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|  U.S. DEPARTMENT of ENERGY Office of Enterprise Assessments | | Number: EA CRAD 32-16 Revision: 0 Effective Date: July 21, 2025 |
| Process Safety Management Criteria and Review Approach Document | | |
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1.0 PURPOSE

The mission of the U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments (EA-30) is to assess the effectiveness of safety and emergency management systems and practices used by line and contractor organizations and to provide clear, concise, rigorous, and independent evaluation reports of performance in protecting workers, the public, and the environment from the hazards associated with DOE activities.

In addition to the general independent oversight requirements and responsibilities specified in DOE Order 227.1A, *Independent Oversight Program*, this criteria and review approach document (CRAD), in part, fulfills the responsibility assigned to EA in DOE Order 226.1B, *Implementation of Department of Energy Oversight Policy*, to ensure that contractors implement the requirements of 10 CFR 851, *Worker Safety and Health Program*, and DOE Order 450.2, *Integrated Safety Management*.

The CRADs are available to DOE line and contractor assessment personnel to aid them in developing effective DOE oversight, contractor self-assessment, and corrective action processes. The current revisions of EA's CRADs are available at <https://www.energy.gov/ea/criteria-and-review-approach-documents>.

2.0 APPLICABILITY

The following CRAD is approved for use by the Office of Worker Safety and Health Assessments:

3.0 FEEDBACK

Comments and suggestions for improvements on this CRAD can be directed to the Director, Office of Environment, Safety and Health Assessments.

4.0 CRITERIA AND REVIEW APPROACH

The review of the workplace will evaluate the effectiveness of programs and processes that implement the Occupational Safety and Health Administration (OSHA) standard for process safety management (PSM) for operations, 29 CFR 1910.119, *Process safety management of highly hazardous chemicals*, involving:

- One or more toxic and/or reactive chemicals that are present at the worksite at or above the specified threshold quantities listed in 29 CFR 1910.119, appendix A, *List of Highly Hazardous Chemicals, Toxics and Reactives (Mandatory)*, and/or
- A Category 1 flammable gas (as defined in 29 CFR 1910.1200(c), *Definitions*) or a flammable liquid with a flashpoint below 100°F on site in one location, in a quantity of 10,000 pounds (4,535.9 kg) or more.

The review will evaluate PSM documentation and employee involvement in the PSM process, PSM hazard analysis processes, PSM safe operating procedures, subcontractors performing work on a PSM-covered process, and additional topical areas as required by the OSHA standard.

This CRAD is primarily used to supplement work planning and control assessments. However, it can be used to support a focused review of PSM, when warranted, or as part of an EA targeted review.

The objectives and lines of inquiry are supported by the following regulation and OSHA Compliance Directive:

- 29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*
- CPL 03-00-021, *PSM Covered Chemical Facilities National Emphasis Program*, 01/17/2017

The following objectives are designed as stand-alone sections to be used in any combination based on the need of the specific assessment.

OBJECTIVES

PSM.1: PSM documentation includes employee participation and process safety information. (29 CFR 1910.119(c), *Employee participation*, and 29 CFR 1910.119(d), *Process safety information*)

Criteria:

1. The contractor has developed a written plan of action for the implementation of employee participation, consulted with employees on the development of the process hazard analysis (PHA) (hazard evaluation) and other elements of PSM, and provided access to PHAs and all other information required by the PSM standard. (29 CFR 1910.119(c))
2. The contractor has compiled the following written information pertaining to the hazards of the process: (29 CFR 1910.119(d)(1), *Information pertaining to the hazards of the highly hazardous chemicals in the process*)
 - Toxicity information

- Permissible exposure limits
- Physical data
- Reactivity data
- Corrosivity data
- Thermal and chemical stability data
- Hazardous effects of the inadvertent mixing of different materials that could foreseeably occur.

Safety data sheets meeting the requirements of 29 CFR 1910.1200(g), *Safety data sheets*, may be used to meet this requirement if they contain the information above.

3. PSM documentation includes the following: (29 CFR 1910.119(d)(2), *Information pertaining to the technology of the process*, and 29 CFR 1910.119(d)(3), *Information pertaining to the equipment in the process*)
 - Information on the technology of the covered process includes at least the following: a block flow diagram or simplified process flow diagram; process chemistry; maximum intended inventory; safe upper and lower limits of such items as temperatures, pressures, flows, or compositions; and an evaluation of the consequences of deviations, including those affecting the safety and health of employees. (29 CFR 1910.119(d)(2)(i)(A-E))
 - Information pertaining to the equipment in the process includes the following: materials of construction, piping and instrument diagrams, electrical classification, relief system design and design basis, ventilation system design, design codes and standards employed, material and energy balances for processes built after May 26, 1992, and safety systems (e.g., interlocks, detection, or suppression systems). (29 CFR 1910.119(d)(3)(i)(A-H))
 - The contractor has documented that the equipment complies with recognized and generally accepted good engineering practices. For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the contractor has determined and documented that the equipment is designed, maintained, inspected, tested, and operating in a safe manner. (29 CFR 1910.119(d)(3)(ii) & (iii))

PSM.2: The contractor has performed an initial PHA of covered processes as well as associated updates and revalidations. (29 CFR 1910.119(e), *Process hazard analysis*)

Criteria:

1. The contractor has performed an initial PHA of covered processes. (29 CFR 1910.119(e)(1))
2. The contractor has used one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed: (29 CFR 1910.119(e)(2))
 - What if
 - Checklist
 - Hazard and operability study
 - Failure mode and effects analysis
 - Fault tree analysis
 - An appropriate equivalent methodology.
3. The PHA addresses the following: (29 CFR 1910.119(e)(3))
 - The hazards of the process
 - Identification of any previous incidents
 - Engineering and administrative controls

- Consequences of a failure of engineering or administrative controls
 - Facility siting
 - Human factors
 - A qualitative evaluation of the possible safety and health effects of the failure of controls on employees in the workplace.
4. The PHA was performed by a team that had the following: (29 CFR 1910.119(e)(4))
 - Expertise in engineering and process operations
 - At least one employee with experience and knowledge specific to the covered process
 - One member of the team must be knowledgeable in the specific evaluation methodology used to perform the PHA.
 5. The contractor has established a system to promptly address PHA findings and recommendations. (29 CFR 1910.119(e)(5))
 - The system requires that findings and recommendations are resolved in a timely manner.
 - Resolutions to findings and recommendations are documented.
 - Schedules for the completion of recommended actions are documented.
 - Actions scheduled or taken to resolve findings and recommendations are communicated to employees, contractors, or other persons possibly impacted by the recommendations or actions.
 6. PHAs have been updated and revalidated at least every five years by a team meeting the requirements in criterion 4 above. (29 CFR 1910.119(e)(6))
 7. The contractor has retained all documentation for PHAs, updates, revalidations, recommendations, and resolutions of recommendations for the life of the process. (29 CFR 1910.119(e)(7))

PSM.3: The contractor has developed and implemented written, safe operating procedures for each covered process, addressing the steps for each operating phase, operating limits, safety and health considerations, and safety systems and their functions. (29 CFR 1910.119(f), *Operating procedures*)

Criteria:

1. The contractor has developed and implemented written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and has addressed at least the following steps for each operating phase: (29 CFR 1910.119(f)(1)(i), *Steps for each operating phase*)
 - Initial startup
 - Normal operations
 - Temporary operations
 - Emergency shutdown, including the conditions under which emergency shutdown is required and the assignment of responsibility to qualified operators to ensure safe and timely shutdown
 - Emergency operations
 - Normal shutdown
 - Startup following a turnaround or after an emergency shutdown.
2. The contractor has developed and implemented written operating procedures that address the following items related to operating limits: (29 CFR 1910.119(f)(1)(ii), *Operating limits*)
 - Consequences of deviation
 - Steps required to avoid or correct deviation.

3. The contractor has developed and implemented written operating procedures that address the following safety and health considerations: (29 CFR 1910.119(f)(1)(iii), *Safety and health considerations*)
 - The properties and hazards of chemicals present in the covered process
 - Precautions required to prevent exposure, including engineering and administrative controls and personal protective equipment
 - Control measures to be taken if physical or airborne exposure occurs
 - Quality control of raw materials and control of hazardous chemical inventory levels
 - Any special or unique hazards (e.g., forklifts hitting ammonia refrigeration pipes).
4. The contractor has developed and implemented written operating procedures that address safety systems and their proper operation. (29 CFR 1910.119(f)(1)(iv), *Safety systems and their functions*)
5. Operating procedures are readily accessible to employees, are certified annually to be current and accurate, and address safe work practices to provide for the control of hazards. (29 CFR 1910.119(f)(2-4))

PSM.4: Employees are properly trained to ensure that each employee operating a process understands and adheres to the current operating procedures of the process. (29 CFR 1910.119(g), *Training*)

Criteria:

1. Initial training: Each employee involved in operating a covered process is trained in an overview of the process and in the operating procedures discussed in objective PSM.3 above. The contractor trains each employee involved in operating a covered process before the employee is involved in operating that process. The training includes an emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks. (29 CFR 1910.119(g)(1), *Initial training*)
2. Refresher training: Refresher training is provided at least every three years and more often if necessary to ensure that the employee operating a process understands and adheres to the current operating procedures of the process. (29 CFR 1910.119(g)(2), *Refresher training*)
3. Training documentation: The contractor has prepared a record that contains the identity of the employee, the date of the training, and the means used to verify that the employee understood the training. (29 CFR 1910.119(g)(3), *Training documentation*)

PSM.5: Contractors and subcontractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process properly adhere to the respective requirements discussed below. (29 CFR 1910.119(h), *Contractors*)

Criteria:

1. The contractor has the following responsibilities: (29 CFR 1910.119(h)(2), *Employer responsibilities*)
 - When selecting a subcontractor, evaluate information regarding the subcontractor's safety performance and programs. (29 CFR 1910.119(h)(2)(i))
 - Inform subcontractors of the known hazards related to the subcontractor's work and the process. (29 CFR 1910.119(h)(2)(ii))
 - Explain the emergency action plan to subcontract employees. (29 CFR 1910.119(h)(2)(iii))

- Develop and implement safe work practices to control the entrance, presence, and exit of subcontract employees in covered process areas. (29 CFR 1910.119(h)(2)(iv))
 - Evaluate the performance of subcontractors in fulfilling their obligations in criterion 2 below. (29 CFR 1910.119(h)(2)(v))
 - The contractor maintains a subcontract employee injury and illness log related to the subcontractor's work in process areas. (29 CFR 1910.119(h)(2)(vi))
2. The subcontractor has the following responsibilities: (29 CFR 1910.119(h)(3), *Contract employer responsibilities*)
- Ensure that each subcontract employee is trained in the work practices necessary to safely perform their job. (29 CFR 1910.119(h)(3)(i))
 - Ensure that each subcontract employee is instructed in the known hazards of their job and the emergency action plan. (29 CFR 1910.119(h)(3)(ii))
 - Ensure that each subcontract employee has received and understands the required training. (29 CFR 1910.119(h)(3)(iii))
 - Verify that each subcontract employee follows the facility safety rules and safe work practices. (29 CFR 1910.119(h)(3)(iv))
 - Advise the contractor of any unique hazards presented by the subcontractor's work, or of any hazards found by the subcontractor's work. (29 CFR 1910.119(h)(3)(v))

PSM.6: The contractor has ensured that the following additional provisions of the PSM program have been implemented. (29 CFR 1910.119(i-o))

Criteria:

1. For new facilities or for modified facilities when the modification is significant enough to require a change to process safety information, the contractor has performed a pre-startup safety review. The pre-startup safety review confirms that prior to the introduction of highly hazardous chemicals to a process, the following requirements will be met: (29 CFR 1910.119(i), *Pre-startup safety review*)
 - Construction and equipment are in accordance with design specifications. (29 CFR 1910.119(i)(2)(i))
 - Safety, operating, maintenance, and emergency procedures are in place and are adequate. (29 CFR 1910.119(i)(2)(ii))
 - For new facilities, a PHA has been performed, and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in 29 CFR 1910.119(l), *Management of change*. (29 CFR 1910.119(i)(2)(iii))
 - Training of each contract employee involved in operating a process has been completed. (29 CFR 1910.119(i)(2)(iv))
2. For process equipment (i.e., pressure vessels and storage tanks, piping systems (including piping components such as valves), relief and vent systems and devices, emergency shutdown systems, monitoring devices, sensors, alarms, interlocks, and pumps), the contractor has established and implemented controls to ensure mechanical integrity, to include the following: (29 CFR 1910.119(j), *Mechanical integrity*)
 - Written maintenance procedures to maintain the on-going integrity of process equipment. (29 CFR 1910.119(j)(2), *Written procedures*)
 - Training for process maintenance activities to include an overview of the process and its hazards and the procedures applicable to the contractor's job tasks. (29 CFR 1910.119(j)(3), *Training for process maintenance activities*)

- Inspection and testing programs on process equipment following recognized and generally accepted good engineering practices, ensuring that such inspections and tests, including frequency, are consistent with manufacturers' recommendations and good engineering practices. The contractor documents each inspection and test that has been performed on the process equipment. (29 CFR 1910.119(j)(4), *Inspection and testing*)
 - A process for correcting equipment deficiencies; when equipment is determined to be deficient, a management-of-change procedure must be established and implemented. (29 CFR 1910.119(j)(5), *Equipment deficiencies*). See criterion 4 below.
 - Systems for verifying the quality assurance of new plants and equipment to ensure that (1) equipment is suitable for the process application, (2) appropriate checks and inspections are performed to ensure that the equipment is installed properly and consistent with the design specifications, and (3) the maintenance manual, spare parts, and equipment are suitable for the process. (29 CFR 1910.119(j)(6), *Quality assurance*)
3. The contractor issues a hot work permit for hot work operations conducted on or near a covered process and ensures the permit documents that the fire prevention and protection requirements of 29 CFR 1910.252(a), *Fire prevention and protection*, have been implemented prior to beginning hot work operations. (29 CFR 1910.119(k), *Hot work permit*)
 4. The contractor has established and implemented written procedures to manage changes to process chemicals, technology, equipment, and procedures, and changes to facilities that affect a covered process. The procedures include: (29 CFR 1910.119(l)(1) & (2))
 - The technical basis for the proposed change
 - Impact of change on safety and health
 - Modifications to operating procedures
 - Necessary time period for the change
 - Authorization requirements for the proposed change
 - Means for documenting proposed changes and updates.

Employees involved in operating a process and maintenance and subcontract employees whose job tasks will be affected by a change in the process are informed of, and trained in, the change prior to start-up of the process or affected part of the process. (29 CFR 1910.119(l)(3))

If a change results in a change in the process safety information or operating procedures and practices, such information and documentation is updated accordingly. (29 CFR 1910.119(l)(4) & (5))

5. The contractor investigates each incident that resulted in, or could reasonably have resulted in, a catastrophic release of highly hazardous chemicals into the workplace. The following criteria are met with respect to the conduct of an investigation: (29 CFR 1910.119(m), *Incident investigation*)
 - The incident investigation is initiated as promptly as possible, but not later than 48 hours following the incident. (29 CFR 1910.119(m)(2))
 - An incident investigation team is established consisting of at least one person knowledgeable in the process involved, including a subcontract employee if the incident involved the work of the subcontractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident. (29 CFR 1910.119(m)(3))
 - A report is prepared at the conclusion of the investigation. (29 CFR 1910.119(m)(4))
 - The contractor has established a system to promptly address and resolve the incident findings and recommendations. Resolutions and corrective actions are documented. (29 CFR 1910.119(m)(5))

- The report is reviewed with all affected personnel whose job tasks are relevant to the incident findings, including contract and subcontract employees where applicable. (29 CFR 1910.119(m)(6))
 - Incident investigation reports are retained for five years. (29 CFR 1910.119(m)(7))
6. The contractor has developed and implemented an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38, *Emergency action plans*. In addition, the emergency action plan includes procedures for handling small releases. (29 CFR 1910.119(n), *Emergency planning and response*)
 7. The contractor certifies that it has evaluated compliance with the provisions of the PSM standard at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed. Specific requirements of the compliance audit are as follows: (29 CFR 1910.119(o), *Compliance Audits*)
 - The compliance audit is conducted by at least one person, knowledgeable in the process. (29 CFR 1910.119(o)(2))
 - A report of the findings of the audit is developed. (29 CFR 1910.119(o)(3))
 - The contractor promptly determines and documents an appropriate response to each of the findings of the compliance audit. (29 CFR 1910.119(o)(4))
 - The contractor retains the two most recent compliance audit reports. (29 CFR 1910.119(o)(5))

REVIEW APPROACH

Records Review

- Process safety information, including details about hazardous chemicals, technology, and equipment. Examples include engineering drawings (e.g., process flow diagrams, piping and instrument diagrams, legends), materials of construction, unit electrical classification documents, and safety system design documents.
- Description of safety systems (e.g., interlocks, detection or suppression systems)
- Design codes and standards used for covered processes and equipment.
- PHA documents defining how hazards are identified and controlled and most recent PHA updates. Relevant records include PHA reports, documented resolution of findings, and communication of findings to personnel. Revalidation records (every five years) are also important.
- Operating procedures and written instructions for the covered processes, including current and accurate procedures and annual certifications that are up to date. Include safe upper and lower operating limits for the covered processes and equipment.
- Employee participation records/documentation of employee involvement in PSM elements. These records include written plans of action and documentation of employee consultation on PHAs.
- Training records for employees and subcontractors. These records cover initial and refresher training, certification of employee understanding, the means used to verify employees' understanding of the training, and training records for subcontract employees.
- Management-of-change records: procedures and documentation for managing process changes. Review written management-of-change procedures, documentation for changes (chemicals, technology, equipment, procedures), and related training records.
- Mechanical integrity records: procedures and records for maintaining equipment integrity. This involves written procedures, inspection and test schedules, and detailed inspection and test records.
- Deferred corrective maintenance lists

- Reports and documentation of incidents and corrective actions, including incident investigation reports, documentation of resolutions and corrective actions, and records of the communication of findings
- Compliance audits/reports from previous PSM compliance audits, including the two most recent reports and documentation of responses to findings
- Other relevant records, including written emergency action plans, hot work permit programs, and pre-startup safety review documentation

Interviews

- Environment, Safety, and Health (ES&H) Manager
- Industrial hygiene and safety managers and personnel
- Engineering Manager
- Maintenance Manager
- PSM Section Manager
- PSM PHA Manager
- Training Manager
- Covered process operators and maintenance personnel
- Subcontractor employees involved in changes to covered processes
- Quality Assurance Manager
- Compliance Assurance Manager (issues management)
- Emergency Planning Manager
- Mechanical Integrity Manager
- Management of Change Coordinator
- DOE industrial hygiene and safety managers and personnel
- DOE Facility Representatives
- DOE engineers overseeing PSM

Observations

- Walkdowns of covered processes
- Observations of covered process operations
- Observations of covered process equipment maintenance
- Observations of pre-job and post-job briefings for covered process operations
- Observations and walkdowns of PHA development (if applicable)
- Observations of safety meetings associated with covered processes
- Observations of PSM-related training