.0 Frequency: Every 3-4 months, during bottle replacement.

3.0 Personal Protective Equipment (PPE) Required

a. Eye protection: Chemical Goggles or Face Shield
b. Natural latex rubber, nitrile or PVC gloves

4.0 Equipment

a. Water Dispenser
b. Bottled Water
c. Bleach Solution
d. Sponge
e. Bucket

5.0 Procedure

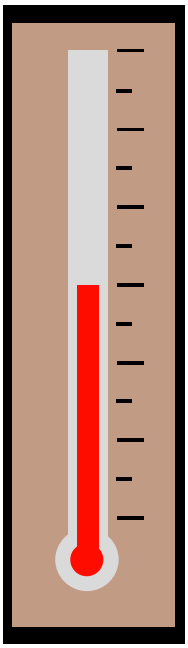
a. Preparing Bleach Solution
   (1) Don PPE.
   (2) Prepare a disinfecting solution by adding one tablespoon (15ml) of household bleach per gallon (4.5L) of water.
   (3) Label the bleach solution container following instructions in Chapter 9.2, paragraph 9.2.17, of this handbook. Also, label with your name and the date.
   (4) Bleach solution must be used within one week of preparation.
b. Cleaning of Water Dispenser
   (1) Unplug the cord from electrical outlet of water dispenser.
   (2) Remove bottle, and drain any water through the spigot.
   (3) Use gloves and eye protection when working with bleach.
   (4) Use the sponge to scrub the interior surface of the water cooler reservoir with the bleach solution and let stand for not less than two minutes but not more than five minutes.
   (5) Drain the bleach solution from the reservoir through the spigot into a bucket.
   (6) Dispose of the bleach solution into the sanitary system.
   (7) Rinse the reservoir thoroughly by filling the reservoir with clean tap water or bottled water four (4) times. Drain the rinse water through the cooler spigots into a bucket. This will remove traces of the bleach solution. Dispose of rinse water into the sanitary system.
   (8) Place new bottle onto dispenser.
c. Cleaning the drip tray
   (1) Lift off the drip tray.
   (2) Remove the screen and wash both tray and screen in mild detergent or bleach solution.

(3) Rinse well in clean tap water and replace on cooler.

Attachment 6.5A, Normal boiling points of cryogenic fluids

CRYOGENIC THERMOMETER
Normal Boiling Points of Cryogenic Fluids

		DEG. F	DEG. R	DEG. K	DEG. C
KRYPTON	LKr	-242.1	217.59	120.2	-152.8
OXYGEN	LOX	-297.3	162.39	90.2	-182.8
ARGON	LAr	-302.3	157.39	87.4	-185.6
FLUORINE	LF2	-306.7	152.99	85.0	-188
NITROGEN	LN2	-320.4	139.29	77.3	-195.7
NEON	LNe	-410.9	48.79	27.1	-242.9
HYDROGEN	LH2	-423.2	36.49	20.3	-249.7
HELIUM	LHe	-452.1	7.59	4.2	-269/9
ABSOLUTE ZERO		-459.69	0	0	-273.0



Attachment 6.5B, Liquid oxygen

Properties and characteristics:

- Normal boiling point: –297°F (90 K [Kelvin])
- Appearance: pale blue
- Toxicity: toxic to humans
- Vapor density: .279 lb/ft^3 (about one-fourth that of air)

Material incompatibility:

- Causes organic materials to react violently when ignited
- Can detonate powdered organic materials

Flammability: Nonflammable; however, it can rapidly increase rate of burning in a fire

Safety and handling:

- Avoid skin or eye contact
- Use proper storage and handling equipment
- Provide adequate ventilation
- Prevent sources of ignition
- Obtain a thorough knowledge of this material before handling
- Use the “buddy” system when handling

Major hazards:

- Fire: Remember that oxygen/fuel mixtures ignite readily and may explode. Materials that burn in air usually burn much faster in oxygen; materials that do not normally burn in air may burn in oxygen.
- Exposure: Cold gas or liquid may cause skin and eye injuries similar to burns.
- Extreme cold can condense LO_2 and LN_2 on uninsulated surfaces, adding to local fire hazards. Condensed LO_2 can react with oil and grease to cause a fire.

Precautions:

In case of . . .	*Take these actions . . .*
Spill or Leak	Shut off source(s) of ignition. No smoking or use of traffic control flares permitted. Keep unnecessary personnel away from area. DO NOT walk on or roll equipment over spill area until frost has disappeared. Use proper clothing (gloves, face shield, etc.) to enter spill area. Shut off source(s) of supply by using proper equipment. Fog in form of condensed moisture usually indicates water vapor.
Fire	Use water to spray container that is exposed to fire. If substantial parts of container insulation jacket and insulation are gone, vacate general area immediately (explosion hazard).

In case of . . .	*Take these actions . . .*
Exposure	Thaw frosted parts with water. Get prompt medical attention. Air clothing thoroughly for 30 to 60 minutes before smoking or approaching any source of ignition.

Attachment 6.5C, Liquid hydrogen (LH_2)

Properties and characteristics:

- Normal boiling point: –423°F (20 K)
- Appearance: colorless, odorless
- Toxicity: nontoxic
- Vapor Density: 0.083 lb/ft^3 (about one-fourteenth that of air)

Material incompatibility: not corrosive or significantly reactive

Flammability limits: in air by volume (H_2 gas): 4.0 to 74.2%

Safety and handling:

- Avoid contact with eyes and skin.
- Use proper storage and handling equipment.
- Provide adequate ventilation.
- Prevent sources of ignition.
- Obtain a thorough knowledge of this material before handling.
- Use the "buddy" system when handling.

Major hazards:

- Fire: LH_2 is extremely flammable. Hydrogen-air mixtures are readily ignited and may be explosive in confined spaces. Flames are invisible. Hydrogen can self-ignite if rapidly released in large volumes.
- Exposure: Cold gas or liquid may cause skin or eye injuries similar to frostbite. Though vapor is not toxic, breathing it may cause sudden unconsciousness because of lack of oxygen.

Precautions:

In case of . .	*Take these actions . .*
Spill or leak	Shut off source(s) of ignition. No smoking or use of traffic control flares permitted. Be aware that invisible flames may be present. Keep unnecessary personnel away from area. Self-contained breathing apparatus and gloves are required to enter spill area. Shut off source(s) of supply by using proper equipment. Fog in form of condensed moisture usually indicates water vapor.
Fire	Permit escaping hydrogen to burn if flow cannot safely be shut off. Spray tank with water if it is exposed to fire. If a substantial part of insulation jacket and insulation is gone, immediately vacate general area (explosion hazard).
Exposure	Remove victim(s) to fresh air. If not breathing, administer CPR; provide oxygen as appropriate. Thaw frosted areas with water. Get medical attention promptly.

Attachment 6.5D, Liquid nitrogen (LN_2)

Properties and characteristics:

- Normal boiling point: –320°F (77 Kelvin)
- Appearance: colorless, odorless
- Toxicity: nontoxic to humans
- Vapor density: 0.288 lb/ft^3 (about one-fourth that of air)

Material incompatibility: noncorrosive

Flammability: noncombustible

Safety and handling:

- Avoid contact with eyes and skin.
- Use proper storage and handling equipment.
- Provide adequate ventilation.
- Obtain a thorough knowledge of this material before handling.
- Use the "buddy" system when handling.

Major hazards:

- Fire: LN_2 is inert and will not burn.
- Exposure: Vapor is not toxic, but breathing it may cause sudden unconsciousness because of lack of oxygen. Cold gas or liquid may cause skin and eye injuries similar to burns (frostbite).

Precautions:

In case of . . .	*Take these actions . . .*
Spill or Leak	Keep unnecessary personnel away. Appropriate personnel required. Use appropriate self-contained breathing apparatus in spill area. Fog in form of condensed moisture usually indicates vapor area. Shut off leak source(s) of supply using proper equipment.
Fire	Nitrogen can help put out fire. Spray tank with water if it is exposed to fire.
Exposure	Remove victim(s) to fresh air. If not breathing, apply artificial respiration and oxygen. Thaw frosted areas with water. Get medical attention promptly.

Attachment 8.2A, Policy for issuing locks and tags

1.0 POLICY AND PROCEDURES

This attachment is JSC's policy issuing LO/TO locks, LO/TO tags and operational control tags, which will be called "equipment." Issuing LO/TO equipment will be as follows:

a. The JSC LO/TO Center issuer (LO/TO-CI) issues the equipment. The JSC LO/TO-CI is provided by the Safety and Test Operations Division, mail code NS. The LO/TO-CI will issue equipment to designated contractor safety representatives or their designee (such as a shift supervisor), whose organization conducts LO/TO operations at JSC, Ellington Field, or the Sonny Carter Training Facility.

b. As a designated contractor safety representative, you must submit the normal request for LO/TO equipment to the LO/TO-CI for the amount of equipment that you expect your organization would normally need to conduct LO/TO operations. Request forms are available from the LO/TO-CI. The LO/TO-CI will process requests during daytime work hours.

c. The LO/TO-CI will issue equipment to the contractor requestor and maintain a record of the equipment issued. If additional equipment is needed by the contractor after normal work hours (i.e., nights, weekends, or holidays), you—as a contractor safety representative—or your designee (shift supervisor) can get equipment on an emergency basis from the on-duty Fire Protection Specialist (temporary Center issuer) at Building 25. If the on-duty Fire Protection Specialist is not available at Building 25, you will find a telephone number (security dispatcher) and instructions on the LO/TO equipment storage locker to contact the Fire Protection Specialist, who will return to the site and issue the equipment.

d. Ellington Field and Sonny Carter Training Facility will also have an inventory of equipment available during normal work hours. As the designated contractor safety representative, you must maintain the inventory and be responsible for issuing equipment during normal hours for scheduled LO/TO work, including work scheduled for non-normal hours. If emergency work or work not previously scheduled requires additional equipment, you or your designee must get additional equipment from the Fire Protection Specialist (temporary Center issuer) at JSC.

2.0 RESPONSIBILITIES

a. The ***LO/TO-CI*** is responsible for:

- Submitting purchase orders for LO/TO equipment as needed to maintain a working inventory.
- Issuing LO/TO locks, LO/TO tags, and operational control tags (equipment) during normal work hours and making provisions for issuing LO/TO devices outside of normal working hours and on an emergency basis.
- Maintaining a record of the equipment issued.

- Making sure an adequate amount of replacement equipment is available at JSC, Ellington Field, and Sonny Carter Training Facility by contacting the designated safety representatives periodically.

b. As a ***Designated Safety Representative***, you are responsible for:

- Determining the realistic amount of LO/TO equipment that your organization will need.
- Obtaining the determined amount of equipment from the LO/TO-CI and issuing it as needed to your organization involved in LO/TO operations. Whenever possible, contact the LO/TO-CI in advance to ensure that an adequate supply of equipment will be on hand to meet your request, and request your replacement equipment as needed from the LO/TO-CI.
- Supporting JSC annual inventories and periodic audits of the JSC LO/TO program as required by JSC implementation of 29 CFR 1910.147.

Attachment 8.2B, Operational Control

1.0 JSC'S OPERATIONAL CONTROL PROGRAM

This Attachment is JSC's operational control program to safely control configuration or other operations when lockout/tagout is not required. It provides a consistent and uniform policy and minimum requirements for safe operational control of machinery, equipment, or systems to prevent damage from inadvertent activation. The procedure in this Attachment ensures that machines, equipment and/or systems are, as a minimum, properly and uniformly tagged out throughout JSC.

If you work within the boundaries of JSC, you must follow this JSC basic operational control program. All employers working at JSC must follow this basic JSC program and use the procedure for attaching Warning, Do Not Operate tags to energy-isolating devices. This is to prevent unexpected energization, startup, or release of stored energy to the machinery, equipment, or systems.

Each project, contractor, or organization may take this basic policy and add addendums, as long as the intent of the basic policy is met or exceeded, followed by all employees and strictly enforced.

2.0 GENERAL REQUIREMENTS AND ENFORCEMENT

The following requirements apply to all employees at JSC. If you:

a. See a piece of equipment that is tagged out, you **must never** attempt to start, energize or use that machine, equipment or system.

b. Are responsible for configuring equipment, you must follow the procedures listed below when tagging out.

c. Violate these procedures, you are subject to disciplinary measures by your employer as described in Chapter 3.7, "Disciplinary system," of this Handbook.

3.0 JSC'S BASIC TAGOUT PROCEDURE

You must follow these steps when tagging out equipment for purposes other than maintaining, servicing, or repairing equipment:

a. Notify "affected employees" who operate or use the machinery, equipment, or system.

b. Attach tagout tags to the isolation devices for the necessary time. You are also encouraged to use craft or shop locks per your organizations' policy for extra security. However, you must never use a red lockout/tagout lock for operational control.

c. Isolate an energy source with the isolation device.

d. Remove tagout tags from the isolation devices.

e. Restore the machinery, equipment, or system to operation.

f. Notify “affected employees.”

4.0 TAGS

You must only use tagout tags (JSC form 19A, WARNING, DO NOT OPERATE tag) and attach them with nylon cable ties, for operational control.

Tags are essentially **Warning Devices** attached to energy-isolation devices or lockout devices, but provide no physical restraint as would be provided by a lock.

a. When a tag is attached to an energy-isolation device for operational control purposes, other than maintenance or repair activities (lockout/tagout), no one may remove it without authorization of the person responsible for the tag or authorization from a supervisor. It also must never be bypassed, ignored or otherwise defeated.

b. The employee who removes the tag must ensure any control records are updated to record the tag removal and restoration of service.

c. Tag information must be legible and understandable.

d. You must only use **JSC Form 19A for Operational Control.** Never use JSC Form 19A, WARNING, DO NOT OPERATE, as a DANGER, LOCKOUT TAGOUT tag.

5.0 TAG REMOVAL

Preferably the employee who applied the tag should be the one to remove the tag, but if not practical, the employee’s supervisor is authorized to assign someone to remove the tag when required. Periodically review tags in the area to ensure they are still needed.

6.0 TRAINING FOR OPERATIONAL CONTROL

If you are involved in operational control, you must have lockout/tagout training as described in Paragraph 8.2.12 of Chapter 8.2 of this Handbook.

Attachment 8.8A, Training Matrix of Requirements for Fall Protection and Rescue Personnel

	Program Administrator	Qualified Person	Competent Person	Authorized Person / Authorized Rescuer	Competent Person, Competent Rescue, Qualified Person Trainers
Trained or Evaluated By:	• A Competent Person trainer • A Qualified Person trainer.	A Qualified Person trainer.	▪ A Competent Person trainer ▪ A Qualified Person trainer.	▪ A Competent Person, ▪ A Qualified Person, ▪ A Qualified Person trainer, or ▪ A Competent Person trainer. • • The Authorized Rescuer shall be evaluated by: ▪ A Competent Rescuer or ▪ A Competent Rescue Trainer.	
Frequency:		Not less than once every two years.	Not less than once every two years.	Be evaluated at least annually on the items in “Demonstrations” below. Receive training: ▪ Before they are exposed to a fall hazard for the first time; ▪ When the nature of the work changes, ▪ When the nature of the workplace changes, ▪ When the methods of eliminating or controlling a fall hazard change to an extent that prior training is not adequate; ▪ When the person does not have the required level of knowledge, or • When the person is not following the required means and methods.	

	Program Administrator	Qualified Person	Competent Person	Authorized Person / Authorized Rescuer	Competent Person, Competent Rescue, Qualified Person Trainers
Skills Covered:	• Applicable fall protection regulations, • Selecting fall protection systems, including the common hazards associated with each system and component, • Developing a managed fall protection program, • Fall hazard surveys, • Selection and appointment of steering committee personnel, • Developing approved equipment purchase lists, • Selecting and appointing competent and qualified people, • Developing written fall protection, rescue, and evacuation procedures, • Developing engineering system standards, • Developing training programs, • Investigating incidents and near misses.	▪ The responsibilities of authorized, competent, qualified, and program administrators with respect to fall protection, ▪ Applicable fall protection regulations, ▪ Preparing fall hazard surveys, ▪ Fall hazard elimination and control methods, ▪ Selecting fall protection systems, including the common hazards associated with each system and component, ▪ Assessing fall protection systems and determining system safety (clearance requirements, free fall distance, swing fall forces, impact forces), ▪ Developing written fall protection, rescue, and evacuation procedures, ▪ Developing engineering system standards, ▪ Designing, selecting, and analyzing anchorages and anchorage structures, ▪ Designing new, and evaluating existing, horizontal lifelines, ▪ Inspection and recoding of equipment components and systems (including component compatibility), ▪ Determining when fall protection systems are infeasible, ▪ Investigating incidents and near misses.	• The responsibilities of authorized, competent, qualified, and program administrators with respect to fall protection, • Applicable fall protection regulations, • Fall hazard elimination and control methods, • Selecting fall protection systems, including the common hazards associated with each system and component, • Preparing fall hazard surveys, • Developing written fall protection, rescue, and evacuation procedures, • Inspection and recoding of equipment components and systems (including component compatibility), • Assessing fall protection systems and determining system safety (clearance requirements, free fall distance, swing fall forces, impact forces), • Selection, and use, of non-certified work positioning and travel restraint anchorages. • Investigating incidents and near misses.	The program administrator determines what training is required by an Authorized Person and considers: ▪ What trainees are required to know or do; ▪ Any available job analysis and any changes to the job; ▪ Site specific information; ▪ Special abilities, needs, or languages of the trainee; ▪ Previous training provided to the trainee; and ▪ Regulatory requirements and changes to regulations.	Experience, knowledge and training skills in adult education.

	Program Administrator	Qualified Person	Competent Person	Authorized Person / Authorized Rescuer	Competent Person, Competent Rescue, Qualified Person Trainers
Demonstrations:		**How to properly:** • **Select the equipment,** • **Inspect the equipment prior to use,** • **Install the equipment,** • **Anchor appropriately,** • **Assemble the components,** • **Use the selected fall protection equipment in the field where the work is done,** • **Dismantle the system, and** • **Store the equipment.**	**How to properly:** • **Select the equipment,** • **Inspect the equipment prior to use,** • **Install the equipment,** • **Anchor appropriately,** • **Assemble the components,** • **Use the selected fall protection equipment in the field where the work is done,** • **Dismantle the system, and** • **Store the equipment.**	• **Demonstrate how to properly use the types of equipment that the person is authorized to operate.** • **Pass a written examination.**	