

Process Safety Management (PSM) Program

Responsible Administrator: Senior Research Safety Specialist
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Summary:

This Process Safety Management (PSM) Program establishes requirements for identifying, evaluating, and controlling hazards associated with highly hazardous chemicals and operations at the University of California, Irvine (UC Irvine). The program aligns with [Cal/OSHA Process Safety Management §5189](#), [OSHA Process Safety Management §1910.119](#), and applies to laboratories, pilot-scale operations, facilities, and other campus operations where hazardous processes are present.

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Program Description

The PSM Program provides a structured framework to identify, assess, and control hazards. It integrates technical, operational, and administrative measures to ensure the safe handling of hazardous materials and processes across campus.

Scope

This program applies to:

- All UCI processes involving chemicals at or above the threshold quantity (TQ) listed in the [Cal/OSHA §5189 List of Acutely Hazardous Chemicals, Toxics, and Reactives](#).
- Processes involving flammable gases or flammable liquids with flashpoints below 100 °F (37.8 °C) in quantities ≥10,000 pounds.
- Laboratory and non-laboratory operations, including research labs, pilot-scale operations, facilities/utility systems, and specialized support operations.

Examples of hazards include:

Physical Hazards: fire, explosion, high-pressure systems, combustible dust, combustible liquids, cryogenics, explosives, flammable materials, peroxide formers, organic peroxides, oxidizers, pyrophoric materials, highly reactive materials.

Health Hazards: highly toxic or toxic chemicals, corrosives, irritants, and other substances capable of causing acute or chronic health effects.

Definitions

Combustible Dust: Fine particulate material that can ignite and burn when suspended in air, creating an explosion hazard.

Combustible Liquid: A liquid with a flashpoint at or above 100 °F (37.8 °C) but below 200 °F (93.3 °C) that can burn if exposed to ignition sources.

Corrosives: Materials that cause visible destruction or irreversible alterations to living tissue or equipment surfaces.

Cryogenics: The study or use of materials at extremely low temperatures, often below –150 °C, which can present hazards such as cold burns, asphyxiation, or pressure buildup.

Explosives: Substances or mixtures capable of a rapid chemical reaction producing gas, heat, and pressure capable of causing damage to surroundings.

Flammables: Gases or liquids with low flashpoints that ignite easily and pose fire or explosion hazards.

Flammable Gas: A gas that can ignite and burn in air under normal conditions.

Flammable Liquid: A liquid with a flashpoint below 100 °F (37.8 °C) that can ignite easily.

Flammable Solid: A solid material that is easily ignitable and capable of rapid combustion.

Highly Hazardous Chemical (HHC): Any chemical possessing toxic, reactive, flammable, or explosive properties.

Highly Reactive Materials: Substances prone to violent reaction under certain conditions such as heat, pressure, or contact with incompatible materials.

Irritants: Substances causing reversible inflammation of skin, eyes, or the respiratory system.

Organic Peroxides: Organic compounds containing the –O–O– functional group that can be thermally unstable, sensitive to shock, and explosive.

Oxidizers: Substances that readily yield oxygen or other oxidizing species, increasing the risk or intensity of fire or explosion.

Peroxide Formers: Chemicals that can form explosive peroxides upon exposure to air, heat, or light.

Pyrophoric Materials: Substances that ignite spontaneously upon exposure to air.

Toxic Materials: Substances capable of causing acute or chronic health effects via inhalation, ingestion, or skin absorption.

Process: Any activity involving hazardous materials, including use, storage, transfer, manufacturing, or disposal.

Process Hazard Analysis (PHA): Systematic evaluation of hazards using What-If, Checklist, Hazard and Operability Study (HAZOP), or Failure Modes and Effects Analysis (FMEA).

Management of Change (MOC): A formal process to evaluate and authorize modifications to chemicals, equipment, or standard operating procedures.

Pre-startup Safety Review (PSSR): A documented evaluation ensuring that new or modified processes are safe to operate

Responsibilities

Staff / Lab Staff:

- Follow established standard operating procedures (SOPs) and safe work practices.
- Complete hazard-specific training.
- Report unsafe conditions and incidents.

Principal Investigator (PI) / Manager:

- Ensure hazard assessments and PHAs are performed.
- Maintain current SOPs and training records.
- Implement corrective actions from audits, inspections, or investigations.

Environmental Health & Safety (EHS):

- Provide oversight, training, and technical guidance.
- Coordinate audits, inspections, PHAs, and incident investigations.
- Maintain campus-wide PSM documentation and ensure regulatory compliance.

Department Chair / Dean's Office:

- Allocate resources to support compliance.
- Promote accountability and program implementation within departments.

Program Components

1. Employee Participation

Employees are actively involved in hazard analyses, SOP development, and incident investigations. EHS ensures employees have access to safety information and a mechanism to provide input.

2. Process Safety Information (PSI)

Written information must be compiled and maintained on:

- Chemical hazards (toxicity, flammability, reactivity, corrosivity)

- Process technology (flow diagrams, safe operating limits, potential consequences of deviations)
 - Process equipment (design standards, relief systems, instrumentation, ventilation, safety systems)
3. **Process Hazard Analysis (PHA)**
PHAs identify, evaluate, and control hazards. Acceptable methodologies include What-If, Checklist, HAZOP, or FMEA. PHAs must be performed initially and revalidated every five years. Findings and corrective actions must be documented and tracked.
4. **Standard Operating Procedures (SOPs)**
SOPs must address:
- Initial startup, normal operation, temporary operations, emergency operations, normal shutdown, and restart
 - Operating limits, consequences of deviations, and corrective actions
 - Safety and health considerations.
5. **Training**
- Initial training is required before working with a covered process.
 - Refresher training is required at least every three years or sooner as needed.
 - Training must cover process hazards, SOPs, personal protective equipment (PPE) and emergency response.
 - Training records must be maintained and documented.
6. **Pre-Startup Safety Review (PSSR)**
Conducted before introducing hazardous materials into new or modified processes. Reviews verify equipment design, SOPs, training, and PHA recommendations are complete and implemented.
7. **Mechanical Integrity**
Systems must maintain the integrity of process equipment, including:
- Written inspection, testing, and maintenance SOPs
 - Training for maintenance staff
 - Documentation of inspections, test results, deficiencies, and corrective actions
8. **Hot Work Permits**
Required for welding, cutting, or spark-producing work. Permits confirm fire prevention measures, specify authorized dates, and are retained until work is complete. A Hot Work Permit can be obtained through the [UCI Hot Work Permit Request Form](#).
9. **Management of Change (MOC)**
SOPs are required to evaluate and authorize changes to chemicals, equipment, technology, or procedures. Each MOC must address:
- Technical basis and safety impacts

- Modifications to SOPs and training
- Authorization and documentation prior to implementation

10. Incident Investigation

Incidents, injuries, and near-misses that result in, or could have resulted in, catastrophic releases must be investigated within 48 hours. Reports must include descriptions, contributing factors, and corrective actions, and be shared with affected personnel.

11. Emergency Planning and Response

Emergency action plans must be established and included in the SOP for each covered process. Plans address evacuation, small release handling, communication, and coordination with responders. Personnel must be trained in their roles.

12. Compliance Audits

Audits must be conducted at least every three years. Findings must be documented, corrective actions tracked, and the two most recent audit reports retained.

Reporting Requirements

- Incidents and near-misses must be reported to EHS within 24 hours.
- Incident investigations must begin within 48 hours.
- Regulatory notifications will be made by EHS to Cal/OSHA or other agencies as required.
- Documentation of PHAs, audits, SOPs, and training records must be maintained and made available to EHS for 5 years.

References

- OSHA 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals
- California Code of Regulations, Title 8, Section 5189
- OSHA 29 CFR 1910.38, Emergency Action Plans