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Glenn Safety Manual – Chapter 1A

Glenn Safety Permit System w/Change 4 (5/24/2016)

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***Include all information for each revision. Do not remove old revision data. Add new rows to table when space runs out by pressing the tab key in the last row, far right column.*

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Chapter 1A—Safety Permit Process

NOTE: *The current version of this chapter is maintained and approved by the Safety and Health Division (SHeD). The last revision date of this chapter was May 2010. The current version is located on the Glenn Research Center (GRC) intranet within the BMS Library. Approved by Chief of Safety and Health Division.*

1.0 PURPOSE

The purpose of the safety permit system is to avoid undue risks, injury to personnel, damage to property, or disruption of operations by

- Assuring that a systematic approach is used to identify and control potential hazards
- Obtaining an independent, thorough, and timely safety review of all technical designs, tests, and operations
- Permitting the operation of facilities, systems/subsystems, and experiments within safe constraints
- Controlling changes to permitted facilities system/subsystems, and experiments to ensure continued safe operations
- Instilling safety awareness in all employees and ensuring that facility/test personnel have received the necessary training to safely and properly operate test facilities and research rigs

2.0 APPLICABILITY

The safety permit system applies to research areas and institutional systems across the Glenn Research Center (GRC) and Plum Brook Station (PBS) and to research or test equipment designed and fabricated at GRC that would also be tested offsite.

3.0 BACKGROUND

The requirements of this chapter were derived from NASA Procedural Requirement (NPR) 8715.3—NASA General Safety Program Requirements, NASA Safety Standard (NSS) 8719.7—Facility System Safety Standard, and the GRC Safety and Health Division (SHeD) Manual, Chapter 1—Safety and Health Management System.

4.0 POLICY

Research areas requiring safety permits shall be determined by the area safety committee chair, laser safety committee chair, or biological safety committee chair and will include laboratories, test sites, test cells, and research operations with potential hazards to personnel or facilities. Institutional systems requiring safety permits shall be determined by the process systems safety committee (PSSC) chair or the electrical applications safety committee (EASC) chair.

Permitted research areas and institutional systems shall have an active safety permit for operation. Active safety permits shall be posted at or near the research areas or systems. Expired safety permits shall be removed by the permit requester or safety chair.

The safety permit requester shall submit a safety permit request to SHeD for each proposed GRC test operation, institutional system, and/or modifications to permitted areas and systems, each as determined by the appropriate safety committee chair.

5.0 RESPONSIBILITIES

5.1 Safety Permit Requester

It is the responsibility of the safety permit requester and the supervisor who are assigned to a system, experiment, or facilities operation to ensure that the design and operation of research equipment are safe. All systems should be designed to fulfill fail-safe requirements and to avoid any unsafe condition to any interfacing system. The safety permit requester is also responsible for periodically reviewing the status of the permits and ensuring that expired

safety permits are not posted in the areas of responsibility. In addition, requesters must ensure that equipment is not operated until an approved safety permit is obtained from the safety chair.

5.2 Safety Committee Chair

It is the responsibility of the safety committee chair, using the guidelines in this chapter, to evaluate and determine when a safety permit is required. The safety chair may enlist the assistance of a safety, health, or environmental division representative or any other members of the safety committee to determine the need for a safety permit. The safety chair has the authority to authorize operations under the specific operating conditions noted on the safety permit, provide temporary extensions out of operational necessity, or suspend the safety permit based on unauthorized activity or violation of any NASA headquarters safety and health standard or SHeD manual requirement. The chair may also waive the requirement for a safety permit if the work can be covered by laboratory standard practices and there are no significant hazards to personnel or facilities.

5.3 Safety Committee Members

It is the responsibility of the area safety committee members, through an onsite visit, to review safety permit documentation for facility and test operations and insure that all identified hazards are documented and adequately controlled in accordance with NASA policies and requirements. In addition, the committee will recommend specific conditions of operation designed to minimize risk to personnel, equipment, or facilities.

5.4 Safety and Health Division (SHeD) Team Leaders

It is the responsibility of the team leaders of SHeD, operations, compliance, PBS, and facility teams to provide safety, health, and environmental support to the safety committees by reviewing safety permit documentation, serving as a resource for interpreting Occupational Safety and Health Administration (OSHA) and Environmental Protection Agency (EPA) regulations, and ensuring that permitted operations comply with NASA Safety and Health Standards, National Consensus Standards, and the GRC Safety and Health Division Manuals.

5.5 Chief, Safety and Health Division (SHeD)

It is the responsibility of the chief of SHeD to maintain the division safety permit files, represent the safety committees on the Safety, Health and Environmental Board (SHEB), seek qualified individuals to serve as safety chairs and recommend their appointment to the Center director.

6.0 REQUIREMENTS

6.1 Process Summary

The safety permit process can be divided into eight distinct steps:

1. **Determination**.—Requester determines if a proposed activity will require a safety permit.
2. **Application**.—Requester prepares Safety Permit Request (NASA GRC923), Safety Permit Hazard Analysis worksheet (NASA GRC923a), Facility Hazard Analysis (FHA per NASA–STD–8719.7), and Qualified Operators List (NASA GRC580) forms with all supporting documentation. Requester obtains supervisor approval and mails the original documentation plus four copies to “SHeD” at mail stop 6–4.
3. **Review**.—Safety committee reviews safety permit request forms, and safety chair requests onsite visit to activity location. Safety committee reviews suitability of location, adequacy of controls, and recommends conditions of operation to safety committee chair.
4. **Issuance**.— Safety committee chair issues Safety Permit (NASA GRC919) and NASA GRC580 (as a minimum) and files copies with both the safety chair and the SHeD offices. Requester posts the signed original at the activity location.
5. **Maintenance**.—Activity is performed until permit expires or modifications are made.
6. **Modification/renewal**.—Any major changes or modifications to the design, operating conditions, or procedures and/or any changes to the facility hazard assessment are documented on the Safety Permit Renewal /Change Request (NASA GRC590), NASA GRC580, and associated hazard analysis forms.

7. **Termination/phase down**.—Activity is completed. Safety permit is removed, and requester or NASA technical supervisor signs off at the lower right-hand side and mails it to "SHeD" at mail stop 6–4. Cleanup and removal of chemicals are performed. Requester contacts the safety representative to the committee to verify that facility is left in a safe condition. Safety permit is closed out and archived in SHeD files.

8. **Appeal**.—If a permit is denied or a stop-work order is issued, the requester can appeal to SHEB. This step is reserved for situations where a risk management decision must be made and the decision goes beyond the authority of the safety committee (e.g., final risk assessment code of 3 or less).

Any safety permit hazard category with a final risk code of 1 or 2 shall not be permitted. See risk assessment code (RAC) matrix in Appendix B.

6.2 Determining the Need for a Safety Permit

The safety committee chair or designated safety committee members can perform a preliminary review of the hazards associated with the proposed activity and provide guidance on whether a safety permit is required. As a general rule of thumb, any operation or activity that has equipment that contains hazardous chemicals (not simply laboratory chemical handling), pressurized vessels or components, sources of ionizing or non-ionizing radiation, operates at high or low temperatures, has electrical or mechanical energy sources, or has fire or life safety hazards will need a safety permit. The chair and committee members are supported by SHeD safety and occupational health personnel in making this determination. General hazard categories shown on the NASA GRC923a are as follows:

- CHEMICALS (beyond laboratory scale handling)
- COLLISION (rotating or moving equipment)
- ELECTRICAL SHOCK (>50 volts)
- TEMPERATURE EXTREMES (materials or processes that are high, >120 °F or low, <32 °F)
- FIRE (capable of producing sufficient heat to produce combustion)
- EXPLOSION/IMPLOSION (vacuum or pressurized vessels or piping)
- HIGH NOISE (equipment that generates noise levels of 80 decibels or higher)
- RADIATION (lasers, radioisotopes, radiofrequency radiation, or induced electromagnetic force)
- LOSS OF HABITABLE ATMOSPHERE (presence of materials that could reduce breathable oxygen concentration to less than 19.5 percent)
- CORROSION (subject to corrosion from environmental factors)
- BIOLOGICAL (research involving pathogens, bacteria, viruses, plants, embryonic cells, animals, or humans subjects)
- OTHER (hazards not covered by any other category)

6.3 Applying for a New Safety Permit, Renewal, or Modification

When applying for a safety permit, the requester must determine which safety committee at GRC has jurisdiction and which safety chairman should be contacted prior to submitting the safety permit documentation. Below are links of interest:

- Safety committee area map for GRC
- Safety committees that have activity, rather than area, jurisdiction: laser safety, biological safety, process safety, and electrical applications safety
- Safety chair/safety committee listing by safety committees for GRC and PBS

When the design is complete in a timely fashion (typically 30 to 60 days prior to the planned initiation of operations, depending on the scope and complexity of the planned activity), the requester prepares and submits these forms to

the requester's branch chief for review and signature: NASA GRC923, NASA GRC590, NASA GRC923a, and NASA GRC580; Plum Brook Hazard Analysis or a Facility Hazards Analysis, FHA per NASA–STD–8719.7; Plum Brook Station Hazard Analysis format or contractor equivalent form; and any required supporting documentation. All safety permit forms are located at the GRC electronic forms Web site.

When the requester is a NASA support service contractor (SSC), the branch chief of his or her NASA organization acts as the NASA technical supervisor on the forms. After the request has been approved by the NASA technical supervisor, a copy is submitted to SHeD at mail stop 6–4. SHeD administrative staff will then assign a permit number to the safety permit and distribute it for review to the safety chair and SHeD personnel. The safety chair distributes review copies for safety committee members who are not part of SHeD.

6.4 Safety Permit Review

After submittal of the request, the safety committee chair or assigned technical lead schedules a review of the proposed operation. For most reviews, the chair should involve a minimum of three committee members, two of whom preferably come from safety and health disciplines. As needed, the safety committee may also call on advisory personnel to assist it. SHeD conducts a review to ensure compliance with OSHA or EPA regulations, NASA safety standards or national consensus standards, industrial hygiene, hazardous chemical, or health physics requirements. After the safety committee has reviewed the submittal, an onsite meeting and walk-through of the facility is normally held. Opinions, concurrences, or clarifications are to be documented, forwarded to the permit requester for a response, and filed by the safety committee chair as part of the review documentation. The SHeD representatives must provide their input at this time to the safety committee chair. If action items are assigned to the requester, another meeting may be required to complete the review. The safety committee representatives from SHeD also verify closure of open safety issues and/or concur on acceptable risk codes for all hazards identified in the hazard analysis form. If open safety issues cannot be resolved through the safety chair or if the final risk assessment code is 3 or less for any hazard, as shown in the risk matrix in Appendix B, the chief of SHeD may choose to escalate the review of the permit to SHEB or to the director of code Q, Safety and Mission Assurance Directorate (SMAD) for ultimate disposition.

6.5 Issuing the Safety Permit

After the safety committee reviews a safety permit, the safety chair or designee prepares the NASA GRC919 with appropriate operating conditions and attaches the NASA GRC580. The chair signs the original safety permit and adds the permit number provided by the SHeD administrative staff. The SHeD safety representative provides the appropriate National Fire Protection Association (NFPA) hazard ratings to the safety chair for hazardous chemicals associated with the process so that helpful information can be provided to emergency response personnel. The chair retains a copy of the documentation for his/her files before sending the original to SHeD.

The SHeD administrative staff will log the approved permit into the SAFEPERM database and send the original NASA GRC919 safety permit (with the colored NFPA hazard identification sticker attached) along with the qualified operator list (QOL) to the requester for posting at the worksite. A copy of the approved permit, permit renewal/change request, hazard analysis, and QOL are kept in the SHeD files.

7.0 RECORDS

7.1 Safety Chair

The safety chair maintains copies of approved Safety Permit forms (NASA GRC919), new Safety Permit Requests (NASA GRC923), safety permit Renewal/Change Requests (NASA GRC590), Qualified Operators Lists (NASA GRC580), Hazard Analysis (NASA GRC923a) or Facility Hazards Analysis (FHA), and all related drawings, specification, procedures, and checklists, including written correspondence with the permit requester.

7.2 Safety and Health Division Offices

Maintains copies of all approved or active Safety Permits (GRC919), new Safety Permit Requests (NASA GRC923), safety permit Renewal/Change Requests (NASA GRC590), Qualified Operators Lists (NASA GRC580) and all cancelled or archived safety permits for the period specified on the documentation retention record NASA GRC278.

8.0 REFERENCES

Document number	Document name
NPR 8715.3	NASA Safety Program Requirements
NASA–STD–8719.7	Facility System Safety Standard

APPENDIX A.—DEFINITIONS AND ACRONYMS

Electrical application safety committee (EASC)

Environmental Protection Agency (EPA)

Facility Hazard Analysis (FHA)

Glenn Research Center (GRC)

Material safety data sheet (MSDS)

National Aeronautics and Space Administration (NASA)

National Fire Protection Association (NFPA)

NASA Procedural Requirement (NPR)

Nuclear Regulatory Commission (NRC)

NASA Safety Standard (NSS)

Occupational Safety and Health Administration (OSHA)

Plum Brook Station (PBS)

Pressure Systems Office (PSO)

Process and instrumentation diagram (P&ID)

Process system safety committee (PSSC)

Qualified operator's List (QOL)

Risk assessment code (RAC)

Support service contractor (SCC)

Safety, Health and Environmental Board (SHEB)

Safety and Health Division (SHeD)

Safety and Mission Assurance Directorate (SMAD)

APPENDIX B.—SAFETY PERMIT REQUESTER'S GUIDE

B.1 Safety Permit Areas

1. There are 13 safety committees at GRC.
2. After checking the listing below to see in which safety area your activity is occurring, contact the safety committee chair for that area at the conceptual stages of design or as early as possible. The chair will determine if a safety permit is required and will discuss the requirement for any necessary supporting documentation, as well as the safety committee review process. Buildings located in various safety areas are shown below:

   - Aviation safety committee: buildings 4 and 101 flight operations only
   - Area 2 safety committee: buildings 5, 23, 37, and 38
   - Area 3 safety committee: buildings 14, 21, and 50
   - Area 4 safety committee: buildings 39, 53, 54, 55, 56, 63, 85, 102, 110, 124, 125, 145, and 150
   - Area 5 safety committee: buildings 35, 51, 109, 100, 100 Annex, 127, 135, 147, 401, 401, and 403
   - Area 6 safety committee: buildings 24, 34, 49, 105, 106, 127, and 140
   - Area 7 safety committee: buildings 16, 301, 302, 309, 332, 333, 334, and 336
   - Area 8 safety committee: buildings 6, 7, 11, 45, and 77
   - Area 9 safety committee: all Plum Brook Station buildings
   - Biological safety committee: all research associated with pathogens, bacteria, viruses, plants, embryonic cells, animals, or testing with human subjects
   - Electrical applications safety committee (EASC): all electrical substations, variable-frequency drives and high-voltage systems (with source voltages of 601 volts or greater)
   - Process system safety committee (PSSC): all central process systems, including cooling tower water, combustion air, natural gas heating systems, steam boilers, centralized refrigeration systems, shop air, wind tunnel natural gas heaters and desiccant air dryers, underground fuel storage, central air equipment, stationary compressed gas and cryogenic fluid storage tanks and distribution systems
   - Laser safety committee: all laser use.

B.2 Preparing the Safety Permit Documentation

Obtain and complete a NASA GRC923 or NASA GRC590, and the associated NASA GRC923a or FHA and NASA GRC580. Also include any support documentation, such as pressure system certification, exemption or approved safety deviation or waiver, process and instrumentation diagrams (P&IDs), schematics, graphical representations, operational and emergency procedures, checklists, barricading plans, list of alarms and shutdowns. Include copies of any material safety data sheets (MSDSs) for any hazardous chemicals. Copies of these forms are provided online at the GRC electronic forms Web site

2. Perform an internal review of the safety permit documentation with your immediate supervisor to ensure accuracy and completeness. Use the guidance below to check completeness of the documentation for the NASA GRC923:

   - Permit title, number, location, and duration of activity
   - Safety committee number or name, requester's name, organization, and work phone number
   - Test description

- Technical description of the test rig, systems, equipment (including design approach), compliance with applicable codes, supporting calculations, test or inspection data, and parts lists or descriptions
- Frequency of operations
- Pressure system certification waiver or exemption.

  (Note: A Pressure Systems Office (PSO) risk assessment is required for permits where equipment has any of the following characteristics: compressible fluids, relief devices, pressure or vacuum vessels, fuel tanks, and pressurized gas distribution systems. GRC pressure system certification requirements are located at the Facilities Division Web site).
- Ionizing or non-ionizing radiation hazards require a separate safety permit issued by the GRC radiation/laser safety officer.

  (Note: For activities involving ionizing radiation sources, Glenn's Nuclear Regulatory Commission (NRC) license may need to be modified. This takes at least 60 days, so it is crucial that the safety permit process be initiated as early as possible so that this time element can be built into the permit processing schedule).

Use the guidance below to check completeness of the documentation for the NASA GRC923a, the Plum Brook Station hazard analysis, or the FHA. (Note: For guidance on which hazard analysis form to use, refer to section B.9 or contact the safety representative assigned to your safety committee):

- For complex systems or facilities, consider identifying all hazards at system, subsystem, or component level by assessing failure modes and effects using the FHA.
- For simple systems or laboratory rigs, consider identifying hazards by type: collision, chemical, explosion or implosion, electrical, temperature extremes, fire, high noise, ionizing or non- ionizing radiation, loss of habitable atmosphere, biological or other hazards.

Use the guidance below to check completeness of the documentation for the NASA GRC580:

- Permit title, number, and location
- Experience, knowledge, skills, certification, or training required to perform the activity.
- On-The-Job Training (NASA GRC40) shall be attached to the QOL if new operator qualification is based on working with a present qualified operator using specific written procedures or when classroom or online training is considered insufficient.
- A copy of certification required for the activity, such as explosive or propellant handler, radiation worker, or laser operator training record, crane or tow motor operator, high-pressure-trailer operator, high-voltage-system field operator, or other hazardous operation certification.

Use the guidance below to check completeness of the documentation for the NASA GRC590:

- Permit title, number, and duration of activity
- Safety committee number or name, requester’s name and work phone number
- Technical description of changes (or no changes for simple renewals) to processes, equipment, qualified operators, or emergency contacts; identification of any new equipment and related documentation

3. Request that the NASA technical supervisor sign the NASA GRC923, NASA GRC590, and NASA GRC580. It is also necessary to have the NASA GRC580 signed by the actual supervisor(s) of the qualified operator(s).

B.3 Submitting the Documentation for Review

1. Submit the original plus four copies of the package to SHED at mail stop 6–4. This will allow tracking of safety permit requests by the SHED administrative staff. SHED will assign a number to the permit documentation and will forward the request to the safety committee chair, if the permit request is properly completed.

   If there is no hazard analysis, QOL, or proper signatures, the request will be returned by SHED to the requester for correction immediately.

2. After review of the request for completeness, the request will be forwarded to the safety committee chair. The safety committee chair or designee will then contact the requester to set up a meeting and a safety committee walk-through for the permit activity. (This step does not constitute a full technical review, but can be considered a quality check.) Since obtaining an approved safety permit can at times be a lengthy process, it is recommended that the permit requester submit the required documentation as early as possible.

B.4 What Happens When the Safety Permit is Approved?

After receiving a signed safety permit, the permit requester is responsible for posting the safety permit in a conspicuous place at the location of the activity or preferably in a nonhazardous location accessible by emergency responders. The requester must post the signed NASA GRC919 (pp. 1 and 2 describing test activity and conditions of operation), any signed Certificate of Exclusion NASA–STD 8719.17, NASA Requirements for Ground-Based Pressure Vessels and Pressurized Systems (PV/S) (NASA GRC4029), and the signed NASA GRC580. No other safety-permit-related documentation needs to be posted.

B.5 What Happens After the Safety Permit is Approved?

1. Posting of the safety permit allows the requester to begin the permitted operation or experiment. Any desired deviations from the specified conditions or procedures approved by the area safety committee shall be approved by the safety committee chair prior to implementation.

   Failure to comply with the procedures and operating conditions described on the safety permit may result in suspension or termination of the operation by the safety committee chair.

2. SHED safety inspectors, as part of quarterly and annual walk-through inspections, will write violations on expired safety permits that are posted.

B.6 How Long is My Safety Permit Good?

1. New safety permits are typically issued for a 1-year period. There may be permitted activities that the safety committee determines to be relatively benign and unchanging (generally not testing-related activities) for which the committee is willing to issue a multi-2- or 3-year permit. The decision to issue a multiyear permit is at the discretion and control of the safety committee chair.

2. A notification of expiration will be sent to the last permit requester of record by SHED 60-days prior to expiration. If the responsible permit requester changes before the permit expires, it is the original requester‘s responsibility to notify SHED using the NASA GRC590.

B.7 How Do I Renew (or Modify) a Safety Permit?

For renewals/modifications or changes, the procedure is as follows. A notification of expiration will be sent for renewals to the last requester by SHED 60 days prior to expiration. For all submittals, ensure that all documentation that was submitted with the original NASA GRC923 is accurate and up to date. Review the NASA GRC580 and ensure that it is also up to date. Ensure that all test procedures are up to date and that limit switches, warning lights, emergency stops, and other safety features are still functional. Complete a NASA GRC590, NASA GRC923a or FHA, updated NASA GRC580, and obtain the requester’s NASA

technical supervisor's signature of approval. Send all forms to SHED at mail stop 6–4 at least 30 days before expiration.

B.8 What Should I Do With the Safety Permit When the Activity is Completed?

1. The activity area must be returned to a safe condition. Properly dispose of all hazardous materials used for the activity and clean up the facility for future use. Contact GRC Waste Management for assistance with chemical disposal.
2. Take down the posted NASA GRC919 safety permit, sign and date it in the lower right-hand corner, and send it to SHED at mail stop 6–4. Then contact the SHED safety representative assigned to the area to perform a final inspection.

B.9 Hazard Analysis: What Type of Hazards Analysis Form is Required?

A hazards analysis is used to identify the hazards associated with a task, system, facility, or operation; to assess the risk associated with the hazards; and to implement control measures that will reduce that risk to an acceptable level. Three types of hazard analysis support the safety permit process at GRC: Hazard Analysis Worksheet (NASA GRC923a), Facility Hazard Analysis (FHA), and aircraft hazard analysis. Plum Brook Station performs a hazard analysis in accordance with GRC BMS document GLP–H–8715.1, which is entitled “Hazards Analysis Development.”

1. The NASA GRC923a is used for activities
   a. That involve chemicals with a NFPA rating of 1 to 3 (health, flammability, or reactivity) which are handled in a single cylinder or drum
   b. Where there is substantial (>2 years) experience at GRC in similar or identical activities
   c. Where the potential damage from hazards inherent to the activity is less than $250,000
   d. When the cognizant area safety committee has approved its use
2. The FHA is used for activities
   a. That involve chemicals with a NFPA rating of 4 (health, flammability, or reactivity) or special NFPA designations (e.g., OXY)
   b. That involve chemicals with a NFPA Rating of 1 to 3 (health, flammability, or reactivity) which are handled in nonstandard containers (i.e., anything larger than standard cylinders or 55-gallon drums)
   c. Where there is no substantial (<2 years) experience at GRC in similar or identical activities
   d. Where the potential damage from hazards inherent to the activity is greater than or equal to $250,000
   e. Where nonrelated activities in surrounding rooms, buildings, cells, and so forth can be adversely affected by the activity seeking the permit
3. Determining the risk assessment code (RAC) for each hazard on the Hazard Analysis form

   The hazard analysis consists of (1) a list of identified hazard types or a listing of failure modes; (2) an assessment of the risk (severity and probability); and (3) the hazard controls that will ensure the safe operation of the test, facility, or activity. Numerical tabulation of the severity and probability predictions (RAC) is required before and after mitigation techniques are utilized. Current NASA policy requires the use of a 4 × 6 matrix of hazard category versus probability level.

TABLE B.1—HAZARD CATEGORIES

Category	Personal Illness/Injury	Equipment Loss ($K)	Downtime	Data Integrity	Environmental Effect
I Catastrophic	Death	>$1000	>4 months	Data never recoverable or primary program	Long-term (>5 years) environmental damage or requiring >$1M to correct

Category	Personal Illness/Injury	Equipment Loss ($K)	Downtime	Data Integrity	Environmental Effect
				objectives lost	and/or in penalties
II Critical	Severe injury or occupational illness	$1000 to $250	4 months to 2 weeks	Repeat test program	Medium-term (1-5 years) environmental damage or requiring $250K-$1M to correct and/or in penalties
III Marginal	Minor injury or occupational illness	$250 to $25	2 weeks to 1 day	Repeat test period	Short-term (<1 year) environmental damage or requiring $25K-$250K to correct and/or in penalties
IV Negligible	No injury or illness	$25 to $1	<1 day	Repeat data point or data requires minor manipulation or computer rerun	Minor environmental damage, readily repaired and/or requiring $1K-$25K to correct and/or in penalties

TABLE B.2—PROBABILITY LEVELS

Level	Descriptive Word	Qualitative Definition	Quantitative Definition
A	Frequent	Likely to occur repeatedly in system/component life cycle	$X > 10^{-1}$
B	Probable	Likely to occur several times in system/component life cycle	$10^{-1} \geq X > 10^{-2}$
C	Occasional	Likely to occur at some time in system/component life cycle	$10^{-2} \geq X > 10^{-3}$
D	Remote	Not likely to occur in system/component life cycle, but is possible	$10^{-3} \geq X > 10^{-6}$
E	Improbable	So unlikely that it can be assumed occurrence may not be experienced	$10^{-6} \geq X$
F	Impossible	Occurrence is physically impossible	

TABLE B.3—RISK ASSESSMENT CODE (RAC) MATRIX

RAC	A Frequent	B Probable	C Occasional	D Remote	E Improbable
1 Catastrophic	1A	1B	1C	1D	1E
2 Critical	2A	2B	2C	2D	2E
3 Marginal	3A	3B	3C	3D	3E
4 Negligible	4A	4B	4C	4D	4E

The intersection of the Hazard Category and the Hazard Probability produces the RAC. The hazard category, probability of occurrence, and resulting RAC must all be shown on the sheet.

4. Will my Safety Permit be approved?

   The final RAC (after mitigation of each hazard) will determine if the facility, equipment, or experiment will be permitted. Below are the criteria used for determining if the permitted activity is of accessible risk.

a. RAC = (1) = (1A, 1B, 1C, 2A, 2B, or 3A): Unacceptable Risk; a safety permit cannot be issued without further hazard mitigation.

b. RAC = (2) = (1D, 2C, 2D, 3B or 3C): Undesirable Risk; the director of Safety and Mission Assurance Directorate must review and approve.

c. RAC = (3) = (1E, 2E, 3D, 3E, 4A, 4B): Acceptable Risk; this RAC is suitable for area safety committees to review and safety chairs to approve.

d. RAC = (4) = (4C, 4D or 4E): Acceptable Risk; this RAC is suitable for Area safety committees to review and safety chairs to approve.