



1.0 INTRODUCTION

The purpose of this directive is to classify operations as to their hazard level, to indicate the necessary control actions to be performed in order to satisfy each hazard level, and to specify the approval level required. Safety professionals shall be utilized as part of the review cycle. This directive is responsive, in part, to DOE Order 5481.1B, "Safety Analysis and Review System."

2.0 HAZARD CLASSIFICATIONS

All operations at PPPL shall be classified as either LOW, MODERATE, OR HIGH safety hazards. Hazard classification shall be determined by line management (see Appendix 1). In the event of conflict, the classification shall be made by the Executive Safety Board (ESB). Final hazard classifications, along with all required approvals and documentation as stated in this HSD, shall be completed before implementation of any new operation.

2.1 LOW HAZARD OPERATIONS

A low hazard operation presents minor onsite and negligible offsite impacts to people or the environment. Typical low hazard operations are as follows:

1. Normal shop operations, using hand and power tools.
2. Work on research devices and operation of small devices and experiments.
3. Office work.

2.1.1 LOW HAZARD CONTROL TECHNIQUES

Safety training, on the job training, supervisor pre-job briefings, and adequate management supervision are primary techniques of low hazard control.

2.1.2 LOW HAZARD APPROVALS

The immediate supervisor approves low hazard operations and written documentation is not necessary.

2.2 MODERATE HAZARD OPERATIONS

A moderate hazard operation presents considerable potential onsite impacts to people or the environment, but, at most, only minor offsite impacts. Typical moderate hazard operations are as follows:

1. Operation of an energy storage capacitor bank.
2. Operations where personnel safety interlocks have been bypassed or rendered inoperative.



3. Confined Space Entry.
4. Crane Operation.

2.2.1 MODERATE HAZARD CONTROL TECHNIQUES

Pre-job briefing, training, personnel certification, written permits, written approvals, and coordination of activities are the primary control techniques.

Periodic management walk-throughs and area safety inspections are suggestions to control moderate hazards.

A preliminary hazard analysis is required. A detailed hazard analysis and a Safety Assessment Document (SAD) may be requested by Branch/Division Heads or the Safety Office.

2.2.2 MODERATE HAZARD APPROVALS

Moderate hazard operations require written approval from the division or branch head, and for DOE operations specified by DOE, DOE authorization is required (as per DOE 5481.1B, Chapter II, Section 5). Special training and/or certification is generally required. Approvals may be an on-the-job approval, special safety approval, or other written forms.

2.3 HIGH HAZARD OPERATIONS

A high hazard operation presents major potential for serious onsite or offsite impacts to people or the environment. Operations are defined high hazard due to their intrinsic hazards or due to a collection of lower hazards which increase the probability of a serious accident. Typical high hazard operations are as follows:

1. TFTR D-D Operations.
2. TFTR D-T Operations.
3. PBX-M Operations.
4. TFTR Diborane Operations.
5. Any operation where there is a real possibility of >\$250,000 property loss or damage, including cleanup and recovery costs [DOE 5484.1].
6. Any operation where there is a real possibility of 100 mrem effective dose equivalent to maximum offsite individual [DOE 5400.5 and HSD 5008, Section 10.5.2].
7. Any operation where there is a real possibility of ≥ 600 mr effective dose equivalent to any occupational worker [DOE 5480.11 and HSD 5008, Section 10.5.1].



2.3.1 HIGH HAZARD CONTROL TECHNIQUES

A safety certificate is required (see HSD 5004). A detailed hazard analysis shall be performed that includes a safety analysis review conducted by a committee of experts. A Safety Assessment Document (SAD) or a Safety Analysis Report (SAR) shall be prepared.

2.3.2 HIGH HAZARD APPROVALS

An operation is usually classified as high hazard by line management; however, the ESB, Departmental Safety Officer (DSO), or Activity Certification Committee may also make the classification. Once an operation has been classified as high hazard, a safety certificate shall be issued by the DSO after review and documentation (see HSD 5004). For DOE operations specified by DOE, DOE approval also shall be required (as per DOE 5481.1B, Chapter II, Section 5).

3.0 PRELIMINARY AND DETAILED HAZARD ANALYSIS

Appendix 2 specifies the analytical tools to be used in performing a preliminary or detailed hazard analysis. A detailed hazard analysis may require use of more than one analytical tool because of the specific nature of the operation/hazard being reviewed. Individuals uncertain of which hazard analyses are appropriate should contact the Safety Office.

4.0 DEFINITIONS

4.1 OPERATIONS - This is a general term intended to encompass individual operations or efforts in the aggregate. Operations do not include activities that involve hazards that are routinely encountered and accepted in the course of everyday living by the vast majority of the general public (e.g., machine shops which do not handle hazardous materials, cars for personal transportation). At PPPL, operations as defined here are generally synonymous with projects. For work covered under Contract DE-AC02-76CHO3073, DOE operations are further defined as activities for which DOE environment, safety, and health requirements are applicable.

4.2 PRE-JOB BRIEFING (PJB) - This is a briefing conducted by the supervisor with the employee in which the supervisor explains the job that the employee is to perform. It includes the description of hazards and potential risks associated with the job and emphasizes safety precautions required and the correct sequence of operations, as well as the description of required protective equipment. Recent changes to relevant equipment and/or procedures are considered.

4.3 RISK - A quantitative or qualitative expression of possible loss which considers both the probability that a hazard will cause harm and the consequences of that event.

4.4 SAFETY ANALYSIS - A documented process (via SAD or SAR) to systematically identify the hazards of a PPPL operation, to describe and analyze the adequacy of the measures taken to eliminate, control or mitigate identified hazards, and to analyze and evaluate potential accidents and their associated risks.



4.5 SAFETY ANALYSIS REPORT (SAR) - An SAR is an extensive documentation process in which potential hazards associated with facility operations are: identified, analyzed to determine and quantify consequences; associated with a specific level of risk; and minimized through the choice of appropriate methods of detection and control. The document content and format shall follow the requirements of DOE Order 5481.1B, Chapter II, Section 4. The SAR shall be presented to the Executive Safety Board for review and, if necessary, for risk acceptance. Depending on the hazard level of a DOE operation, the SAR may also have to be presented to DOE for review and acceptance (see Sections 2.2.2 and 2.3.2).

4.6 SAFETY ASSESSMENT DOCUMENT (SAD) - This document presents the written results and recommendations of Hazard Analyses, Failure Mode and Effects Analysis, etc. The document also determines if these analytical results are adequate or inadequate in identifying hazards or risks and also the cost of incorporating recommended controls to attain adequate safety levels. The document content and format should follow the requirements of DOE Order 5481.1B, Chapter II, Section 4. The Safety Assessment Document shall be presented to the Executive Safety Board for review and, if necessary, for risk acceptance. Depending upon the hazard level of a DOE operation, the SAD may also have to be presented to DOE for review and acceptance (see Sections 2.2.2 and 2.3.2).

4.7 SAFETY CERTIFICATION - This is a document that authorizes start-up and/or continuing operation of a high hazard project, facility, work area, building, etc. and is issued by the appropriate DSO after the SAD or SAR has been reviewed and approved.

5.0 REFERENCES

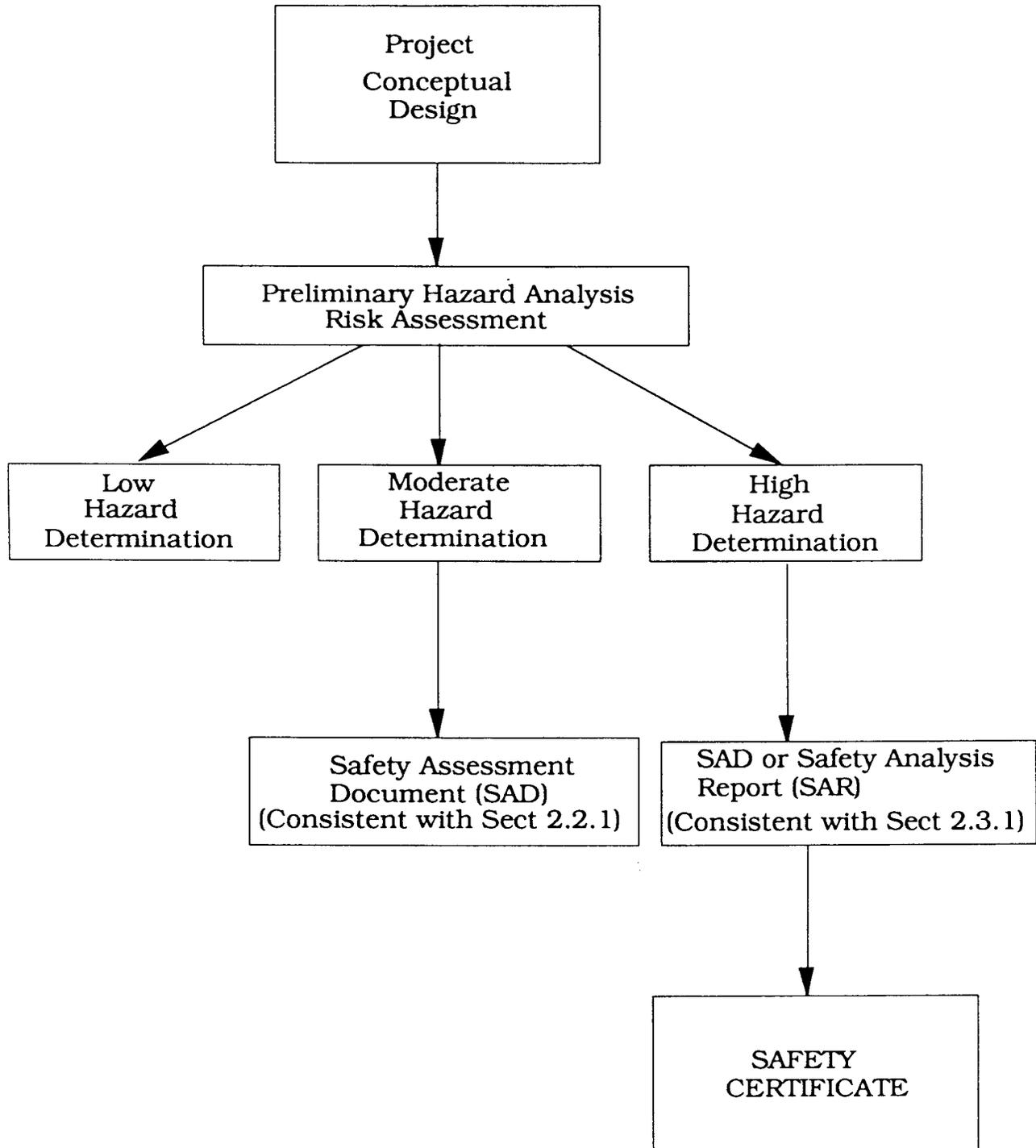
DOE 5400.1	General Environmental Protection Program
DOE 5400.5	Radiation Protection of the Public and the Environment
DOE 5480.11	Radiation Protection for Occupational Workers
DOE 5481.1B	Safety Analysis and Review System
DOE 5484.1	Environmental Protection, Safety and Health Protection Information Reporting Requirements
MORT SSDC-17	Applications of MORT to Review Safety Analysis
PPPL HSD 5000	H & S Directive System



PPPL HSD 5001	Safety Policy
PPPL HSD 5002	Safety Organization
PPPL HSD 5004	Safety Certification System
PPPL HSD 5006	Priority Problems List
PPPL HSD 5008	Health & Safety Manual
40 CFR 61, Subpart H	National Emission Standard for Radionuclide Emissions from DOE Facilities



APPENDIX - 1





APPENDIX-2

HAZARD ANALYSIS TECHNIQUES

1.0 PRELIMINARY AND DETAILED HAZARD ANALYSIS

1.1 Preliminary Hazard Analysis (PHA) - The preliminary hazard analysis shall demonstrate conformance with applicable guides, codes, standards, and regulations. Its documentation shall describe features of design and operations and demonstrate compliance with environmental assessments or impact statements. It shall also demonstrate reasonable assurance that the operation can be conducted in a manner that will limit risks to personnel and to the environment. A preliminary hazard analysis shall be performed on appropriate components, systems, subsystems, devices, facilities, operations, etc. and shall include the following:

1.1.1 Energy and Hazardous Material Analysis - All sources of energy and hazardous material and potential targets of an unwanted transfer of energy or hazardous material shall be identified.

1.1.2 Barrier Analysis - All barriers present and/or planned on each source of energy or hazardous material, between the source and the potential target, or on the potential target, shall be identified.

1.1.3 Evaluation - An evaluation shall be performed to determine the potential effects of an unwanted transfer of energy or hazardous material combined with accompanying failure of barriers designed to mitigate that transfer of energy or hazardous material.

1.2 Detailed Hazard Analysis (DHA) - The detailed hazards analysis shall demonstrate conformance with applicable guides, codes, standards, and regulations. Its documentation shall describe features of design and operations and demonstrate compliance with environmental assessments or impact statements. It shall also demonstrate reasonable assurance that the operation can be conducted in a manner that will limit risks to personnel and to the environment. Depending upon the results of the PHA, more extensive and more detailed follow-on hazard analyses shall be required when the PPPL hazard class is high. The analytical tools to be employed will depend upon each particular case, but shall be selected from standard techniques listed below.

1.2.1 Detailed Energy and Hazardous Material Analysis (DEA) - A DEA is the process of identifying the types of energy (kinetic, potential, electrical, radiation, etc.) or hazardous material, and their sources and potential target(s) should an unwanted transfer of energy or hazardous material occur.

1.2.2 Detailed Barrier Analysis (DeBA) - A DeBA is the process of identifying the types and location of barriers present to control the source of energy or hazardous material, e.g., on the source, on the target, between the two, or separation of source and target by time and space.

1.2.3 Detailed Protective Devices Analysis (PDA) - A PDA is the process of determining the adequacy of protective devices, e.g., personal equipment, interlocks, etc.



1.2.4 Detailed Change Analysis (DCA) - A DCA is the process of examining changes (design, operating, maintenance, etc.) to determine their potential and/or actual effects on the overall safety level as a result of a change.

1.2.5 Failure Mode and Effects Analysis (FMEA) - An FMEA is a detailed analysis of the failure modes in and the effects of those failures on components, systems, subsystems, etc., ultimately to determine the effects on the level of safety present in the system.

1.2.6 Event Tree Analysis (ETA) - An ETA is a logic block diagram for systematically determining, through event identification, the effects on the safety of project and systems.

1.2.7 Fault Tree Analysis (FTA) - An FTA is a logic block diagram for systematically determining, through fault identification, the probability of failures in components and systems and the safety effects.

1.2.8 Component Hazard Analysis (CHA) - A CHA is an analysis and study to determine the effects of failures on safety at the component level.

1.2.9 Subsystem Hazard Analysis (SSHA) - An SSHA is a detailed study of a particular subsystem (a system that together with other systems make up a larger, more complex system) to determine the effects on safety should that subsystem fail or malfunction.

1.2.10 System Hazard Analysis (SHA) - An SHA is a detailed study of an entire system, or project, to detect the effects of failures on safety of the overall system or any of its subsystems.

1.2.11 Support of Operations Hazard Analysis (SOHA) - An SOHA is a projected analysis to identify hazards associated with the operating and support functions of a system.

1.2.12 Inspection and Maintenance Hazard Analysis (IMHA) - An IMHA is the process of identifying hazards resulting from maintenance actions and to determine the adequacy of the inspection requirements.

1.2.13 Sneak Circuit Analysis (SCA) - An SCA is a study of electrical or electronic circuitry and their components to assure that they are completely isolated from other circuits and cannot activate unwanted states in associated circuits and/or other components.

1.2.14 Human Factors Analysis (HFA) - An HFA is an analysis of that part of the machine that interfaces with people to determine if the machine is suitably/safely designed for the people who will operate it.