

2.11 Incident Investigation

29 CFR 1910.119 (m)

- (1) *The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace.*
- (2) *An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.*
- (3) *An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.*
- (4) *A report shall be prepared at the conclusion of the investigation which includes at a minimum:*
 - (i) *Date of incident;*
 - (ii) *Date investigation began;*
 - (iii) *A description of the incident;*
 - (iv) *The factors that contributed to the incident; and,*
 - (v) *Any recommendations resulting from the investigation.*
- (5) *The employer shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.*
- (6) *The report shall be reviewed with all affected personnel whose job task are relevant to the incident findings including contract employees where applicable.*
- (7) *Incident investigation reports shall be retained for five years.*

Intent

The purpose of incident investigation is to prevent recurrence of incidents having the same nature or the root cause. Every incident that results in or could reasonably result in a catastrophic chemical release must be investigated. The PSM Rule defines catastrophic as “a major, uncontrolled emission, fire, or explosion, involving one or more HHCs, that present a serious danger to employees in the workplace” [Q87].

The incident investigation team's recommendations are to be implemented unless it can be documented that an alternative will address the concerns at least as effectively and efficiently. Management may reject recommendations that are erroneous, infeasible, or more costly or complex than a equally protective measure.

Corresponding DOE Programs and Requirements

DOE incident investigations are addressed in DOE O 225.1A, ACCIDENT INVESTIGATION and DOE M 231.1-2, OCCURRENCE REPORTING AND PROCESSING OF OPERATIONS INFORMATION. The Accident/Incident Reporting System and the Occurrence Reporting and Processing System within DOE meet the intent of the incident investigation element of the PSM Rule. Additional DOE guidance is provided in DOE G 231.1-1, OCCURRENCE REPORTING AND PERFORMANCE ANALYSIS GUIDE and DOE G 231.1-2, OCCURRENCE REPORTING CAUSAL ANALYSIS GUIDE.

Documentation Requirements

Incident investigation findings must be documented in a written report that contains the date of the incident, the date the investigation began, a description of the incident, the factors that contributed to the incident, and recommendations. The PSM Rule requires that a team be appointed and an investigation initiated within 48 hours of discovery of the incident. However, current DOE Orders are more restrictive and should be consulted for additional requirements.

Minimum Implementation Criteria

Investigations must be conducted for all incidents that result in, or could reasonably result in, catastrophic releases of highly hazardous chemicals. DOE contractors must assemble a team and initiate an investigation within 48 hours of an incident or sooner, per DOE requirements [Q88]. Therefore, an effective written incident investigation procedure must be in place for establishing an incident investigation team, including a leader, and preserving relevant information and evidence. Activities for preserving information include securing/barricading the scene, initiating the collection of transient information, and interviewing personnel.

The incident investigation team should vary according to the type of incident. A typical team may include management personnel from the facility where the incident occurred; engineering and/or maintenance personnel; facility and/or operations personnel; ES&H personnel; and technical and/or research personnel. Incident investigation teams must include at least one person knowledgeable in the process involved in the incident. If the incident involved the work of a subcontractor, at least one subcontractor employee must be included on the investigation team. Other members should have the appropriate knowledge and experience to support the investigation.

The team chairperson must effectively control the scope of team activities by identifying the lines of investigation to be pursued; assigning tasks and establishing timetables; and keeping facility management advised of the progress of the investigation.

Investigations should include a visit to the incident scene; preparation of visual aids, such as photos and field sketches; eyewitness interviews, conducted privately and individually; observation of any mechanical equipment involved; review of as-built drawings, operating logs, recorder charts, previous reports, procedures, equipment manuals, design data, laboratory tests, and other potentially useful information; and documentation of the sources of information for the incident report.

Incident investigations should analyze for root causes that will lead to recommendations for corrective actions. Recommendations should include the actions to prevent a recurrence of the incident, the identification of the person responsible for completing the actions, and the schedule for completion. Corrective actions should be aimed primarily at preventing or controlling the underlying causes of an incident rather than the surface manifestations.

Incident investigation report findings and recommendations must be implemented and documented promptly. A system should be in place to ensure follow-up, closure, and documentation of open recommendations from an incident investigation.

Incident investigation reports must be reviewed with all affected personnel, whose jobs relate to the incident findings, including subcontractor employees, where applicable. Consideration should be given to sharing lessons learned with similar DOE facilities through the Accident/Incident Reporting System or the Occurrence Reporting and Processing System. Incident investigation reports must be retained for at least 5 years. The purpose of maintaining the reports is to detect incident patterns.

Questions

87. How severe must an incident be before it is investigated? What does *or could reasonably have resulted in* mean? Does the same investigation technique have to be applied to all incidents covered under this element?

DOE contractors must investigate each incident that resulted in or could reasonably have resulted in a catastrophic release which the PSM Rule defines as “a major, uncontrolled emission, fire, or explosion, involving one or more HHCs, that presents a serious danger to employees in the workplace.” The PSM Rule provides no further guidance on what *or could reasonably have resulted in* means. Existing criteria which mandate the investigation of occurrences and accidents and incidents provide the basic guidance within DOE. However, contractors should include relevant process incidents historically referred to as near-misses.

88. If we cannot gain access to the area where an accident occurred within 48 hours due to the hazards the area may pose to members of the investigation team, are we in violation of the requirement to begin the investigation within this time period?

Assembling an accident investigation team and preparing to conduct an onsite inspection is considered the beginning of the investigation. Contractors are not relieved of time requirements for occurrence reporting.

2.12 Emergency Planning and Response

29 CFR 1910.119 (n)

The employer shall establish and implement an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38(a). In addition, the emergency action plan shall include procedures for handling small releases. Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120(a), (p) and (q).

Intent

Emergency planning and response are required under the PSM Rule to mitigate the consequences of catastrophic chemical releases. Emergency plans form the last line of defense in protecting workers from such events. Plans must specify evacuation routes, safe zones, and alarms; incident reporting; actions an employee should take to stop releases; and preplanning for incidental releases. The PSM Rule requires DOE contractors to develop an emergency action plan in compliance with 29 CFR 1910.38(a). Plans must include procedures for dealing with small chemical releases. In addition, DOE contractors are subject to the emergency response provisions in 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response.

Corresponding DOE Programs and Requirements

DOE O 151.1B, COMPREHENSIVE EMERGENCY MANAGEMENT SYSTEM, deals with emergency preparedness for DOE contractors. Little modification of DOE requirements or site emergency plans is expected to address the emergency planning and response requirements of the PSM Rule. Existing emergency plans for DOE facilities must already comply with the requirements of 29 CFR 1910.38 and 29 CFR 1910.120, both of which are required by DOE order. Nevertheless, emergency plans should be reviewed to ensure that they adequately address the requirements of this element.

Documentation Requirements

Detailed written emergency plans are required for subcontractor facilities with processes covered by the PSM Rule.

Minimum Implementation Criteria

Emergency plans must be developed and current for all processes covered by the PSM Rule. DOE contractor employees must be trained to respond in accordance with the plans, which must contain:

- emergency procedures and responsibilities;
- escape routes;
- the location of safe zones;
- types of accidents considered;
- a description of alarms;
- procedures for safe shutdown before evacuation;

- procedures to account for all employees following evacuation;
- rescue and medical responsibilities;
- reporting procedures;
- emergency contact personnel; and
- strategies and procedures for handling small releases [Q89].

Questions

89. What does the PSM Rule mean by procedures for handling small releases?

DOE contractors should develop appropriate strategies and procedures for workers to use in dealing with localized, small releases of HHCs that are not of sufficient magnitude to cause wide-scale evacuation of a facility. These procedures typically include the steps that operating and maintenance personnel may take to isolate such releases while using personal protective equipment. Contractors should develop their own appropriate classification of these incidents for each covered process.

2.13 Compliance Audits

29 CFR 1910.119 (o)

- (1) *Employers shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.*
- (2) *The compliance audit shall be conducted by at least one person knowledgeable in the process.*
- (3) *A report of the findings of the audit shall be developed.*
- (4) *The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.*
- (5) *Employers shall retain the two (2) most recent compliance audit reports*

Intent

The purpose of the audit element is to ensure that the PSM program is operating in an integrated and effective manner. DOE contractors must conduct internal audits or self assessments for compliance with the PSM Rule at least every 3 years to determine the degree to which plans and programs have been implemented.

Audits are a tool to help contractors identify PSM weaknesses and develop recommendations. The audit team should provide an independent assessment of the degree of compliance with the PSM Rule, even though one member may by necessity be involved in the operation of the process.

Audits have two major objectives. The first is to assess whether the management system in place adequately addresses all elements of the PSM Rule. This part of the audit attempts to discover fundamental design deficiencies that could compromise the effectiveness of a PSM program. The second objective is to assess whether the management system has been adequately implemented for every facility or process. Deficiencies discovered during this part of the audit may indicate a need for better communications or training, or may signal fundamental management problems.

Corresponding DOE Programs and Requirements

DOE G 414.1-1A, Management Assessment and Independent Assessment Guide, provides nonmandatory guidance for satisfying requirements contained in DOE O 414.1A Chg 1, QUALITY ASSURANCE, and 10 CFR Part 830 Subpart A. DOE O 231.1A contains safety and health reporting requirements which provide indicators of program performance that can be used to highlight safety management weaknesses which should be examined.

PSM audits can be encompassed within existing internal self-assessment and corrective action tracking programs within DOE. DOE contractor self-assessments are implemented in various ways and by different organizational groups under DOE safety appraisal programs.

Documentation Requirements

Reports of internal audit findings must be written, and DOE contractors must document responses to the findings and certify that the deficiencies have been corrected.

Initially, the responses should be action plans indicating what corrective actions or additional investigations will be done and when they will be completed. The document should be updated periodically to indicate the completion of corrective actions.

Minimum Implementation Criteria

All elements of the PSM program must be evaluated for compliance with the PSM Rule every 3 years. DOE contractors must certify in writing that there has been a complete internal PSM audit at least every 3 years. However, a complete audit need not be done all at one time. Rather, various portions of a facility, such as process units or departments, may be audited at different times, so long as a complete audit covering all elements is performed at least once every 3 years.

An effective internal audit should include a review of relevant documentation, an inspection of the physical facilities, and interviews with all levels of plant personnel. (A sample audit format is provided at the end of this section in Exhibit 2.13.) The internal audit must be conducted by a team that includes at least one, and preferably several, persons knowledgeable in the processes being audited. Such persons should understand the fundamental process hazards for the operations being reviewed and should be familiar with the specific types of process units used.

The audit team should include a leader and members familiar with the process, experienced in PSM, and trained in audit techniques. Team size should be a function of the number, size, and complexity of the processes being audited. The internal audit team for any facility or process may be either a “standing” audit team, an “ad hoc” team, or a combination, with some permanent auditors augmented by different individuals for each audit.

Internal audits must detail the requirements of each element of the program being audited. A properly designed checklist may assist the auditor in expediting the audit and to ensuring that no requirements of the Rule are omitted. DOE contractors may adopt a sampling approach that examines representative evidence of the PSM practices, such as drawings; training and maintenance records; and results of personnel interviews. Contractors should develop their own criteria for assessing the effectiveness of their PSM programs [Q90].

An audit report must be developed for each audit and the responsible facility manager must promptly develop a response action plan for each finding. Such a response action plan may take the form of an internal memorandum setting forth action items, responsibilities, and completion targets. Action items and status may be tracked by computer to facilitate record keeping.

DOE contractors must further document that action items have been addressed and deficiencies have been corrected. If a computerized database is used to track action items, a paper copy of the documents that report completion of corrective actions should be maintained.

Contractor internal audit programs should provide a process to resolve worker or management disagreements with audit findings. This process may refer issues to higher levels of management. If a finding is reported for which management determines no action is necessary, the basis for the management decision should be documented as part of the audit process. That is, the conclusion that an audit finding is inappropriate or irrelevant may be an adequate response to a finding, provided that the conclusion is well-founded and documented.

The two most recent audit reports must be readily available for review by internal auditors, DOE, and interested workers or their representatives. If the same findings recur in successive audits, contractors must explain why problems were not corrected after their first appearance in an audit report.

Questions

90. What criteria can be used to certify compliance? Must DOE contractors evaluate every operating procedure, inspect every training record, etc.? Or can contractors use an auditing approach that looks at representative examples of PSM practices?

DOE contractors may adopt an auditing approach that looks at representative samples as evidence of PSM practices. The samples may include drawings, training and maintenance records, and results of interviews with personnel. Contractors should develop their own criteria for assessing the effectiveness of their PSM programs.

SAMPLE PSM AUDIT REPORT FORM

Explanation of Levels of Process Safety Management (PSM) Compliance Status (as shown on the following form)

- None: Little or no information is available to determine compliance to the OSHA PSM rule; a lack of information or inability to easily provide information would constitute little proof of compliance.
- Partial: Significant information is available, but not enough to determine compliance with the OSHA PSM rule; incompliance documentation (process descriptions, P&IDs, written procedures, etc.) would constitute partial compliance. Lack of formal methods (verbal only) of handling changes to process information would also constitute partial compliance.
- Complete: The available information is sufficient to verify compliance to the OSHA PSM rule. Personnel responsibilities are clearly established and the documentation is complete and easily accessible.

PSM Element: PROCESS SAFETY INFORMATION

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
CHEMICAL INFORMATION Documentation The following chemical information is available. <ul style="list-style-type: none"> ▪ Toxicity Data ▪ Permissible exposure limits ▪ Physical Data ▪ Reactivity Data ▪ Corrosivity data ▪ Thermal and chemical stability data ▪ Chemical Incompatibility data 					
CHEMICAL INFORMATION Communication Employees are aware of where chemical information is located. Employees are informed when changes are made to the chemical information.					
CHEMICAL INFORMATION Implementation Written program exists for maintaining, revisiting and updating chemical information. Responsibility for maintaining, revisiting, and updating chemical information is clearly established.					

PSM Element: PROCESS SAFETY INFORMATION, continued

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
TECHNOLOGY Documentation					
Written, up-to-date process descriptions exist.					
Block flow diagrams or simplified process flow diagrams exist.				Exhibit 2.13	
Maximum intended inventories of chemicals are documented.					
Information concerning the process chemistry is documented.					
Safe operating ranges (upper and lower limits) are provided for such process parameters as temperature, pressure, flow rate, and composition.					
Consequences associated with process parameter deviations are provided, including those that would affect the safety and health of employees.					
TECHNOLOGY Communication					
Employees are aware of where information is located.					
Employees are informed when changes are made to the process technology information.					
TECHNOLOGY Implementation					
Written program exists for maintaining, revising, and updating process technology information.					
Responsibility for maintaining, revising, and updating technology information is clearly established.					

PSM Element: PROCESS SAFETY INFORMATION, continued

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
PROCESS EQUIPMENT Documentation				Exhibit 2.13	
Documentation is provided for materials of construction (including protective coatings) and their selection bases.					
Up to date piping and instrumentation diagrams (P&IDs) are available.					
Documentation is provided for electrical classifications of equipment (i.e. applicable service environments).					
Documentation is provided for the design basis of relief systems.					
Documentation is provided for the design of ventilation systems.					
Documentation is provided that indicates equipment complies with design codes, standards, or recognized and generally accepted engineering practices used in designing the process.					
Documentation is provided for material and energy balances.					
Documentation is provided for the design of safety systems equipment such as interlocks, detection and suppression systems, etc.					
PROCESS EQUIPMENT Communication					
Employees are aware of where process equipment information is located.					
Employees are informed when changes are made to the process equipment information.					

PSM Element: PROCESS SAFETY INFORMATION, continued

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>PROCESS EQUIPMENT Implementation Written program exists for maintaining, revising, and updating process equipment information.</p> <p>Responsibility for maintaining, revising, and updating process equipment information is clearly established</p>				<p>Exhibit 2.13</p>	

PSM Element: Process Hazards Analysis

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments Exhibit 2.13
	None	Partial	Complete		
<p>Documentation</p> <p>The PrHA documentation includes the following.</p> <ul style="list-style-type: none"> ▪ System analyzed (i.e. a list of P&IDs with revision numbers and dates) ▪ Personnel involved in the PrHA. ▪ PrHA method used. ▪ Recommended actions. ▪ Management response to the recommended actions. <p>The documentation associated with the two most recent process hazard analyses (PrHAs) is on file.</p>					
<p>Communication</p> <p>The findings of the PrHA and actions taken in response to the findings are communicated to all affected personnel (i.e. operations, maintenance, etc.)</p>					
<p>Implementation</p> <p>Written protocol exists for performing PrHAs and established responsibilities.</p> <p>Written program exists describing 1) the PrHA techniques that may be used, 2) when to use them, and 3) how to use them.</p> <p>The PrHA method selected addresses the following.</p> <ul style="list-style-type: none"> ▪ Hazards of the process. ▪ Engineering and administrative controls applicable to the hazards. ▪ Consequences of failure of these controls. ▪ Consequences to workplace employees of the engineering administrative control failures. <p>The PrHA is performed by a team with expertise in engineering and process operations, with at least one individual who has experience and knowledge specific to the process being evaluated.</p>					

PSM Element: Process Hazards Analysis, continued

Major Issues/Questions	PSM Compliance Status			Information Source	Exhibit 2.13 Notes/Comments
	None	Partial	Complete		
<p>Implementation (continued) Written program exists for 1) documenting the recommendations and management response to the recommendations, 2) communicating the results to affected individuals, and 3) implementing the recommendations in a timely manner.</p>					
<p>Written program exists for updating and revalidating PrHAs every 5 years.</p>					

PSM Element: Operating Procedures

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation Written up-to-date operating procedures address at least the following operation modes.</p> <ul style="list-style-type: none"> ▪ Initial startup ▪ Normal operation ▪ Temporary operation (as the need arises). ▪ Emergency operations (including emergency shutdowns, conditions under which to declare a shutdown, and assignment of shutdown responsibility.) ▪ Startup following a turnaround or after an emergency shutdown. 					Exhibit 2.13
<p>Written up-to-date operating procedures address operating limits by considering the following.</p> <ul style="list-style-type: none"> ▪ Consequences of deviations from operating limits. ▪ Steps necessary to correct and/or avoid deviations from operating limits. ▪ Safety systems and their functions. 					
<p>Written up-to-date operating procedures address the following safety and health considerations.</p> <ul style="list-style-type: none"> ▪ Procedures and hazards of chemicals used in the process. ▪ Precautions necessary to prevent exposure (i.e. administrative and engineering controls and protective equipment.) ▪ Measure to be take if contact or exposures occurs. ▪ Safety procedures for opening process equipment (e.g. line breaks). ▪ Quality control for raw materials and chemical inventory levels. ▪ Any special or unique hazards. 					
<p>Communication Operating procedures are readily accessible to employees who work in or maintain a process.</p>					

PSM Element: Operating Procedures, continued

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Communication (continued) Employees are informed when changes are made to the operating procedures.</p>					
<p>Implementation Written program exists for updating operating procedures to include changes in process chemicals, technology, equipment, and facilities.</p> <p>Responsibility for maintaining, revising, and updating operating procedures is clearly established.</p> <p>Written program exists for annually certifying that operating procedures are current and accurate.</p>					

PSM Element: Training

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation For initial and refresher training, an employee record exists that contains the name of the employee, the date of training, and the signature of the person doing the training.</p>					Exhibit 2.13
<p>Communication Employees are made aware of initial and refresher training that is required.</p>					
<p>Training program ensures that employees understand and adhere to the operating procedures</p>					
<p>Implementation Written program exists for providing refresher and supplemental training and for establishing acceptable training methods, responsibilities for training instructors, and methods for maintaining , revising, and updating certification records.</p>					
<p>Written training program ensures that employees are trained in the following areas.</p> <ul style="list-style-type: none"> • An overview of the process • Operating Procedures • Safety and health hazards and procedures • Safe work procedures applicable to the employee's job tasks. 					

PSM Element: CONTRACTORS

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation Documentation exists for contractor orientation to known potential hazards and the applicable provisions of the emergency action plan.</p>					
<p>Communication Employer assumes the following responsibilities.</p> <ul style="list-style-type: none"> ▪ Inform contractors of known potential hazards related to the contractor's work and the process. ▪ Explain to contractor the applicable provisions of the emergency action plan. 					
<p>Implementation Written program establishes responsibilities for orientating contractors to potential hazards and the applicable provisions of the emergency action plan and for documenting the orientation.</p>					
<p>Written programs exists for developing and implementing safe work practices to control the entrance, the exit, and the movement of contractor personnel at the affected processes.</p>					
<p>Written program exists for ensuring that the contractor assumes the following responsibilities.</p> <ul style="list-style-type: none"> ▪ Ensuring their workers are trained in safe work practices. ▪ Ensuring their workers follow all applicable safety rules and work practices. 					

PSM Element: PRE-STARTUP SAFETY REVIEW

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation Prior to introduction of hazardous materials into the affected process, documentation exists indicating that a pre-startup safety review was conducted and confirming the following.</p> <ul style="list-style-type: none"> ▪ Construction is in accordance with design specifications. ▪ Safety, operating, maintenance, and emergency procedures are in place and are adequate. ▪ PrHA recommendations have been addressed and actions necessary for startup have been completed. ▪ Operating procedures are in place and each operating employee has been trained. 					
<p>Communication Operating employees are properly trained in the hazards and safe operating practices of the new or modified facility.</p>					
<p>Implementation Written program exists for determining when a pre-startup safety review is necessary and establishing responsibilities for conducting such a review.</p>					
<p>Written procedure exists for conducting and documenting pre-startup reviews.</p>					

PSM Element: MECHANICAL INTEGRITY

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation</p> <p>Written procedures exist for maintaining the on-going integrity of process equipment. Procedures include maintenance and inspection/testing frequency for process equipment. The frequency of inspections/tests shall be consistent with applicable codes and standards, or more frequently if operating experience so dictates.</p> <p>Certification records exist documenting inspections and tests of equipment. The records contain as a minimum, the following information.</p> <ul style="list-style-type: none"> ▪ Date of the inspection and/or test. ▪ Name of the individual who performed the inspection and/or test. ▪ Serial number, or other identifier, of the equipment tested. <p>Written quality assurance program exists for ensuring the following:</p> <ul style="list-style-type: none"> ▪ Equipment as fabricated meets design specifications ▪ Appropriate checks and inspections are performed, as necessary, to ensure that equipment is installed properly, consistent with design specifications and manufacture's instructions. ▪ Maintenance materials and spare parts and equipment meet design specifications. 					
<p>Communication</p> <p>Employees involved in maintaining the on-going integrity of process equipment are trained in the procedures applicable to the job tasks.</p>					
<p>Implementation</p> <p>Formal system exists for determining maintenance and test frequencies for equipment</p>					

PSM Element: MECHANICAL INTEGRITY, continued

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Implementation (continued) A record keeping system exists for documenting the mechanical integrity of all affected equipment.</p> <p>A quality assurance program exists for ensuring that all affected equipment is properly designed, installed, and maintained.</p> <p>Written program requires that equipment deficiencies outside acceptable limits be corrected to meet acceptable limits as specified in the process safety information package before further use.</p> <p>Inspection and testing procedures follow generally accepted good engineering practices that are consistent with manufacture's recommendations.</p>					

PSM Element: MECHANICAL INTEGRITY

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation A permit exists on file (until completion of the hot work operations) containing the following information.</p> <ul style="list-style-type: none"> • Certification that the fire prevention and protection requirements contained in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations. • Date(s) authorized for hot work • Equipment or facility on which the hot work is to be done. 					
<p>Communication Completion of hot work operations is properly communicated to the individuals responsible for maintaining hot work permits on file.</p>					
<p>Implementation A system exists for issuing permits and responsibility for issuing permits is clearly established.</p>					

PSM Element: MANAGEMENT OF CHANGE

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation Written procedures exist to manage changes (except for “replacements in kind”) to process chemical technology, equipment, and changes to facilities. Procedures ensure that the following are addressed prior to any change.</p> <ul style="list-style-type: none"> ▪ Technical basis for the change. ▪ Impact of the change on safety and health. ▪ Modifications to operating procedures. ▪ Necessary time period for the change. ▪ Authorization requirements for the change. 					
<p>Communication Employees involved in the process are informed of and trained in the change in process as early as practicable prior to its implementation.</p>					
<p>Implementation Written protocol exists for determining what changes in the process (equipment, operating limits, etc.) require implementation of management of change requirements.</p>					
<p>Written protocol exists for implementing management of change in training employees, revising operating procedures, and process safety information.</p>					

PSM Element: INCIDENT INVESTIGATION

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation Incident investigation reports shall be retained for 5 years and shall contain, as a minimum, the follow information.</p> <ul style="list-style-type: none"> ▪ Date of the incident ▪ Date the investigation began ▪ Description of the incident. ▪ Factors that contributed to the incident. ▪ Any recommendations resulting from the investigation. 					
<p>Communication The report has been reviewed with all operating, maintenance, and other personnel whose work assignments are within the facility where the incident took place.</p>					
<p>Implementation Written program exists for reporting and investigating (within 48 hours) any incident that results in, or could reasonably have resulted in, a major accident.</p> <p>Written program includes establishment of an incident investigation team consisting of persons knowledgeable in the process and other appropriate specialties, as necessary.</p> <p>Written program includes system for promptly addressing the incident investigation report findings and recommendations and for implementing report recommendations in a timely manner.</p>					

PSM Element: EMERGENCY PLANNING AND RESPONSE

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation Written up-to-date, emergency response plan exists containing the following elements.</p> <ul style="list-style-type: none"> ▪ Emergency escape procedures and escape route assignments. ▪ Procedures to be followed by employees who remain to operate critical plant operations before they evacuate. ▪ Procedures to account for all employees after emergency evacuation have been completed. ▪ Rescue and medical duties for those employees who are to perform them ▪ The preferred means for reporting fires and emergencies. ▪ Names or regular job titles or persons or departments who can be contacted for further information or explanation of duties under the plan. 					
Documentation exists of employee training with respect to the emergency response plan, including refresher training.					
<p>Communication An alarm system exists with distinctive signals for each purpose.</p>					
Employees are aware of the location of emergency response plan documentation, have access to it, and are notified when changes are made to the plan.					

PSM Element: EMERGENCY PLANNING AND RESPONSE, continued

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Implementation Personnel have been designated and trained to assist in the safe and orderly evacuation of employees.</p> <p>Written program exists for ensuring that employees are trained and familiar with the emergency response plan and for maintaining proper documentation records.</p>				Exhibit 2.13	

PSM Element: COMPLIANCE SAFETY AUDITS

Exhibit 2.13

Major Issues/Questions	PSM Compliance Status			Information Source	Notes/Comments
	None	Partial	Complete		
<p>Documentation The employer documents compliance at least every 3 years.</p> <p>The employer documents the findings of the audit, the management response to the findings of the audit, and certifies that deficiencies have been corrected. The two most recent reports are retained.</p>					
<p>Communication Deficiencies found during the compliance safety audit are communicated to responsible individuals for subsequent improvement of the PSM program.</p>					
<p>Implementation Written procedure exists for performing and documenting compliance safety audits and for establishing a team of individuals (at least one of which is knowledgeable in the process).</p>					

2.14 Trade Secrets

29 CFR 1910.119 (p)

- (1) *Employers shall make all information necessary to comply with the section available to those persons responsible for compiling the process safety information (required by paragraph (d)), those assisting in the development of the process hazard analysis (required by paragraph (e)), those responsible for developing the operating procedures (required by paragraph (f)), and those involved in incident investigations (required by paragraph (m)), emergency planning and response (paragraph (n)) and compliance audits (paragraph (o)) without regard to possible trade secret status of such information.*
- (2) *Nothing in this paragraph shall preclude the employer from requiring the persons to whom the information is made available under paragraph (p)(1) of this section to enter into confidentiality agreements not to disclose the information as set forth in 29 CFR 1910.1200.*
- (3) *Subject to the Rules and procedures set forth in 29 CFR 1910.1200(i)(1) through 1910.1200(i)(12), employees and their designated representatives shall have access to trade secret information contained within the process hazard analysis and other documents required to be developed by this standard.*

Intent

Trade secrets are addressed to ensure that necessary information is available to identify hazards and protect workers. Few trade secrets are expected in information required for DOE contractors to support the PSM Rule. When necessary, confidentiality or nondisclosure agreements are recommended to ensure that personnel having access to trade secrets do not disclose that information.

Corresponding DOE Programs and Requirements

For DOE contractors, classified information is the equivalent to trade secrets. All affected workers in classified areas should have access to PSI and PrHAs for processes covered by the PSM Rule [91]. Security conflicts should be rare, because workers who support such processes have the appropriate security clearances and access to the information necessary to support process safety.

Documentation Requirements

None.

Minimum Implementation Criteria

Information covered by trade secrets must be available to support development of PSI, PrHA, operating procedures, and incident investigations.

Process workers must have appropriate clearances and access to classified PSI. For situations involving National Security interests, DOE contractors must develop methods to provide an equivalent level of protection.

Questions

- 91. What does access to trade secret information contained within PrHA and other documents mean? Must PrHA team members have access to all confidential information concerning a covered process?**

PrHA team members must be able to review all process safety information relevant to a covered process to allow a thorough evaluation of the potential problems that could affect the safety and health of employees. Likewise, process workers and their representatives must be able to review any process information (e.g., PSI, PrHA, incident investigations) necessary for the safe operation of that process.

3.0 PSM Program Development

This section describes a logical process for developing and implementing a PSM program at sites with processes covered by the PSM Rule.

3.1 Defining Process Safety Management Policy, Goals, and Objectives

Many of the elements of the PSM Rule can be applied to chemical safety programs in general. For years DOE safety programs have been concerned with releases of radioactive materials, without a commensurate emphasis on chemical safety. Therefore, affected DOE contractors should develop a policy giving adequate attention to process safety management. This policy must integrate existing programs that may be operating independently.

The primary goal of process safety management is to minimize catastrophic releases of HHCs. The minimum program goal is compliance with the PSM Rule. Although the immediate goal is compliance, contractors should focus on the ultimate goal of preventing all hazardous chemical releases.

Although the PSM Rule does not emphasize the same elements contained in the Chemical Manufacturers Association's Responsible Care Process Safety Code, the Center for Chemical Process Safety (CCPS) PSM program or the American Petroleum Institute Hazard Management program, these programs address nearly identical issues. Contractors may wish to supplement their PSM programs with concepts from industry programs or applicable in-house programs. In addition, contractors should be familiar with the proposed EPA Risk Management Program elements and incorporate these into their policies, goals and objectives. A comparison of the OSHA PSM and EPA's proposed Risk Management Program is provided in Appendix C.

3.2 Process Safety Management Planning

Identifying Chemical Processes Covered by the Rule

DOE contractors can determine the applicability of the PSM Rule by comparing the list of HHCs in Appendix A of the OSHA Rule with their chemical inventory information. Because the list of regulated substances which invoke coverage under EPA's Risk Management Program differs somewhat from those in the OSHA Rule, it is recommended that contractors use the integrated OSHA and EPA listing of HHCs in Appendix A to avoid doing this task twice. This assumes that contractors have systems in place for tracking chemical inventory and use. The TQs of the HHCs listed in Appendix A apply not to aggregate quantities at a site, but to individual processes which must be sufficiently separated from each other so that a release, fire, or explosion in one process will be unlikely to affect others. When processes are not adequately separated, aggregate quantities of individual HHCs used in adjacent processes are used for comparing TQs. Contractors should also check inventories of flammable gases and liquids and any manufacturing of explosives or pyrotechnics.

Where quantities of HHCs approach but do not exceed TQs, or chemicals are used which, though not on the OSHA list of HHCs, are known to be highly hazardous, DOE contractors may want to

ensure that their management of such chemicals conforms to the PSM Rule even though not required by law.

Baseline Audit

DOE contractors should conduct baseline audits to assess their current degree of compliance with the PSM Rule. An audit checklist is provided at the end of Section 2.13. Baseline audits provide a systematic evaluation of internal programs that address individual elements of the PSM Rule. Because they identify compliance gaps, baseline audits also help in preparing a strategy for compliance with the PSM Rule.

Implementation Plan

DOE contractors should develop a description of each activity needed to come into compliance with the PSM Rule. Descriptions must be in sufficient detail to explain exactly what is required. A written plan should then be developed with specific milestones for completing each activity. The plan must identify the individuals responsible for developing the overall PSM program and the lead personnel responsible for each activity.

Employee Involvement

A written plan for employee involvement in the PSM program must be developed. A team composed of safety personnel, process employees, and process managers should formulate the plan. If employee involvement programs exist, they should be reviewed to determine if additional activities are required or desirable, based on requirements in the PSM Rule.

Risk-Based Priorities

For DOE sites with several processes covered under the PSM Rule, completion of PSI and PrHAs must be prioritized based on risk factors associated with the processes. Risk factors suggested by the PSM Rule include the extent of the process hazards, the number of potentially affected employees, the age of the process, and past performance of the process. Other factors might include the complexity of the process or ratios of quantities of HHCs to their respective TQs. The prioritized list of processes and the criteria used to rank the processes must be documented as part of the PSM program records.

Resources and Schedule

The implementation of the PSM Rule at sites with extensive chemical processes may require additional resources to develop an integrated PSM program. OSHA requires a pre-startup safety review in addition to a process hazard analysis for new covered facilities and for modified facilities when the modification is significant enough to require a change in the process safety information. Additional sources of information regarding PSM program implementation are provided in Appendix D.

3.3 Program Leadership and Implementation

Management Commitment

Studies of the most effective safety programs show a high degree of management commitment. Thus, consistent emphasis on PSM and management attention to PSM programs are necessary for these programs to effectively prevent releases of HHCs.

Responsibilities and PSM Integration

Because responsibilities for PSM elements are scattered throughout DOE contractor organizations, clear assignment of responsibilities within PSM programs is essential. However, because a PSM program requires a single point of leadership, each affected site should identify a PSM Coordinator to be responsible for integrating all PSM elements. The PSM Coordinator might chair a site PSM committee composed of representatives from all supporting organizations. The PSM Coordinator might be the manager of a covered process, or the PSM subject-matter expert in the safety organization.

One of the most critical challenges in implementing an effective PSM program is integrating or forging 14 diverse management elements into a single management system focused on process safety. Many aspects of the PSM program exist within DOE. However, these elements often operate independently because they are performed by different departments within contractor organizations. A PSM program cannot succeed without good communication and coordination among elements. Careful implementation of the MOC element can provide critical linkages necessary for integration.

Tracking Systems

A system is essential for tracking incident and audit findings. This system should be implemented early in the PSM program to track progress against milestones in the implementation plan, because most of these milestones address findings of the baseline audit.

This Page Intentionally Blank

Appendix A

**OSHA and EPA Lists of Highly Hazardous Substances
and Threshold Quantities (TQ) for Accidental Release Prevention**

This Page Intentionally Blank

OSHA and EPA Lists of Highly Hazardous Substances and Threshold Quantities (TQ) for Accident Release Prevention

The following table provides a side by side comparison of TQ's of regulated substances in the OSHA Process Safety Management Program (29 CFR 1910.119) and the EPA Risk Management Program (RMP) (40 CFR 68). The purpose of this appendix is to provide an integrated alphabetic listing of covered chemicals to assist DOE contractors in the determination of the applicability of the PSM and RMP requirements.

The EPA list incorporates both toxic and flammable substance lists. The OSHA listing is primarily from the "List of Highly Hazardous Chemicals, Toxics and Reactivities In Appendix A of the PSM rule. Because this includes EPA-listed flammable chemicals, OSHA's generic inclusion of flammable liquids and gases is applicable and is noted. No attempt has been made to try to provide a comprehensive listing of all flammable gases and liquids meeting the OSHA criteria found in 29 CFR 1910.1200(c). For explosives, this table compares the TQs and sources for explosive listing criteria. Certain chemicals were required to be on the EPA list by the 1990 Clear Air Act Amendments. Such chemicals are identified on this listing where applicable.

All concentrations given in the table are by weight percent.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
75-07-0	Acetaldehyde [∞]	2500	10,000
74-86-2	Acetylene [∞]	10,000 [†]	10,000
107-02-8	Acrolein [2-Propenal]	150	5000
107-13-1	Acrylonitrile [2-Propenenitrile]		20,000
814-68-6	Acrylyl chloride [2-Propenoyl chloride]	250	5000
Varies	Alkylaluminums	5000	
107-18-61	Allyl alcohol [2-Propen-1-ol]		15,000
107-05-1	Allyl chloride	1000	
107-11-9	Allylamine [2-Propen-1-amine]	1000	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

Cas No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
7664-41-7	Ammonia (anhydrous) *	10,000	10,000
7664-41-7	Ammonia (aqueous solution)*	15,000 (>44% concentration)	20,000 (>20% concentration)
7790-98-9	Ammonium Perchlorate	7500	
7787-36-2	Ammonium permanganate	7500	
7784-34-1	Arsenous trichloride		15,000
7784-42-1	Arsine [arsenic hydride]	100	1000
542-88-1	Bis (chloromethyl) ether [Chloromethyl ether]	100	1000
10294-34-5	Boron trichloride [Borane, trichloro-]	2500	5000
7637-07-2	Boron trifluoride [Borane, trifluoro-]	250	5000
353-42-4	Boron trifluoride compound with methyl ether (1:1)[Boron trifluoro (oxybis [methane]),T4 -		15,000
7726-95-6	Bromine*	1500	10,000
13863-41-7	Bromine chloride	1500	
7789-30-2	Bromine pentafluoride	2500	
7787-71-5	Bromine trifluoride	15,000	
106-96-7	3-Bromopropyne [Propargyl Bromide]	100	
598-73-2	Bromotrifluorethylene [Ethene, bromotrifluoro-] [∞]	10,000 [†]	10,000
106-99-0	1,3-Butadiene [∞]	10,000 [†]	10,000
106-97-8	Butane [∞]	10,000 [†]	10,000
25167-67-3	Butene [∞]	10,000 [†]	10,000
106-98-9	1-Butene [∞]	10,000 [†]	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
107-01-7	2-Butene [∞]	10,000 [†]	10,000
590-18-1	2-Butene-cis [∞]	10,000 [†]	10,000
624-64-6	2-Butene-trans [2-Butene, (E)] [∞]	10,000 [†]	10,000
75-91-2	Butyl hydroperoxide (tertiary)	5000	
614-45-9	Butyl perbenzoate (tertiary)	7500	
463-58-1	Carbon oxysulfide [Carbon oxide sulfide (COS)] [∞]	10,000 [†]	10,000
75-15-0	Carbon disulfide		20,000
353-50-4	Carbonyl fluoride	2500	
9004-70-0	Cellulose nitrate	2500 (conc.>12.6% nitrogen)	
7782-50-5	Chlorine*	1500	2500
10049-04-4	Chlorine dioxide	1000	1000
7791-21-1	Chlorine monoxide [chlorine oxide] [∞]	10,000 [†]	10,000
13637-63-3	Chlorine pentafluoride	1000	
7790-91-2	Chlorine trifluoride	1000	
97-00-07	1-Chloro-2,4-dinitrobenzene	5000	
96-10-6	Chlorodiethylaluminum [Diethylaluminum chloride]	5000	
67-66-3	Chloroform [Methane, trichloro-]		20,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxics & Flammables Tables (40 CFR 68.130)
107-30-2	Chloromethyl methyl ether [Methane, chloromethoxy-]	500	5000
76-06-2	Chloropicrin	500	
None	Chloropicrin and methyl bromide mixture	1500	
None	Chloropicrin and methyl chloride mixture	1500	
590-21-6	1-Chloropropylene [1-Propene, 1-chloro-] [∞]	10,000 [†]	10,000
557-98-2	2-Chloropropylene [1-Propene, 2 chloro-] [∞]	10,000 [†]	10,000
4170-30-3	Crotonaldehyde [2-Butenal]		20,000
123-73-9	Crotonaldehyde, (E)- [2-Butenal, (E)-]		20,000
80-15-9	Cumene hydroperoxide	5000	
460-19-5	Cyanogen [Ethanedinitrile] [∞]	2500	10,000
506-77-4	Cyanogen chloride	500	10,000
675-14-9	Cyanuric fluoride	100	
108-91-8	Cyclohexylamine [Cyclohexanamine]		15,000
75-19-4	Cyclopropane [∞]	10,000 [†]	10,000
110-22-5	Diacetyl peroxide	5000 (concentration > 70%)	
334-88-3	Diazomethane	500	
94-36-0	Dibenzoyl peroxide	7500	
19287-45-7	Diborane	100	2500
110-05-4	Dibutyl peroxide (tertiary)	5000	
7572-29-4	Dichloroacetylene	250	

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxics & Flammables Tables (40 CFR 68.130)
4109-96-0	Dichlorosilane [∞]	2500	10,000
557-20-0	Diethylzinc	10,000	
75-37-6	Difluoroethane [Ethane, 1,1-difluoro-] [∞]	10,000 [†]	10,000
105-64-6	Diisopropyl peroxydicarbonate	7500	
105-74-8	Dilaluroyl peroxide	7500	
124-40-3	Dimethylamine (anhydrous) [methanamine, N-methyl-]	2500	10,000
75-78-5	Dimethyldichlorosilane	1000	5000
57-14-7	1,1-Dimethylhydrazine	1000	15,000
463-82-1	2,2 Dimethylpropane [Propane, 2,2-dimethyl-] [∞]		10,000
97-02-9	2,4 Dinitroaniline	5,000	
106-89-8	Epichlorohydrin [Oxirane, (chloromethyl)-]		20,000
74-84-0	Ethane [∞]	10,000 [†]	10,000
107-00-6	Ethyl acetylene[1-Butyne] [∞]	10,000 [†]	10,000
75-00-3	Ethyl chloride [Ethane, chloro-] [∞]	10,000 [†]	10,000
60-29-7	Ethyl ether [Ethane, 1, 1-oxybis-] [∞]	10,000 [†]	10,000
75-08-1	Ethyl mercaptan [Ethanethiol] [∞]	10,000 [†]	10,000
1338-23-4	Ethyl methyl ketone peroxide [methyl ethyl ketone peroxide]	5000 (concentration >60%)	
109-95-5	Ethyl nitrite[Nitrous acid, ethyl ester] [∞]	5000	10,000
75-04-7	Ethylamine [Ethanamine] [∞]	7500	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
74-85-1	Ethylene [Ethene] [∞]	10,000 [†]	10,000
371-62-0	Ethylene fluorohydrin	100	
75-21-8	Ethylene oxide [Oxirane]*	5000	10,000
107-15-3	Ethylenediamine [1,2 Ethanediamine]		20,000
151-56-4	Ethyleneimine [Aziridine]	1000	10,000
None	Explosives or pyrotechnics manufacturer	Any amount of explosives or pyrotechnics manufacture [Explosives as defined in 29-CFR 1910.109(a)(3)]	5000 (explosives classified as Division 1.1 by DOT in 49 CFR 172.101, except that intended for onsite use)
7782-41-4	Fluorine	1000	1000
50-00-0	Formaldehyde (Formalin)	1000	15,000 (solution)
110-00-9	Furan	500	5000
684-16-2	Hexafluoroacetone	5000	
302-01-2	Hydrazine		15,000
7647-01-0	Hydrochloric acid (solution)		15,000 (Concentration ≥ 37%)
7647-01-0	Hydrogen chloride [hydrochloric acid, anhydrous]*	5000	5000
74-90-8	Hydrocyanic acid [hydrogen cyanide, anhydrous] *	1000	2500
7664-39-3	Hydrofluoric Acid (solution)*		1000 (Concentration >50%)
7664-39-3	Hydrogen fluoride [hydrofluoric acid, anhydrous]*	1000	1000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

DOE-HDBK-1101-2004

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
1333-74-0	Hydrogen [∞]	10,000 [†]	10,000
10035-10-6	Hydrogen bromide	5000	
7722-84-1	Hydrogen peroxide	7500 (Concentration ≥ 52%)	
7783-07-5	Hydrogen selenide	150	500
7783-06-4	Hydrogen sulfide*	1500	10,000
7803-49-8	Hydroxylamine	2500	
13463-40-6	Iron, pentacarbonyl	250	2500
75-28-5	Isobutane [Propane, 2-methyl-] [∞]	10,000 [†]	10,000
78-82-0	Isobutyronitrile [Propanenitrile, 2-methyl-] [∞]		20,000
78-78-4	Isopentane [Butane, 2-methyl-] [∞]	10,000 [†]	10,000
78-79-5	Isoprene[1,3 Butadinene, 2-methyl-] [∞]	10,000 [†]	10,000
75-29-6	Isopropyl chloride [Propane, 2 chloro-] [∞]	10,000 [†]	10,000
108-23-6	Isopropyl chloroformate [Carbonochloridic acid, 1-methyl ethyl ester]		15,000
75-31-0	Isopropylamine [2-Propanamine] [∞]	5000	10,000
463-51-4	Ketene	100	
78-85-3	Methacrylaldehyde	1000	
126-98-7	Methacrylonitrile [Methyl acrylonitrile] [2-Propenenitrile, 2-methyl-]	250	10,000
920-46-7	Methacryloyl chloride	150	
30674-80-7	Methacryloyloxyethyl isocyanate	100	

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
74-82-8	Methane [∞]	10,000 [†]	10,000
74-83-9	Methyl bromide	2500	
563-46-2	2-Methyl-1-butene	10,000 [†]	10,000
563-45-1	3-Methyl-1-butene	10,000 [†]	10,000
74-87-3	Methyl chloride [Methane, chloro-]*	15,000	10,000
79-22-1	Methyl chloroformate [Carbonochloridic acid, methyl ester]	500	5000
115-10-6	Methyl ether [Methane, oxybis-] [∞]	10,000 [†]	10,000
1338-23-4	Methyl ethyl ketone peroxide	5000 Concentration >60 %	
453-18-9	Methyl fluoroacetate	100	
421-20-5	Methyl fluorosulfate	100	
107-31-3	Methyl formate [Formic acid, methyl ester] [∞]	10,000 [†]	10,000
60-34-4	Methyl hydrazine	100	15,000
74-88-4	Methyl iodide	7500	
624-83-9	Methyl isocyanate [Methane, isocyanate-]*	250	10,000
74-93-1	Methyl mercaptan [Methanethiol]	5000	10,000
556-64-9	Methyl thiocyanate [Thiocyanic acid, methyl ester]		20,000
79-84-4	Methyl vinyl ketone	100	
74-89-5	Methylamine (anhydrous) [Methanamine] [∞]	1000	10,000
115-11-7	2-Methylpropene [1-Propene, 2 methyl-] [∞]	10,000 [†]	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

DOE-HDBK-1101-2004

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
75-79-6	Methyltrichlorosilane	500	5000
13463-39-3	Nickel carbonyl [Nickel tetracarbonyl]	150	1000
7697-37-2	Nitric Acid	500 (Concentration ≥ 94.5%)	15,000 (Concentration ≥ 80%)
10102-43-9	Nitric oxide [Nitrogen oxide(NO)]	250	10,000
100-01-6	Nitroaniline [para-Nitroaniline]	5000	
10102-44-0	Nitrogen dioxide	250	
10102-44-0	Nitrogen Oxides (NO; NO ₂ ; N ₂ O ₄ ; N ₂ O ₃)	250	
10544-72-6	Nitrogen tetroxide [Nitrogen peroxide]	250	
7783-54-2	Nitrogen trifluoride	5000	
10544-73-7	Nitrogen trioxide	250	
72-52-5	Nitromethane	2500	
8014-95-7	Oleum [Fuming sulfuric acid]	1000 (Concentration of S ₀₃ 65-80%)	10,000 (Concentration of S ₀₃ not specified)
20816-12-0	Osmium tetroxide	100	
7783-41-7	Oxygen difluoride [Fluorine monoxide]	100	
10028-15-6	Ozone	100	
19624-22-7	Pentaborane	100	
13463-40-6	Pentacarbonyl-iron	250	2500
504-60-9	1,3-Pentadinen [∞]	10,000 [†]	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

DOE-HDBK-1101-2004

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
109-66-0	Pentane [∞]	10,000 [†]	10,000
109-67-1	1-Pentene [∞]	10,000 [†]	10,000
646-04-8	2-Pentene (E)- [∞]	10,000 [†]	10,000
627-20-3	2-Pentene (Z)- [∞]	10,000 [†]	10,000
79-21-0	Peracetic Acid [Peroxyacetic acid] [Ethane peroxy acid]	1000 (Conc.>60% Acetic acid)	10,000 (No concentration given)
7601-90-3	Perchloric acid	5000 (Concentration>60%)	
594-42-3	Perchloromethyl mercaptan [Methane sulfenyl chloride, trichloro-]	150	10,000
7616-94-6	Perchloryl fluoride	5000	
75-44-5	Phosgene [Carbonyl chloride][Carbonic dichloride]*	100	500
7803-51-2	Phosphine [Hydrogen phosphide]	100	5000
10025-87-3	Phosphorus oxychloride [Phosphoryl chloride]	1000	5000
7719-12-2	Phosphorus trichloride	1000	15,000
110-89-4	Piperidine		15,000
463-49-0	Propadiene [1,2-Propadiene] [∞]	10,000 [†]	10,000
74-98-6	Propane [∞]	10,000 [†]	10,000
107-12-0	Propionitrile [Propanenitrile]		10,000
109-61-5	Propyl chloroformate [Carbonochloridic acid, propylester]		15,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
627-3-4	Propyl nitrate	2500	
115-07-1	Propylene [1-Propene] [∞]	10,000 [†]	10,000
75-56-9	Propylene oxide [Oxirane, methyl-]		10,000
75-55-8	Propyleneimine [Aziridine, 2-methyl-]		10,000
74-99-7	Propyne [1-Propyne] [∞]	10,000 [†]	10,000
107-44-8	Sarin	100	
7783-79-1	Selenium hexafluoride	1000	
7803-62-5	Silane [∞]	10,000 [†]	10,000
7803-52-3	Stibine (Antimony hydride)	500	
7446-09-5	Sulfur dioxide (anhydrous/liquid)*	1000	5000
5714-22-7	Sulfur pentafluoride	250	
7783-60-0	Sulfur tetrafluoride	250	2500
7446-11-9	Sulfur trioxide [Sulfuric anhydride]*	1000	10,000
7783-80-4	Tellurium hexafluoride	250	
116-14-3	Tetrafluoroethylene [Ethene, tetrafluoro-] [∞]	5000	10,000
10036-47-2	Tetrafluorohydrazine	5000	
75-74-1	Tetramethyl lead [Plumbane, tetramethyl-]	1000	10,000
75-76-3	Tetramethyl silane [∞]	10,000 [†]	10,000
509-14-8	Tetranitromethane		10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

DOE-HDBK-1101-2004

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
7719-09-7	Thionyl chloride	250	
7750-45-0	Titanium tetrachloride		2500
584-84-9	Toluene 2,4 diisocyanate*		10,000
91-08-7	Toluene 2,6-diisocyanate*		10,000
26471-62-5	Toluene diisocyanate (mixed isomers)*		10,000
1558-25-4	Trichloro (chloromethyl) silane	100	
27137-85-5	Trichloro (dichlorophenyl) silane	2500	
10025-78-2	Trichlorosilane ∞	5000	10,000
79-38-9	Trifluorochloroethylene [Ethene, chlorotrifluoro-]∞	10,000	10,000
75-50-3	Trimethylamine [Methanamine N,N- dimethyl-]∞	10,000†	10,000
75-77-4	Trimethylchlorosilane		10,000
2487-90-3	Trimethyloxysilane	1500	
108-05-4	Vinyl acetate monomer [Acetic acid ethenyl ester]		15,000
689-97-4	Vinyl acetylene [1-Buten-3-yne]∞	10,000†	10,000
75-01-4	Vinyl chloride [Ethene, chloro-]*∞	10,000†	10,000
109-92-2	Vinyl ethyl ether [Ethene, ethoxy-]∞	10,000†	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

∞ On the EPA list of regulated flammable substances.

† The applicable OSHA TQ though not specifically listed in the PSM Rule.

CAS No.	Chemical Name	OSHA PSM TQ (lbs) Appendix A (29 CFR 1910.119)	EPA RMP TQ (lbs) Toxic & Flammables Tables (40 CFR 68.130)
75-02-5	Vinyl fluoride [Ethene, fluoro-] [∞]	10,000 [†]	10,000
107-25-5	Vinyl methyl ether [Ethene, methoxy-] [∞]	10,000 [†]	10,000
75-35-4	Vinylidene chloride [Ethene, 1,1-dichloro-] [∞]	10,000 [†]	10,000
75-38-7	Vinylidene fluoride [Ethene, 1,1,-difluoro-] [∞]	10,000 [†]	10,000

* Required to be on EPA's list by the 1990 Clean Air Act Amendments.

[∞] On the EPA list of regulated flammable substances.

[†] The applicable OSHA TQ though not specifically listed in the PSM Rule.

This Page Intentionally Blank

Appendix B
The Process Safety Management Rule

This Page Intentionally Blank

The Process Safety Management Rule

SUBPART NUMBER: H (Hazardous Materials)

Process Safety Management of Highly Hazardous Chemicals

Purpose. This section contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire or explosion hazards.

(a) Application.

(1) This section applies to the following:

(i) A process which involves a chemical at or above the specified threshold quantities listed in Appendix A to this section;

(ii) A process which involves a flammable liquid or gas (as defined in 1910.1200(c) of this part) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for:

(A) Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard;

(B) Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

(2) This section does not apply to:

(i) Retail facilities;

(ii) Oil or gas well drilling or servicing operations; or,

(iii) Normally unoccupied remote facilities.

(b) Definitions.

Atmospheric tank means a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g. (pounds per square inch gauge, 3.45 Kpa).

Boiling point means the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). For the purposes of this section, where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, may be used as the boiling point of the liquid.

Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more highly hazardous chemicals, that presents serious danger to employees in the workplace.

Facility means the buildings, containers or equipment which contain a process.

"Highly hazardous chemical" means a substance possessing toxic, reactive, flammable, or explosive properties and specified by paragraph (a)(1) of this section.

"Hot work" means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

"Normally unoccupied remote facility" means a facility which is operated, maintained or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility. Facilities meeting this definition are not contiguous with, and must be geographically remote from all other buildings, processes or persons.

"Process" means any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For purposes of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.

"Replacement in kind" means a replacement which satisfies the design specification.

"Trade secret" means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix D contained in 1910.1200 sets out the criteria to be used in evaluating trade secrets.

(c) Employee Participation.

- (1) Employers shall develop a written plan of action regarding the implementation of the employee participation required by this paragraph.
- (2) Employers shall consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this standard.

- (3) Employers shall provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this standard.

(d) Process Safety Information.

In accordance with the schedule set forth in paragraph (e)(1) of this section, the employer shall complete a compilation of written process safety information before conducting any process hazard analysis required by the standard. The compilation of written process safety information is to enable the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals. This process safety information shall include information pertaining to the hazards of the highly hazardous chemicals used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

- (1) Information pertaining to the hazards of the highly hazardous chemicals in the process. This information shall consist of at least the following:
- (i) Toxicity information;
 - (ii) Permissible exposure limits;
 - (iii) Physical data;
 - (iv) Reactivity data;
 - (v) Corrosivity data;
 - (vi) Thermal and chemical stability data; and
 - (vii) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur

Note: Material Safety Data Sheets meeting the requirements of 29 CFR1910.1200 (g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph.

- (2) Information pertaining to the technology of the process.
- (i) Information concerning the technology of the process shall include at least the following:
 - (A) A block flow diagram or simplified process flow diagram (see Appendix B to this section);
 - (B) Process chemistry;
 - (C) Maximum intended inventory;

(D) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,

(E) An evaluation of the consequences of deviations, including those affecting the safety and health of employees.

(ii) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(3) Information pertaining to the equipment in the process.

(i) Information pertaining to the equipment in the process shall include:

(A) Materials of construction;

(B) Piping and instrument diagrams (P&ID's);

(C) Electrical classification;

(D) Relief system design and design basis;

(E) Ventilation system design;

(F) Design codes and standards employed;

(G) Material and energy balances for processes; and

(H) Safety systems (e.g. interlocks, detection or suppression systems).

(ii) The employer shall document that equipment complies with recognized and generally accepted good engineering practices.

(iii) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

(e) Process Hazard Analysis.

(1) The employer shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this standard. The process hazard analysis shall be appropriate to the complexity of the process and shall

identify, evaluate, and control the hazards involved in the process. Employers shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be completed prior to process startup.

- (2) The employer shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.
 - (i) What-If;
 - (ii) Checklist;
 - (iii) What-If/Checklist;
 - (iv) Hazard and Operability Study (HAZOP);
 - (v) Failure Mode and Effects Analysis (FMEA);
 - (vi) Fault Tree Analysis; or
 - (vii) An appropriate equivalent methodology.

- (3) The process hazard analysis shall address:
 - (i) The hazards of the process;
 - (ii) The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace;
 - (iii) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);
 - (iv) Consequences of failure of engineering and administrative controls;
 - (v) Facility siting;
 - (vi) Human factors; and
 - (vii) A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.

- (4) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.
- (5) The employer shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.
- (6) At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (e)(4) of this section, to assure that the process hazard analysis is consistent with the current process.
- (7) Employers shall retain process hazards analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e)(5) of this section for the life of the process.

(f) Operating Procedures.

- (1) The employer shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.
 - (i) Steps for each operating phase:
 - (A) Initial startup;
 - (B) Normal operations;
 - (C) Temporary operations;
 - (D) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.

- (E) Emergency Operations;
- (F) Normal shutdown; and,
- (G) Startup following a turnaround, or after an emergency shutdown.

(ii) Operating limits:

- (A) Consequences of deviation; and
- (B) Steps required to correct or avoid deviation.

(iii) Safety and health considerations:

- (A) Properties of, and hazards presented by, the chemicals used in the process;
- (B) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;
- (C) Control measures to be taken if physical contact or airborne exposure occurs;
- (D) Quality control for raw materials and control of hazardous chemical inventory levels; and,
- (E) Any special or unique hazards.

(iv) Safety systems and their functions.

- (2) Operating procedures shall be readily accessible to employees who work in or maintain a process.
- (3) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate.

- (4) The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

(g) Training.

(1) Initial training.

- (i) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in paragraph (f) of this section. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.
- (ii) In lieu of initial training for those employees already involved in operating a process, an employer may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

- (2) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The employer, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

- (3) Training documentation. The employer shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The employer shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

(h) Contractors.

- (1) Application. This paragraph applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

- (2) Employer responsibilities.
 - (i) The employer, when selecting a contractor, shall obtain and evaluate information regarding the contract employer's safety performance and programs.
 - (ii) The employer shall inform contract employers of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.
 - (iii) The employer shall explain to contract employers the applicable provisions of the emergency action plan required by paragraph (n) of this section.
 - (iv) The employer shall develop and implement safe work practices consistent with paragraph (f)(4) of this section, to control the entrance, presence and exit of contract employers and contract employees in covered process areas.
 - (v) The employer shall periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3) of this section.
 - (vi) The employer shall maintain a contract employee injury and illness log related to the contractor's work in process areas.

- (3) Contract employer responsibilities.
 - (i) The contract employer shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.
 - (ii) The contract employer shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.
 - (iii) The contract employer shall document that each contract employee has received and understood the training required by this paragraph. The contract employer shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

- (iv) The contract employer shall assure that each contract employee follows the safety rules of the facility including the safe work practices required by paragraph (f)(4) of this section.
- (v) The contract employer shall advise the employer of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.

(i) Pre-startup Safety Review.

- (1) The employer shall perform a pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.
- (2) The pre-startup safety review shall confirm that prior to the introduction of highly hazardous chemicals to a process:
 - (i) Construction and equipment is in accordance with design specifications;
 - (ii) Safety, operating, maintenance, and emergency procedures are in place and are adequate;
 - (iii) For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change, paragraph (l).
 - (iv) Training of each employee involved in operating a process has been completed.

(j) Mechanical Integrity.

- (1) Application. Paragraphs (j)(2) through (j)(6) of this section apply to the following process equipment:
 - (i) Pressure vessels and storage tanks;
 - (ii) Piping systems (including piping components such as valves);

- (iii) Relief and vent systems and devices;
 - (iv) Emergency shutdown systems;
 - (v) Controls (including monitoring devices and sensors, alarms, and interlocks) and,
 - (vi) Pumps.
- (2) Written procedures. The employer shall establish and implement written procedures to maintain the on-going integrity of process equipment.
 - (3) Training for process maintenance activities. The employer shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.
 - (4) Inspection and testing.
 - (i) Inspections and tests shall be performed on process equipment.
 - (ii) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.
 - (iii) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.
 - (iv) The employer shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

- (5) Equipment deficiencies. The employer shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in paragraph (d) of this section) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

- (6) Quality assurance.
 - (i) In the construction of new plants and equipment, the employer shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.
 - (ii) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.
 - (iii) The employer shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

(k) Hot Work Permit.

- (1) The employer shall issue a hot work permit for hot work operations conducted on or near a covered process.
- (2) The permit shall document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

(l) Management of Change.

- (1) The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.
- (2) The procedures shall assure that the following considerations are addressed prior to any change:
 - (i) The technical basis for the proposed change;
 - (ii) Impact of change on safety and health;

- (iii) Modifications to operating procedures;
 - (iv) Necessary time period for the change; and,
 - (v) Authorization requirements for the proposed change.
- (3) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.
 - (4) If a change covered by this paragraph results in a change in the process safety information required by paragraph (d) of this section, such information shall be updated accordingly.
 - (5) If a change covered by this paragraph results in a change in the operating procedures or practices required by paragraph (f) of this section, such procedures or practices shall be updated accordingly.

(m) Incident Investigation.

- (1) The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace.
- (2) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.
- (3) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.
- (4) A report shall be prepared at the conclusion of the investigation which includes at a minimum:
 - (i) Date of incident;
 - (ii) Date investigation began;
 - (iii) A description of the incident;
 - (iv) The factors that contributed to the incident; and,

- (v) Any recommendations resulting from the investigation.
- (5) The employer shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.
- (6) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.
- (7) Incident investigation reports shall be retained for five years.

(n) Emergency planning and response.

The employer shall establish and implement an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38. In addition, the emergency action plan shall include procedures for handling small releases. Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120(a), (p) and (q).

(o) Compliance Audits.

- (1) Employers shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.
- (2) The compliance audit shall be conducted by at least one person knowledgeable in the process.
- (3) A report of the findings of the audit shall be developed.
- (4) The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.
- (5) Employers shall retain the two (2) most recent compliance audit reports.

(p) Trade secrets.

- (1) Employers shall make all information necessary to comply with the section available to those persons responsible for compiling the process safety

information (required by paragraph (d) of this section), those assisting in the development of the process hazard analysis (required by paragraph (e) of this section), those responsible for developing the operating procedures (required by paragraph (f) of this section), and those involved in incident investigations (required by paragraph (m) of this section), emergency planning and response (paragraph (n) of this section) and compliance audits (paragraph (o) of this section) without regard to possible trade secret status of such information.

- (2) Nothing in this paragraph shall preclude the employer from requiring the persons to whom the information is made available under paragraph (p)(1) of this section to enter into confidentiality agreements not to disclose the information as set forth in 29 CFR 1910.1200.
- (3) Subject to the rules and procedures set forth in 29 CFR 1910.1200(i) (1) through 1910.1200(i)(12), employees and their designated representatives shall have access to trade secret information contained within the process hazard analysis and other documents required to be developed by this standard.

This Page Intentionally Blank

Appendix C

Comparison of the EPA Risk Management Program with OSHA's Process Safety Management Program

This Page Intentionally Blank

Comparison of the EPA Risk Management Program with OSHA's Process Safety Management Program

The Environmental Protection Agency's (EPA) "Risk Management Programs for Chemical Accidental Release Prevention" (40 CFR Part 68) adds significant new requirements beyond those in the Occupational Safety and Health Administration (OSHA), "Process Safety Management of Highly Hazardous Chemicals" (29 CFR 1910.119). In addition, the chemical list and threshold quantities for the EPA rule differ somewhat from those in the OSHA rule and may well result in a facility needing to expand their risk management program to other portions of the facility as shown in Appendix A.

The three principal areas in which the requirements of the EPA exceed those of the OSHA Rule are:

- 1) Performance of hazard assessments which includes analyses of the "worst case" accident consequences.
- 2) Preparation of written risk management plans to document the risk management program. EPA makes the plans available to the public, State and local emergency planning officials and the Chemical Safety and Hazard Investigation Board. Response actions have to be coordinated with local emergency planning and response agencies.
- 3) Registration of the risk management plans with the EPA.

The key differences between the OSHA rule on process safety management (PSM) and the EPA Risk Management Program (RMP) are discussed in the following sections.

Risk Management Program

A risk management plan must be developed and implemented by all facilities that manufacture, process, use, store, or handle regulated substances to provide an integrated approach to identifying and managing the hazards posed by the regulated substances. The RMP consists of three major parts (a) a hazard assessment, (b) a prevention program, and (c) an emergency response program.

EPA considers critical its requirement for the owner or operator of a facility to define its management system and name the person or position responsible for the program. The facility owner or operator also would be required to document the results of the risk management program(s) in the risk management plan. Facilities will be required to maintain onsite documentation of the implementation of the risk management plan.

EPA requires a risk management plan that summarizes the program elements because the information of most use to the public and local agencies will be related to the hazard assessment and consequence analysis.

Hazard Assessment

The EPA rule is designed to assist facilities and communities in efforts to lessen the number and severity of serious chemical accidents. Under EPA's RMP, facilities must complete a hazard assessment to evaluate potential effects of an accidental release of any regulated substance present at or above the threshold quantity. The hazard assessment also must evaluate the impact of significant accidental releases on the public health and environment. OSHA's PSM Rule requires only a qualitative evaluation of a range of possible safety and health effects on employees in the work place resulting from a release.

The hazard assessment of a regulated substance requires evaluation of a range of accidental release scenarios, including:

- “Worst-case” accidental releases
- Other more probable releases
- Potential offsite consequences
- Five-year accident history for the facility

The EPA rule defines “worst-case” release as the instantaneous loss of all of the regulated substance in a process, with failure of all passive and active mitigation systems. Once the worst-case and other significant accidental scenarios are identified, facilities would be required to analyze the potential offsite consequences associated with these scenarios using source release and air dispersion modeling. This analysis would include fires, explosions, and hazard material releases.

Air dispersion modeling would be used to evaluate the fate and transport of the regulated substance for the offsite consequence analyses. At a minimum, the offsite analyses would estimate the possible rate of release, the quantity released, the duration of the release, and the distances in any direction that the substance could travel before it dispersed enough to no longer pose a hazard to the public health or the environment.

Along with calculating the severity of the consequences, source term modeling would be used to calculate release rate as a function of time and other release characteristics.

Under the EPA rule, facilities would be required to update the offsite consequence analyses of their risk management plans no longer than every five years. Updates would be required sooner, if changes at the facility or its surroundings might change the results of the risk management plan to any significant degree.

A final element of the hazard assessment is compiling and documenting a five-year history of releases of the regulated substances. EPA's RMP would require the facility to document the releases that caused, or had the potential to cause, offsite consequences. The accident history must include:

- The substance and quantity released

- The concentration of the substance when released
- Duration of the release
- Date and time of the release
- Offsite consequence(s) (e.g., evacuations, injuries).

Note that most of the releases that meet the criteria of the proposed EPA RMP are already reported under CERCLA and SARA Title III. Most of the information needed to define accidental release scenarios will be derived from the process hazard analysis.

Prevention Program

Along with the hazard assessment and the emergency response program, the risk management plan includes a prevention program. In addition to the process hazard analysis, the prevention program covers safety precautions and maintenance, monitoring, and employee training measures. However, the OSHA PSM rule does include elements which are specific to worker protection issues that EPA has not included in its rule.

Requirements of the EPA prevention program are similar to the requirements of the OSHA PSM rule with parallel elements being nearly identical. This similarity exists because EPA separates the offsite consequence analysis and the five-year accident history from the formal process hazard analysis requirements.

The integrated approach of the EPA prevention program consists of the following twelve elements:

- Process hazard analysis
- Process safety information
- Standard operating procedures
- Training
- Maintenance (mechanical integrity)
- Pre-startup review
- Management of change
- Safety audits
- Accident investigation
- Employee participation
- Hot work permit
- Contractors.

EPA's RMP requires that the order in which PrHAs are conducted be prioritized based on offsite consequences. The qualitative evaluation of safety and health impacts focuses on impacts on public health and environment rather than impacts on employees. The identification of previous incidents as a part of the prevention program PrHA emphasizes offsite consequences rather than

those with catastrophic consequences in the workplace as required by the PSM Rule. Facilities are expected to have fewer incidents to consider under the EPA RMP Rule, because some potential incidents will not have offsite impacts.

Another EPA requirement, which is not included in the OSHA PSM rule, is that a facility define its management system. Facilities are required to identify the person (by name) or the position responsible for implementing the prevention program.

Emergency Response Program

An emergency response program also must be developed. The applicable emergency response program requirements are much more stringent under the proposed EPA RMP than those under OSHA's PSM rule. OSHA's emergency action plan regulation basically requires an evacuation plan. Whereas, under the EPA rule, facilities will need to develop a more extensive emergency response plan. This emergency response plan must detail how the facility would respond to a release to limit offsite consequences. Coordination of plans with the Local Emergency Planning Committee (LEPC) is also required. Coordination with the LEPC is not required by OSHA although many facilities do so currently.

RMP and Documentation

The RMP Rule requires facilities to submit the RMP to the LEPC and have it available for the public, the State, and the Chemical Safety and Hazard Investigation Board. The RMP would include the results of the risk management program elements, a copy of the registration, description of the management system, and certification of the accuracy and completeness of the information. Facilities would be required to maintain the documentation supporting the implementation of the risk management plan for inspection by EPA and other agencies.

Registration

The RMP Rule requires facilities to register with the EPA if they have a regulated substance in a quantity greater than the threshold quantity. The content of the registration would include the name and address of the facility, the facility's Dun and Bradstreet number, the regulated substances on site and the quantities, and the facility's North American Industry Classification System Code (NAICS) that apply to the use of each regulated substance. Most of these registration requirements are already reported under the SARA Title III.

If the information on registration changes (e.g., a change that requires a revised offsite consequence analysis or a revised process hazard analysis or hazard review) after the submittal of the registration or most recent update, facilities would be required to file an amended registration form within six (6) months.

Appendix D
Sources of Information

This Page Intentionally Blank

Sources of Information

Federal

U.S. Department of Labor, Occupational Safety and Health Administration (OSHA),
200 Constitution Ave. N.W., Washington, D.C. 20210. For general publication information, call
the OSHA Publications Office at (202) 693-1888.

The following documents are available from the Docket Office by writing U.S. Department of
Labor/OSHA, Technical Data Center, Docket Office, 200 Constitution Ave. N.W., Room
N2625,
Washington, D.C. 20210 or calling (202) 693-2350 or by faxing a request to: (202) 693-1648

*The Phillips 66 Company Houston Chemical Complex Explosion and Fire. A Report to
the President. OSHA, Washington, DC. 1990.*

*Collection of Data and Information on the Procedures for Minimizing Employee
Exposure to Toxic Chemical Releases. Plummer, Ralph W., Terrence J. Stobbe, and
James E. Morgensen. OSHA, Washington, DC. Undated.*

*A Study of Safety and Health Practices as they Pertain to the Reliance Upon
Petrochemical Industries, Preliminary Findings of the John Gray Institute of Lamar
University. OSHA, Washington, DC.*

Report on Chemical Special Emphasis Program. Washington, DC. OSHA, Undated

The following booklets are available from OSHA, Publications Office, Room N3101, 200
Constitution Ave. N.W., Washington, D.C. 20210. Enclose a self-addressed mailing label with
request. Single copies are free.

Chemical Hazard Communication. OSHA 3084. Washington, DC.

*Systems Safety Evaluation of Operations with Catastrophic Potential, OSHA Instruction
CPL:2-2.45, Washington, DC. 1988.*

Safety and Health Guide for the Chemical Industry, OSHA 3091. Washington, DC. 1986.

*Health and Safety Committees: A Good Way to Protect Workers. OSHA 3035.
Washington, DC.*

*Training Requirements in OSHA Standards and Training Guidelines. OSHA 2254.
Washington, DC.*

*How to Prepare for Workplace Emergencies, OSHA 3088 (Rev.). Washington, DC.
1988.*

Process Safety Management of Highly Hazardous Chemicals--Compliance Guidelines and Enforcement Procedures, OSHA Instruction CPL 2-2.45A CH-1. Washington, DC. 1994.

U.S. Environmental Protection Agency (EPA), 401 M St. S.W., Washington, DC. 20460.

To locate published material, call the main EPA library in Washington, D.C. at (202) 566-0556, the nearest EPA regional office or see ordering information listed under entries below. In addition, the office that issued the publication often maintains copies. Offices may be contacted directly by calling the EPA Locator at (202) 272-0167 and asking for the appropriate telephone number.

EPA's Environmental Services Division. *Chemical Safety Audit Report*, W.R. Grace Organic Chemicals Division, Nashua, N.H. Lexington, Mass.; Region 1, EPA, Nov. 17, 1989. Available from Region 1 office: (617) 918-1111.

EPA's Office of Toxic Substances (Prepared by Industrial Economics, Inc., Management Technology and Data Systems, Inc., and PEI Associates, Inc.) *Acute Hazardous Events DataBase*. EPA, 1985. Pb-86158946/LL. Available on CD-ROM from NTIS (703) 487-4650.

The following items, although issued by EPA, are available from the OSHA Docket Office; for ordering information, see OSHA resources section, above.

EPA, Federal Emergency Management Agency, and U.S. Department of Transportation. *Technical Guidance for Hazards Analysis*. EPA, Washington, DC. 1987.

Review of Emergency Systems, Report to Congress, Interim and Final Reports. EPA, Washington, DC. 1986.

Guidance Manual for Chemical Safety Audit Team Members. EPA, Washington, DC. 1990.

Professional Societies and Associations

American Petroleum Institute, 1220 L St. N.W., Washington, DC. 20005, (202) 682-8000.

Reports may be obtained from the publications office at (202) 682-8417.

Management of Process Hazards, API Recommended Practice 750, First Edition. API, Washington, DC. 1990.

Chlorine Institute, 1300 Wilson Boulevard, Arlington, VA. 22209, (703) 741-5760..

Safety Guidelines for the Manufacture of Chlorine, Edition 1, Revision 2, 1981. Publication No. 67

Guidelines on Risk Analysis, Edition 1, 1989. Publication No. 83

American Chemistry Council, 1300 Wilson Boulevard, Arlington, VA. 22209,
(703) 741-5000.

A Manager's Guide to Reducing Human Errors, Improving Human Performance in the Chemical Industry. CMA, Washington, DC. 1990.

Evaluating Process Safety in the Chemical Industry, A Manager's Guide to Quantitative Risk Assessment. CMA, Washington, DC. 1989.

Process Safety Management (Control of Acute Hazards). CMA, Washington, DC. 1985.

Safe Warehousing of Chemicals, Resource Manual. CMA, Washington, DC. 1989.

Process Safety Manual. CMA, Washington, DC. 1985.

Managing Process Changes: Implementing and Improving Management of Change Programs. CMA, Washington, DC. Washington, DC. 1993.

Center for Chemical Process Safety, American Institute of Chemical Engineers (AIChE),
3 Park Avenue., New York, NY 10016-5991, (212) 591-7319.

Publications may be purchased at (800) 242-4363.

Guidelines for Technical Management of Chemical Process Safety. AIChE, New York, NY, 1989.

Plant Guidelines for Technical Management of Chemical Process Safety. AIChE, New York, NY, 1992.

Guidelines for Technical Management of Chemical Process Safety. AIChE, New York, 1989.

Guidelines for Implementing Process Safety Management Systems. AIChE, New York, NY, 1994.

Guidelines for Chemical Process Quantitative Risk Analysis. AIChE, New York, NY, 1989.

Guidelines for Process Equipment Reliability Data, with Data Tables. AIChE, New York, NY, 1989.

Prepared by Battelle Columbus Division. *Guidelines for Hazard Evaluation Procedures*. AIChE, New York, NY, 1992

Guidelines for Hazard Evaluation Procedures. Second Edition with Worked Examples, AIChE, New York, NY, 1992.

Guidelines for Chemical Reactivity Evaluation and Application to Process Design. AIChE, New York, NY, 1995.

Guidelines for Use of Vapor Cloud Dispersion Models. AIChE, New York, NY, 1987.

Workbook of Test Cases for Vapor Cloud Source Dispersion Models. AIChE, New York, NY, 1989.

Guidelines for Vapor Release Mitigation. AIChE, New York, NY, 1988.

Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs. AIChE, New York, NY, 1994.

Tools for Making Acute Risk Decisions: with Chemical Process Applications. AIChE, New York, NY, 1995.

Guideline for Safe Automation of Chemical Processes. AIChE, New York, NY, 1993.

Guidelines for Safe Storage and Handling of High Toxic Hazard Materials. AIChE, New York, NY, 1988.

Guideline for Engineering Design for Process Safety. AIChE, New York, NY, 1993.

Guidelines for Preventing Human Error in Process Safety. AIChE, New York, NY, 1994.

Guidelines for Investigating Chemical Process Incidents. AIChE, New York, NY, 1992.

Guidelines for Auditing Process Safety Management Systems. AIChE, New York, NY, 1993.

Guidelines for Process Safety Management Documentation. AIChE, New York, NY, 1995.

Guidelines for Safe Process Operations and Maintenance. AIChE, New York, NY, 1992.

Guidelines for Process Safety Fundamentals for General Plant Operations. AIChE, New York, NY, 1995.

Guidelines for Chemical Transport Risk Analysis. AIChE, New York, 1995.

Guidelines Technical Planning for On-Site Emergencies. AIChE, New York, NY, 1995.

Guidelines for Evaluating Process Plant Buildings for External Explosions and Fires. AIChE, New York, NY, 1995.

Organization Resources Counselors Inc. (ORC), 1910 Sunderland N.W., Washington, DC. 20036, (202) 293-2980

Recommendations for Process Hazards Management of Substances with Catastrophic Potential. ORC, Process Hazard Management Task Force, Washington, DC. 1988.

Synthetic Organic Chemical Manufacturers Association (SOCMA), 1850 M Street, N.W., Suite 700, Washington, DC. 20036-5810, (202) 721-4100.

Level One Chemical Process Operator, Worker Certification Training Program. SOCMA, Washington, DC. 1990.

General Listings

The Dow Chemical Co., Corporate Safety & Loss Prevention. Fire & Explosion Index Hazard Classification Guide, 6th Edition. The Dow Chemical Co., Midland, MI. 1987.

The Dow Chemical Co., Corporate Safety & Loss Prevention. Guidelines for a Reactive Chemicals Program, 2nd Edition. The Dow Chemical Co., Midland, MI. 1987.

The Dow Chemical Co., Corporate Safety & Loss Prevention. Chemical Exposure Index. The Dow Chemical Co., Midland, MI. 1988.

The Workplace Health Fund, Center for Emergency Response Planning, Blueprint for Prevention, A Guide to Preventing Chemical Releases. The Workplace Health Fund, Washington, DC. November 1989.

CONCLUDING MATERIAL

Review Activity:

DOE HQ

DP
EH
EM
ER
NE
RW
SS

FIELD OFFICES

AL
ID
NV
Oakland
NV
RF
SR

Preparing Activity:

DOE EH-52

Project Number:

SAFT-0097

PROJECT OFFICES

GJ