Chemical Process Hazard Analysis
High Hazard Review Checklist

(See attached instructions)

Introduction

Every laboratory performing chemical processes should have a current hazard analysis. The Process Hazard Analysis (PHA) is mandatory for chemical processing laboratories that fall under 29 CFR 1910.1450 to assess the hazards associated with new or modified chemical processes or operations. The High Hazard Review Checklist is used in evaluating the safety of new, modified, or relocated experiments or tests, which present a high potential hazard to employees, equipment and facilities, or the environment. Supervisor's Designees or employees performing the operation are responsible for completing the analysis. Participation by a representative of the Occupational Safety and Health Division (Code 350) is required.

Instructions at the end of this template provide information on the hazard review process, and aid in determining which level of Process Hazard Review is appropriate: Low, Moderate, or High. A High Hazard Review (HHR) is conducted for "high hazard" equipment, experiments, and processes, which, in the even of a failure, present a significant potential for injury, equipment damage, or environmental impact. An HHR requires a special review team to thoroughly analyze the potential hazards in the specific planned laboratory environment to identify process changes and hazard mitigation measures.

The responsible organization shall establish a HHR Committee consisting of the Supervisor's Designee (who will chair the committee), a representative of the Occupational Safety and Health Division (OSH), Medical and Environmental Division (Code 250), researcher, technician, Chemical Safety Committee (CSC) representative, and any other resources deemed necessary. The HHR Committee performs a comprehensive analysis of all potential hazards involved in the laboratory processes and equipment. A member of the CSC or an OSH representative can help determine how best to accomplish the review, based on the nature of the hazard(s) presented. OSH shall be the final approval authority of the process.

This type of review requires a number of documents to be assembled for or made available to the review committee. Piping and instrument diagrams, as applicable; chemical reaction characteristics; safeguards and personal protective equipment; relevant incident reports, as applicable; and operating and emergency procedures are all examples of what should be provided. Other types of documents may be identified by the review committee.

The review shall be documented thoroughly. The completed review package, in combination with other required laboratory operating procedures, constitutes the laboratory safety documentation package. This package shall be available in a prominent location in the laboratory or the electronic location posted while the work is in progress.

Laboratory Name/Description:		
Laboratory Location:		
Supervisor's Designee:	**Code:**	**Extension:**
Product/Experiment Description:		

The following steps make up the HHR, and are the responsibility of the Supervisor's Designee or researcher.

☐ **1. Consult with assigned OSH representative**
- **a) Provide brief description of process and potential hazards**
- **b) OSH may suggest review guidelines and potential HHR Review Committee participants**

☐ **2. Assemble High Hazard Review Committee**
- **a) Supervisor's Designee (required), who will chair the HHR Committee**
- **b) Technical expert/researcher/lead engineer**
- **c) Occupational Safety and Health Division Representative (required)**
- **d) Medical and Environmental Division Coordinator (required)**
- **e) Others (determine with OSH Coordinator)**
- **f) CSC representative**

☐ **3. Provide Process Information at least one week prior to review (information may be provided via electronic means or hardcopy)**

a) Process Chemistry - reaction rates, temperature, pressure, intermediates, etc

b) Process Flow Diagram, if applicable

c) Piping and Instrument Diagram, if applicable

d) Equipment Specifications - capacity, pressure rating, etc., if applicable

e) Standard Operating Procedures (SOP's). A draft is acceptable, but it must be approved before the process is begun.

f) Environmental Information - permits, waste disposal, minimization, if applicable

g) Emergency Plans - evacuation, fume release (This information can be part of the Building Emergency Plans)

h) Process History - *review any related previous incidents*

i) Personal Protective Equipment (describe what is required for this work)

j) Material Safety Data Sheets (or list of chemicals and manufacturers if available on-line)

☐ **4. Schedule Review**

a) Review meetings should be held near operating area

b) Have major components available for area inspection, if required

☐ **5. Perform Review & maintain minutes of meetings. Distribute to HHR Committee for review and comment, updating minutes as applicable. Maintain a list of actions items from the review. After action items have been completed or accepted by OSH and Directorate Management, the final report may be prepared for signature.**

☐ **6. Issue Final Approval and Report, which should containing the following:**

a) Cover sheet, with configuration control information as specified in GPG 1410.2

b) This checklist, signed and dated, with a signed Hazard Analysis Selection matrix

c) Abstract (summary of experiment boundaries and techniques)

e) Program/Process Description

f) List of HHR Committee/Reviewers

g) Area Inspection and Review -- description and findings, if applicable

h) Personnel performing the work-- names, qualifications, training

i) Analysis summary

j) Recommendations, responsibility and disposition of recommendations

k) Summary and conclusion

l) Sign-off by HHR Committee (with Safe to Operate Certification)

m) List of Reference Material

n) Attachments: (this can be the actual documents or the locations if electronic.) supporting documentation, e.g., design criteria; Process and Instrument (P&I) Diagram; equipment specifications; decision trees; alarms and interlocks; pressure relief vent calculations; Environmental Permit; materials of construction, inspection reports; incident history, Material Safety data Sheets (MSDS)

☐ **7. Documentation and Records**

Upon completion of the review and issuance of a Safe to Operate Certification, process operators and personnel located in the lab shall be briefed on all safety procedures and concerns, and certify their understanding of requirements. All necessary safety information, which may include MSDSs and other safety references, shall be prominently posted in the laboratory area or a notice posted indicating where the information may be found if electronic. A dated copy of the HHR review report and all attachments will be provided to the OSH representative. The record/signed copy of the HHR review report shall be retained by the Supervisor's Designee.

Supervisor's Designee Signature	Title	Code	Date
Branch Head Signature	Title	Code	Date

General Instructions for Laboratory Process Hazard Analysis

Introduction

The identification and control of hazards in the laboratory is the responsibility of the owning organization. The Laboratory Process Hazard Analysis is designed to aid management in meeting this responsibility.

The Process Hazard Analysis (PHA) is mandatory for laboratories and other areas that use chemicals falling under 29 CFR 1910.1450 requirements. These analyses are used to assess the hazards associated with new or modified processes or operations in a laboratory environment. There are three levels of reviews for three anticipated levels of hazards: Low, Moderate, and High.

The Hazard Analysis Selection Matrix provides the Supervisor's Designee a quick way to assess the level of process hazard analysis required. The matrix has three vertical columns that correspond to the three levels of review. Horizontal lines describe various potential hazards. By checking those that apply in the appropriate columns, the necessary review level becomes easier to define.

Approach

The first step in determining the level of review required is to fill out the **HAZARD ANALYSIS SELECTION MATRIX** on the last page of these instructions. There are four major sections to the matrix: Material Hazards, Processing Hazards, Equipment Hazards, and Environmental Hazards. Various criteria within these categories determine the level of hazard analysis required.

These guidelines are the MINIMUM suggested methods, and are not meant to be a substitute for good judgment. Combinations of lower level hazards may indicate a need for a higher level of review. Conversely, if in your judgment you can use a lower level of hazard review than that indicated by these guidelines, you may do so with the approval of the Supervisor's Designee and Division Chief.

Level of Process Hazard Analysis

1. **Low Hazard Review (LHR)**: Low Hazard Review (LHR) is conducted when the hazard is deemed "low." Low hazard is defined as having little potential to create injury or property damage, and no potential for environmental release. A LHR requires completion of a brief description of the process, the potential hazards, and what steps will be taken to mitigate those hazards. A set of operating procedures, the personal protective equipment required, special training required, and the signature of those involved with the review shall be included. The Supervisor's Designee and users conduct this level of review. The review is performed using GSFC Form 23-56.

2. **Moderate Hazard Review (MHR)**: Moderate Hazard Review (MHR) is conducted when the hazards involved are deemed "moderate." Moderate hazard is defined as having the potential to cause injury, equipment damage, or environmental release. Supervisor's Designees and users conduct an MHR. The involvement of an OSH representative can be requested and is encouraged. A MHR requires the completion of a comprehensive checklist, and must be accompanied by a complete set of standard operating procedures. Among the information evaluated are process technology, potential hazards and mitigation, environmental issues, and adherence to specific engineering/design standards. The review is performed using GSFC Form 23-57.

3. **High Hazard Review (HHR)**: High Hazard Review (HHR) is conducted for experiments, equipment installations, or processes which are deemed "high hazard." High Hazard is defined as having the potential to cause serious injury, severe equipment or facility damage, or negative environmental impact.

A HHR Committee shall be established for each Laboratory that meets the criteria for High Hazard Review. The HHR Committee will consist of a chairperson, a representative from OSH Division, Medical and Environmental Division, researcher, technician, member of the Chemical Safety Committee (CSC), and any other resources deemed necessary. A comprehensive review by the HHR Committee of all potential hazards involved in processes and equipment is required. A member of the CSC or an OSH representative can help determine what type of HHR method will be used based on the nature of the hazard(s) presented. The HHR requires that a number of documents be assembled and made available to the review committee. Piping and instrument diagrams, chemical reaction characteristics, relevant incident reports, process chemistry, and operation procedures, as applicable, are all required.

The review is performed using GSFC Form 23-58 and shall be documented completely. The HHR Committee shall approve significant changes.

Required Participation for Process Hazard Analysis

Position	LHR	MHR	HHR
Supervisor's Designee and Users	X	X	X
Branch Head	X	X	X
OSH and MEMD Representative			X
Additional Technical Sources			X

Documentation Required

The Hazard Analysis Selection matrix, a copy of the most recent Hazard Review, and operating procedures/attachments shall be available in a prominent location in the laboratory while the work is going on or if the information is stored electronically at the location posted.

A dated copy of all safety documentation packages, including hazard reviews, Hazard Analysis Selection Matrices, and operating procedures, shall be sent to the OSH Division.

Hazard Analysis Selection Matrix

For new, modified or relocated processes, equipment or experiments, or scale-up of previous work, characterize your process according to the criteria below. Then use the most detailed analysis method called for by any single criterion.

Laboratory: Building _____ **Room** _____ **Responsible Org. Code:** _____
Laboratory Description:

	No Review Required	LHR	MHR	HHR
1. Material Hazard - Acute Toxicity				
HMIS Health Rating: Circle the Hazardous Material Identification System rating, found in the Material Safety Data Sheet (MSDS)	0	1-2	3	4
Cylinder DOT Label: if a cylinder, circle Yes if the DOT label on the cylinder indicates Poison Gas, Corrosive Gas, or Flammable Gas			Yes	
2. Material Hazard - Chronic Toxicity (Circle Yes if the MSDS indicates the material exhibits Chronic Toxicity)			**Yes**	
3. Material Hazard - Flammability (Choose applicable line and circle the HMIS rating from the MSDS)				
< 1 Liter & HMIS Flammability Rating	0-1	2-4		
> 1 Liter & HMIS Flammability Rating	0	1-2	3-4	
≥ 1 Liter and under Pressure or above Flash Point & HMIS Flammability Rating	0		1	2-4
4. Material Hazard - Reactivity (Circle one)				
HMIS Reactivity Rating from MSDS	0-1	2	3-4	
5. Processing Hazard - Radiation (Circle all that apply)				
Laser		Class I-IIIA	Class IIIB-IV	
X-Ray Source		<20kv	>20kv	
Radioisotopes in use	None		Yes	
UV, Infra-red, Microwave, Radio wave		<TLV	>TLV	
6. Processing Hazard - Pressure (Circle any one that applies)				
Non-glass	= 0 psig	< 0 psig or > 0 psig & <90psig	>90psig	
Glassware			< 0 or > 0 psig	
7. Processing Hazard - Chemical Reaction Energy				
Will adiabatic reaction lead to temperature change? Circle one that applies (Check MSDS)	< 60° F		> 60° F	
Will this cause solvent to boil? Circle Yes if applicable			Yes	
8. Processing Hazard - New Technology				
New chemistry of technology. Circle correct answer if applicable	None		Outside of Experience	Unknown Reactions
9. Equipment Hazard - Electrical (Circle one if applicable)	Protected < 120V	Exposed or > 120V		
10. Equipment Hazard - Mechanical (Circle Yes or No)				
Exposed pinch points, belts, chains, rotating parts, knives, suspended loads, stored energy, etc.	Yes	No		
11. Processing Hazard - Thermal				
Unprotected heated or chilled surfaces	> -20° F & < 140° F	< -20° F & > 140° F		
12. Environmental Hazards				
Noise (Circle one. Call x6-6669 if you need assistance)	< 80 dBA	> 80 dBA		
Hood Ventilation Testing (Circle one if applicable)		Exemption	Permit	

Contact the Occupational Safety and Health (OSH) Division, Code 350 for assistance in completing this matrix

Acronyms

DBA	decibels, A-scale	HMIS	Hazardous Material Identification System	TLV	Threshold Limit Value
DOT	Department of Transportation	OT	Odor Threshold		

Branch Head	Date	Supervisor's Designee	Date