

Table of Contents

Chapter 1: Introduction

Chapter Overview	1-1
How This Standard Came About	1-3
Process Safety Management	1-5
Application of the Standard	1-6

Chapter 2: Elements of the Standard

Chapter Overview	2-1
Required Action: Employee Participation	2-5
Required Action: Process Safety Information	2-6
Required Action: Process Hazard Analysis	2-8
Required Action: Operating Procedures	2-12
Required Action: Employee Training	2-13
Required Action: Contractors	2-14
Required Action: Pre-Startup Safety Review	2-16
Required Action: Mechanical Integrity	2-17
Required Action: Hot Work	2-19
Required Action: Management of Change	2-20
Required Action: Incident Investigation	2-22
Required Action: Emergency Planning and Response	2-24
Required Action: Compliance Audits	2-25
Required Action: Trade Secrets	2-26

Chapter 3: Written Procedures	
Chapter Overview	3-1
Section I: Developing & Implementing Operating Procedures	3-2
Section Overview	3-2
Written Operating Procedure Elements	3-4
Procedure Writing Guidelines	3-6
How to Write Operating Procedures.....	3-7
Rules for Developing Operating Procedures.....	3-8
Accessible Operating Procedures.....	3-11
Review of Operating Procedures	3-12
Safe Work Practices for Controlling Hazards.....	3-13
Hot Work	3-14
Section II: Mechanical Integrity	3-15
Section Overview	3-15
Mechanical Integrity Programs	3-17
Establishing an Effective Mechanical Integrity Program	3-18
Quality Assurance System.....	3-21
Section III: Management of Change	3-23
Section Overview	3-23
Changes Covered by MOC	3-24
 Chapter 4: Written Plans of Action	
Chapter Overview	4-1
Required Action: Employee Participation	4-2
Emergency Planning and Response	4-3
Investigating an Incident	4-4
 Chapter 5: Training	
Chapter Overview	5-1
Section I: Employee Training	5-2
Section Overview	5-2
Goals and Objectives	5-3
Initial Training	5-4
Refresher Training.....	5-5
Section II: Contractor Training	5-6
Section Overview	5-6
Types of Contract Employers	5-7
Use of Contractors.....	5-8
Chapter Summary: Training	5-10

Chapter 6: Process Requirements

Chapter Overview	6-1
Process Safety Information	6-2
Section Overview	6-2
What Is Process Safety Information?	6-3
Process Hazards Information.....	6-4
Process Technology Information.....	6-5
Process Equipment Information	6-7
Process Hazard Analysis	6-8
Section Overview	6-8
Identifying, Evaluating, and Controlling Hazards.....	6-9
Performing a PHA	6-10
Selecting the PHA Team	6-12
Techniques Overview	6-13
Checklist Analysis.....	6-14
What-If Analysis	6-15
What-If/Checklist Analysis.....	6-17
Hazard and Operability Study	6-18
Failure Modes and Effects Analysis.....	6-20
Fault Tree Analysis	6-22
Selecting a PHA Technique	6-23
Applying a PHA.....	6-26
PHAs for Small Businesses	6-28
Setting Up a PHA Priority System	6-29
Pre-Startup Safety Review	6-30
Section Overview	6-30
Further Information.....	6-31
Pre-Startup Safety Checklist.....	6-32

Chapter 7: Management Issues

Chapter Overview	7-1
Compliance Audit Essentials	7-2
Planning for the Audit	7-3
What Is An Effective Audit?	7-5
Taking Corrective Action	7-6
Using a Corrective Action Tracking System	7-7
Keeping Trade Secrets Secret	7-8

Chapter 8: Other Related Regulations		
29 1910.38		8-1
29 1910.1200		8-3
Chapter 9: Appendixes		
Questions About the PSM Standard		9-1
Application	9-1	
Employee Participation	9-4	
Process Safety Information	9-5	
Process Hazard Analysis	9-6	
Operating Procedures	9-7	
Training	9-7	
Mechanical Integrity	9-8	
Sample Operating Procedures Outline		9-9
Change Request Forms		9-13
Management of Change Form	9-13	
Management of Change Flowchart	9-18	
Sample Emergency Action Plan Outline		9-19
Process Technology Information		9-25
Block Flow Diagram	9-25	
Process Flow Diagram	9-26	
Pipe and Instrument Diagram	9-29	
Compliance Guidelines and Enforcement Procedures		9-31
Introduction	9-31	
Types of Inspections	9-33	
PQV Inspection Scheduling	9-35	
Scope of PQV Inspection	9-36	
PQV Inspection Procedures	9-37	
Recommended Guidelines for PQV Inspection Preparation		9-45
OSHA Area Office Coordination	9-45	
Inspection Team Composition	9-46	
Pre-Inspection Preparation	9-48	
Documents	9-49	
Inspection Facilities and Equipment	9-50	
Critical Inspection Areas	9-51	
Contractors	9-52	
Critical Expertise	9-53	
Documentation	9-54	
Case File and Request Preparation	9-55	
Pre-Inspection Preparation Checklist	9-57	
Document Request List	9-60	

Chapter 10: OSHA Instruction
OSHA Instruction CPL 2-2.45A

Chapter 11: Federal Register
29 CFR Part 1910: Process Safety Management of Highly Hazardous
Chemicals; Explosives and Blasting Agents; Final Rule

REFERENCES

Center for Chemical Process Safety of the American Institute of Chemical Engineers. *Plant Guidelines for Technical Management of Chemical Process Safety*. New York, New York: American Institute of Chemical Engineers; 1989.

Center for Chemical Process Safety of the American Institute of Chemical Engineers. *Plant Guidelines for Technical Management of Chemical Process Safety*. New York, New York: American Institute of Chemical Engineers; 1992.

Center for Chemical Process Safety of the American Institute of Chemical Engineers. *Plant Hazard Evaluation Procedures: With Worked Examples.—2nd ed.* New York, New York: American Institute of Chemical Engineers; 1992.

Department of Labor. *29 CFR Part 1910: Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents; Final Rule*. Occupational Safety and Health Administration; 1992.

Department of Labor. *OSHA Instruction CPL 2-2.45A—Advance Copy of OSHA Compliance Guidelines and Enforcement Procedures for Standard on Process Safety Management of Highly Hazardous Chemicals*. Occupational Safety and Health Administration; September 28, 1992.

Thompson Publishing Group. *Chemical Process Safety Report*. Washington, D.C.: 1992.

IMPLEMENTATION OF THIS MANUAL

This manual has been prepared to help facility administrators, supervisors and workers develop a meaningful policy concerning the Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents; Final Rule. This manual contains an outline representing the minimum required content in a workable format to provide a foundation on which local management and staff can develop a policy. This manual is not intended as a substitute for first-hand knowledge of the standard, but emphasizes the spirit and intent of the standard.

This publication is designed to provide accurate and authoritative information regarding the subject matter covered. Sources for this information are believed to be reliable. Because of the possibility of human error, the publisher does not guarantee its accuracy, adequacy or completeness. Coastal is not responsible for any error, omissions, misprinting or ambiguities contained herein or for the results obtained from the use of such information. If legal advice or other expert assistance is required, the services of a competent professional should be sought.

A series of fully-illustrated employee handbooks, informative posters and broadcast-quality video training programs is also available from Coastal. Each product is the result of painstaking analysis, design, development and production by the instructional designers and technical specialists on our staff.

Our catalog is constantly being revised and expanded, so we appreciate any comments on current titles or suggestions for future ones. For further information on any Coastal product, or to receive a free catalog, call 800-767-7703 or write:

Coastal Video Communications Corporation
3083 Brickhouse Court
Virginia Beach, VA 23452
Fax: (804) 498-3657

This manual is for educational purposes only. Nothing herein is to be regarded as indicating approval or disapproval of any specific practice or product.

Copyright © 1993 Coastal Video Communications Corporation.
All Rights Reserved. Printed in U.S.A.

CHAPTER 1

Introduction

Table of Contents

Chapter Overview	1-1
How This Standard Came About	1-3
Process Safety Management	1-5
Application of the Standard	1-6

CHAPTER 1

Introduction

Chapter Overview

About this manual

This manual will explain, in plain English, what OSHA requires in its standard *Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents; Final Rule*. This manual has been written to assist management and staff at process facilities meet this federally mandated standard.

Organization of this manual

Chapter 1 gives background information on the standard. Chapter 2 begins with an overview map of the elements, or paragraphs, of the standard. The map:

- Lists the paragraph number
- Contains a brief summary of the requirements
- Gives page numbers for more information about the element.

Chapters 3 through 7 contain detailed information related to complying with the standard.

The appendices contain supplementary information such as:

- References
- Questions and answers
- Checklists
- Other useful information.

Forms and checklists

You may find the information on the sample forms and checklists appropriate for your situation. You are welcome and encouraged to use this information verbatim when appropriate. In many cases, you will need to:

- Delete information which is not relevant to your facility.
- Add details to make the form meaningful to your employees and realistic enough to be manageable and enforceable.

Photocopying

Coastal Video Communications Corporation grants the owners of this manual permission to photocopy any forms or checklists for their internal use only. All rights are reserved.

Responsibility

This manual is not intended as a substitute for an actual reading of the Final Rule. As a developer of high-quality training materials, Coastal's Chemical Process Safety Manual emphasizes the spirit and intent of OSHA's Final Rule on chemical process safety management. Employers are still responsible for first-hand knowledge of CFR 29 1910.119

We have designed this publication to provide accurate and authoritative information regarding the subject matter. We believe our sources for this information are reliable. Because of the possibility of human error, the publisher does not guarantee its accuracy, adequacy or completeness. Coastal is not responsible for any errors, omissions, misprintings or ambiguities in this publication or for the results obtained from use of such information. If you need legal advice or other expert assistance, you should seek the services of a competent professional.

Gender

Unless otherwise stated, whenever the masculine gender is used, both men and women are included.

Acknowledgement

The information analysis and presentation method used in this publication is the Information Mapping® method.

In this chapter

This chapter contains the following topics.

Topic	See Page
How This Standard Came About	1-3
Process Safety Management	1-5
Application of the Standard	1-6

How This Standard Came About

Definition: Process

A *process* is any activity involving a highly hazardous chemical. This includes any one or a combination of the following activities:

- Use
- Storage
- Manufacturing
- Handling
- On-site movement.

Definition: Highly hazardous chemical

A *highly hazardous chemical* is a substance that is toxic, reactive, flammable or explosive.

Introduction

Chemical processing and related activities have always been hazardous. Releases of toxic, reactive or flammable liquids and gases in processes involving highly hazardous chemicals have been reported for many years.

Potential for incident

If a facility does not properly control a highly hazardous chemical, there is potential for an accidental release. This increases the possibility of a catastrophic incident.

Major incidents

Recent major incidents include:

Date	Location	Incident	Result
1984	Bhopal, India	release of methyl isocyanate	more than 2,000 deaths
1985	Institute, WV	release of aldicarb oxime and methyl chloride	135 injuries
Oct. 1989	Phillips 66 Chemical Plant	explosion and fire	24 deaths 132 injuries
July, 1990	ARCO Chemical	explosion and fire	17 deaths
July, 1990	BASF	explosion and fire	2 deaths 41 injuries
May, 1991	IMC	chemical release	8 deaths 128 injuries

Response

Major chemical accidents involving highly hazardous chemicals have caused active concern. A push to protect employees, the public and the environment has come from:

- Congress
- Federal agencies
- State government
- Industry
- Unions.

Federal action

Here are some of the actions taken by the federal government in recent years to lessen the likelihood of major chemical accidents.

Agency or Act	Year	Description
EPA	1985	Started a program to encourage community planning and preparation for possible incidents involving accidental release of hazardous materials.
SARA	1986	Congress made it possible for states and communities to begin emergency planning efforts through Title III of the Superfund Amendments and Reauthorization Act (SARA).
CAAA	1990	Clean Air Act Amendments (CAAA) of 1990 require OSHA to develop a chemical process safety standard for preventing accidental releases of hazardous chemicals.

CAAA fulfillment

By developing this final standard, OSHA is fulfilling its duty under the Clean Air Act Amendments. This final rule is consistent with the directive of the CAAA.

Process Safety Management

Definition: Process safety

Process safety is the safe operation of facilities that deal with hazardous materials. These facilities might handle, use, process or store hazardous materials in covered quantities.

Process safety is a dynamic condition. It involves the technology, materials, people and equipment that make up a facility.

Definition: Process safety management

Process safety management is the application of management principles and systems to the identification, understanding and control of process hazards. Its aim is to prevent process-related injuries and incidents.

Example

Process safety management systems would involve:

- Considering the risk factor associated with accepting new products and new processes
 - Verifying that a process safety review has been performed along with a capital expenditure
 - Using a checklist for performing a capital project safety review.
-

Non-example

Process safety management does not involve:

- Setting up policies for the personal safety of employees (for example, slips, trips and falls)
- Security issues (for example, theft) that might occur in facilities
- Continual releases to the environment.

Application of the Standard

Section 1910.119

OSHA wrote the standard to prevent or minimize the consequences of catastrophic releases of extremely toxic, flammable, reactive or explosive chemicals. This standard applies to your company if you process highly hazardous chemicals at or above the specified threshold quantities.

Definition: Process

The standard defines process as any activity carried out by an employer that involves a highly hazardous chemical, including:

- Use
- Storage
- Manufacturing
- Handling
- Processing
- Movement
- Any combination of these activities.

Note: For purposes of this definition, a single process is any group of interconnected vessels and separate vessels situated in a way that a highly hazardous chemical could be involved in a potential release.

For more information

For a list of chemicals OSHA considers to be highly hazardous and their threshold quantities, consult Appendix A: List of Highly Hazardous Chemicals, Toxics, and Reactives (Mandatory) of the standard. A copy of the standard is provided with this manual.

Applicable processes

Here are the processes to which the standard applies:

The standard applies to processes...	Except...
• That involve flammable liquids or gases (29 CFR 1910.1200 (c)) • On-site in one location • In quantities of 10,000 pounds or more	• Hydrocarbon fuels used only for workplace consumption as a fuel if these fuels are not part of a covered process • Flammable liquids stored or transferred that are kept below their atmospheric boiling point without benefit of chilling or refrigeration.
• Involved in manufacture of explosives (29 CFR 1910.109).	
• Involved in manufacture of pyrotechnics, including fireworks and flares.	

*CHAPTER 2***Elements of the Standard****Table of Contents**

Chapter Overview	2-1
Required Action: Employee Participation	2-5
Required Action: Process Safety Information	2-6
Required Action: Process Hazard Analysis	2-8
Required Action: Operating Procedures	2-12
Required Action: Employee Training	2-13
Required Action: Contractors	2-14
Required Action: Pre-Startup Safety Review	2-16
Required Action: Mechanical Integrity	2-17
Required Action: Hot Work	2-19
Required Action: Management of Change	2-20
Required Action: Incident Investigation	2-22
Required Action: Emergency Planning and Response	2-24
Required Action: Compliance Audits	2-25
Required Action: Trade Secrets	2-26

CHAPTER 2

Elements of the Standard**Chapter Overview****Chapter purpose**

This chapter will present the fourteen elements of the standard to you. We have written them in an easy-to-understand way. Here is a quick overview of them. We will explain each one in greater detail on subsequent pages.

Paragraph	This paragraph...	Pages
c. Employee Participation	requires: • Employers to involve employees at a basic level of the process safety management (PSM) program • A written plan for employee participation • Employees to have access to PSM information.	2-5 4-2
d. Process Safety Information	provides complete and accurate information concerning the process which is essential for an effective process safety management program.	2-6 6-2
e. Process Hazards Analysis	requires development of a thorough, orderly and systematic approach for: • Identifying • Evaluating • Controlling the hazards of processes involving highly hazardous chemicals.	2-8 6-8

Continued on next page

Chapter Overview, Continued

Chapter overview

(continued)

Paragraph	This paragraph...	Pages
f. Operating Procedures	requires development and implementation of written operating procedures. They must: • Provide clear instructions for safely conducting activities in each process • Be consistent with process safety information.	2-12 3-2
g. Employee Training	assures that all employees involved in operating the process or newly assigned to the process will receive the following training: • Overview of the process • Operating procedures • Specific safety and health hazards • Safe work practices • Emergency response (including shutdown and evacuation) • Refresher training every three years or more often if needed. <i>Note:</i> Employer must document all such training.	2-13 5-3
h. Contractors	states that employers must inform contractors of potential hazards of fire, explosion or toxic releases. Contractors must make sure their workers are trained in: • Work practices necessary to perform their jobs safely • Applicable facility safety rules.	2-14 5-7
i. Pre-Startup Safety Review	ensures that employers perform a pre-startup review for new facilities and significantly modified facilities before the introduction of chemicals.	2-16 6-30

Continued on next page

Chapter Overview, Continued

Chapter overview

(continued)

Paragraph	This paragraph...	Pages
j. Mechanical Integrity	requires the employer to ensure initial and on-going process equipment integrity. This is done by seeing that the equipment is designed, installed and maintained properly. The standard requires: • Equipment testing and inspection • Documentation of findings • Safe and timely correction of deficiencies • Quality assurance checks of equipment, spare parts and maintenance materials. Mechanical integrity requirements apply to the following process equipment: • Pressure vessels and storage tanks • Piping systems (including valves) • Relief and vent systems and devices • Emergency shutdown systems • Controls • Pumps and compressors.	2-17 3-15
k. Hot Work Permit	requires the employer to issue a permit for all hot work operations on or near a covered process.	2-19 3-14
l. Management of Change	requires written procedures to manage changes (except for replacement-in-kind) to facilities or to process chemicals, technologies or equipment.	2-20 3-23

Continued on next page

Chapter Overview, Continued

Chapter overview

(continued)

Paragraph	This paragraph...	Pages
m. Incident Investigation	requires employers to investigate every incident that results in or could reasonably result in the catastrophic release of chemicals in the workplace. Employers must ensure that the investigation begins no later than 48 hours after the incident.	2-22 4-4
n. Emergency Planning and Response	requires development and implementation of a plan for responding to possible emergency conditions associated with each process. It must include plans for handling small releases.	2-24 4-3
o. Compliance Audits	requires employers' self-evaluation of compliance with this standard at least every three years. The audit team must include at least one person who knows the process.	2-25 7-2
p. Trade Secrets	addresses access to information developed under the PSM standard and procedures for protecting trade secrets information. Employers must make this information available to employees and their representatives.	2-26 7-8

Required Action: Employee Participation

Purpose

OSHA wrote this requirement as a way of involving employees in their plants' process safety programs.

**Requirement 1:
Employee involvement**

OSHA requires that employers write a plan of action which tells how to involve employees, including appropriate contractor employees, in the process safety plan.

**Requirement 2:
Process hazard analysis**

Conducting and developing process hazard analyses is a team effort. To do this, the employer must get help from employees and employee representatives. This is also true of developing the other elements of process safety management in this standard.

**Requirement 3:
Access to information**

Employers must give employees and employee representatives access to process hazard analyses and other information developed under the standard.

Required Action: Process Safety Information

Introduction

Employers are required to develop and maintain certain information about a covered process. They must do this before carrying out any process hazard analysis required by the standard. This information must contain information about:

- Hazards of highly hazardous chemicals used or produced by the process
 - Technology of the process
 - Equipment in the process.
-

Requirement 1: Hazards

Information about chemical hazards must consist of at least:

- Toxicity information
 - Permissible exposure limits
 - Physical data
 - Reactivity data
 - Corrosivity data
 - Thermal and chemical stability data
 - Hazardous effects of accidental mixing of different materials that could be expected to occur.
-

Note:

You can use current Material Safety Data Sheets to comply with this requirement as long as they include the above items.

Requirement 2: Technology

Information about process technology must consist of at least:

- A block flow diagram or simplified process flow diagram (See appendix H.)
 - Process chemistry
 - Maximum intended inventory
 - Safe upper and lower limits for such items as temperatures, pressures, flows or compositions
 - An evaluation of what happens when the process is not followed closely, including effects on the safety and health of employees.
-

Continued on next page

Requirement 2: Technology

(continued)

Original information

Sometimes the original technical information no longer exists. You may develop this information along with the process hazard analysis. It must be detailed enough to support the Process Hazard Analysis (PHA).

Requirement 3: Equipment

Information about process equipment must consist of at least:

- Construction materials
- Piping and instrument diagrams (P&IDs)
- Electrical classification
- Relief system design and design basis
- Ventilation system design
- Design codes and standards used
- Material and energy balances for processes built after May 26, 1992
- Safety systems (for example, interlocks, detection or suppression systems).

Equipment status

You must certify that the condition of the equipment satisfies recognized and generally accepted good engineering practices.

Older equipment

Some of your equipment might have been designed and constructed according to codes, standards or practices that are no longer in use. Determine and document that the equipment is designed, maintained, inspected, tested and operated in a safe manner.

Required Action: Process Hazard Analysis

Definition:
Process hazard analysis

Process hazard analysis (PHA) is a specified process which includes hazard evaluation. It is an analysis of potential causes and possible effects of fires, explosions, spills or releases of hazardous chemicals.

Requirement 1:
Initial analyses

OSHA requires initial process hazard analyses for any hazardous chemical process covered in the standard.

Who is included?

Facilities with a hazardous chemical on-site in the quantities named in the standard.

How much analysis?

The process hazard analysis must be just as extensive and complex as the process.

Order of priority

The employer determines the order in which to conduct the PHAs. To do this he should consider:

- Extent of process hazards
- Number of potentially affected employees
- Age of the process
- Operating history of the process.

Deadlines

Begin the analyses as soon as possible. Here is the schedule for phasing in the PHAs.

No less than	of the initial process hazard analyses must be completed by
25%	May 26, 1994
50%	May 26, 1995
75%	May 26, 1996
100%	May 26, 1997

Previous PHAs

PHAs completed after May 26, 1987, that meet the requirements of the standard can be accepted as initial PHAs. They must be updated and revalidated, based on their completion date.

**Requirement 2:
Choose methodology**

You must choose at least one methodology (technique) to determine and evaluate the process hazards being analyzed. Here are brief explanations of the ones commonly used.

Analysis Type	Description
What-if analysis	Participants ask appropriate questions concerning each step of a process. For example, the question could be posed "What if the operator fails to monitor the level?" The team answers the questions, then makes recommendations and records them.
Checklist	Review the process using a checklist developed from previous process operating experience.
What-if/checklist analysis	Conduct a what-if analysis along with use of a checklist. This ensures that certain types of previously identified potential hazards or scenarios are not overlooked.
Hazard and operability studies (HAZOP)	Conduct a structured review to identify all changes from the design intent. Changes could possibly cause hazards and/or operating problems.
Failure mode and effects analysis (FMEA)	Analyze the failure modes of an item in a process for effects on other components and on the entire system. Where component-specific failures are identified, study the process one component at a time. Evaluate effects of specific failure modes and make preliminary recommendations.
Fault tree analysis	A graphic example of specific events that lead to an undesired hazardous event. It is developed through the use of deductive logic.

**Requirement 3:
PHA inclusions**

The third requirement states the PHA must address:

- Hazards of the process
- Identification of any previous incident which was likely to create catastrophes in the workplace
- Engineering and administrative controls related to the hazards and their interrelationships

Example: Proper application of detection methods to give early warning. Acceptable detection methods might include:

- Process monitoring and control instrumentation with alarms and detection hardware.
- Results of failure of engineering and administrative controls
- Facility siting
- Human factors
- A quantitative evaluation of some possible safety and health effects on employees in the workplace caused by failure of controls.

**Requirement 4:
Operations team**

A team of engineering and process operations experts must perform the process hazard analysis. This team must include at least:

- One employee with experience and knowledge in the process being evaluated (possibly include a contractor employee)
- One person who knows the process hazard analysis method being used.

Note: Experience has shown that teams work better if all members are familiar with group organization and the selected hazard analysis method. This may require an extra training session for operators whose hands-on information is important to this team's success.

**Requirement 5:
Follow-up system**

Employers must set up a system to:

- Quickly address the team's conclusions and recommendations
- Assure that they will document and make quick decisions about recommendations
- Document actions that must be taken
- Complete these actions as soon as possible
- Create a written schedule for completion of these actions
- Communicate these actions to operating, maintenance and other personnel whose work assignments are in the process and who may be affected by the recommendations or actions.

**Requirement 6:
Update and revalidate**

After completion of the initial PHA, a qualified process hazard analysis team must update and revalidate the PHA at least every five years. This team assures that the process hazard analysis is consistent with current process.

**Requirement 7:
Keep documentation**

For each process covered by these PHA requirements, employers must, for the life of the process, retain:

- Process hazards analyses
- Updates or revalidations of the PHA
- Documented resolution of recommendations by the PHA team.

Required Action: Operating Procedures

**Requirement 1:
Phases covered**

OSHA requires written operating procedures to cover specific elements of process safety information. Those elements concern:

- Steps for each operating phase
 - Operating limits
 - Safety considerations
 - Safety systems and their functions.
-

**Requirement 2:
Accessibility**

Employers must make operating procedures readily available to those who work in or maintain a process.

**Requirement 3:
Procedure review**

Employers must review procedures as often as necessary to assure they follow current operating practice. This includes changes that result from changes in process chemicals, technology and equipment as well as changes to facilities. Once a year, the procedures must be certified as being up-to-date and accurate.

**Requirement 4:
Safe work practices**

OSHA requires that employers develop and begin using safe work practices that would prevent hazards during operations. Use of these practices applies to both employees and contractor employees.

Required Action: Employee Training

Introduction

Generally, the new standard requires employers to document initial training and refresher training required for all employees.

Requirement 1: Initial training

The employer is required to provide initial training including:

- All workers currently involved in a process
 - Newly assigned workers.
-

Training includes

Every employee must be trained in:

- An overview of the process
 - Operating procedures
 - Specific safety and health hazards
 - Emergency operations and shutdown
 - Safe work practices that apply to the employee's job tasks.
-

Grandfathering

An employee who has already operated a process as of May 26, 1992 can be grandfathered. The 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 operating procedures.

Note: Does not apply to maintenance employees. Their training must be conducted now.

Requirement 2: Refresher training

Each employee involved in operating a process must receive refresher training at least every three years, and more often if necessary. This training assures that the employee understands and follows the current operating procedures of the process. The employer will consult with process operators to determine the amount of refresher training they should receive.

**Requirement 3:
Document & verify training**

OSHA requires that employers must:

- Document that they have conducted initial and refresher training
- Verify that they have trained each employee
- Verify that each employee understands the training
- Record the employee's identity, training date and how they verified that the employee understood the training.

Required Action: Contractors**Applies to**

This paragraph of the standard applies to any contractor working on or immediately near a covered process. This includes:

- Maintenance or repair
- Turnaround
- Major renovation
- Specialty work.

Does not apply to

It does not apply to contractors providing incidental services which do not influence process safety. Examples of such services are:

- Janitorial work
- Food and drink services
- Laundry
- Delivery
- Other supply services.

Employer responsibilities

The employer has six responsibilities regarding contract employees.

No.	Responsibility
1	To select a contractor, get the contract employer's safety performance and programs information and evaluate it.
2	Let contract employers know that their work and the process exposes them to potential fire, explosion or toxic release.
3	Explain to contract employers the conditions of the emergency action plan that apply to their employees.
4	Develop and begin safe work practices that follow the standard's operating procedures requirements. These practices control the entrance, presence and exit of contract employers and contractor employees in covered process areas.
5	Regularly evaluate the performance of contract employers in meeting their responsibilities (see next page).
6	Keep a contractor employee injury and illness log related to the contractor's work in process areas.

**Contract employer
responsibilities**

The contract employer has responsibilities toward its employees.

No.	Responsibility
1	Train their employees in the work practices necessary to safely perform their jobs.
2	Teach their employees that they are exposed to potential fire, explosion or toxic release hazards through their work and the process.
3	Teach their employees the conditions of the emergency action plan that apply to them.
4	Document that: • They have trained all employees as required. • Employees understood what they were taught. Keep a record that lists: • Contractor employee's identity • Date of training • Proof that the employee understood the training.
5	Make sure their employees follow safety rules of the facility, including safe work practices.
6	Report to facility employers any hazards the contractor employees might have caused or might have found during their work.

Required Action: Pre-Startup Safety Review

Introduction

There are some important things to consider before using a highly hazardous chemical in a process. Like most elements of process safety management, the pre-startup safety review section influences several other parts of the standard, including:

- Process safety information
- Process hazard analyses
- Operating procedures
- Equipment tests and inspections
- Emergency planning
- Training.

All of these elements help to develop an effective pre-startup safety review program.

Requirement 1: Facilities

The first requirement is concerned with both new and modified facilities.

New facilities	Perform a pre-startup safety review.
-----------------------	--------------------------------------

Modified facilities	Perform a pre-startup safety review only when the modification requires a change in the process safety information.
----------------------------	---

Requirement 2: Perform review

Before you introduce highly hazardous chemicals to a process, perform the pre-startup safety review to ensure that these conditions are met:

- Construction and equipment meet design specifications.
- Adequate safety, operating, maintenance and emergency procedures are in place.
- For new facilities, a process hazard analysis should be performed and recommendations have settled or implemented before startup.
- Modified facilities meet the conditions contained in the management of change requirement.
- Training is completed for each employee involved in operating a process.

Required Action: Mechanical Integrity

Specific requirements

As just mentioned, the standard requires maintenance of the integrity of process equipment. Specifically, OSHA has five requirements to follow. This will help assure maintenance of mechanical integrity.

**Requirement 1:
Write procedures**

OSHA requires that facilities write and follow procedures to maintain the integrity of process equipment.

**Requirement 2:
Process equipment training**

The regulation requires training. The company must train each employee who will maintain process equipment. This assures the employer and OSHA that workers can perform job tasks in a safe manner. Training must consist of:

- An overview of the specific process and its hazards
 - Procedures that apply to the employee's job tasks.
-

**Requirement 3:
Inspection and testing**

The third requirement concerns inspection and testing. The company must:

- Perform inspections and tests on all process equipment
- Follow recognized and accepted good engineering practices when carrying out inspection and testing procedures
- Perform inspections and tests with regular frequency and follow manufacturers' recommendations and good engineering practices to determine how often this should be. However, operating experience might tell a worker to inspect and test process equipment more often.
- Document each inspection and test performed on process equipment. The documentation must identify:
 - Inspection date
 - Inspector/tester name
 - Serial number (equipment identifier)
 - Inspection/test description
 - Inspection/test result.

**Requirement 4:
Correct equipment
deficiencies**

If equipment has unacceptable deficiencies the worker should correct them:

- Before re-use *or*
 - Within a reasonable amount of time, taking necessary means to assure safe operation.
-

**Requirement 5:
Quality assurance**

The fifth requirement is about quality assurance of mechanical equipment. To provide quality assurance, the employer must ensure that:

- In the construction of new plants and equipment, the assembled equipment is acceptable for the process application for which it will be used.
- Workers have installed equipment properly.

Note: It must also be consistent with design specifications and the manufacturer's instructions. To assure this, proper checks and inspections must be performed.

- Maintenance materials, spare parts and equipment are suitable for the process for which they will be used.
-

Required Action: Hot Work

Safe work permit procedures OSHA expects employers to use safe work permit procedures. Employers should make sure that employees and contractors follow safe work procedures and practices such as lockout/tagout, confined space entry, pipeline breaking and hot work procedures.

Definition Hot work is defined as work involving electric or gas welding, cutting, brazing or similar flame-producing or spark-producing operations.

**Requirement 1:
Hot work permit** Employers must issue a permit for hot work operations performed in or near processes or facilities.

**Requirement 2:
Permit information** The permit must document:

- That fire prevention and protection requirements were in place before hot work began
- The date(s) approved for hot work
- The item on which hot work is to be performed.

Note: Keep the permit on display until completion of the hot work operations.

Required Action: Management of Change

Definition: Change

To properly manage process technology changes, you must understand what is meant by change. It means modifications to:

- Equipment
 - Procedures
 - Raw materials
 - Processing conditions.
-

**Definition:
Replacement in kind**

Replacement in kind means a replacement which meets design specifications.

**Requirement 1:
Write and carry out
procedures**

The standard requires employers to write and carry out procedures to manage changes. This includes changes to process:

- Technology
 - Chemicals
 - Equipment
 - Procedures
 - Facilities.
-

Exception

Replacements in kind are the exception. If you are replacing an item with a like item that meets design specifications, this is not considered to be change.

Examples: Change

Here are examples of what OSHA considers to be change:

- Piping modifications
 - Any temporary changes in procedures or piping
 - Introduction of a new chemical
 - Revision of a hardware or software control system
 - Safety equipment modifications.
-

Non-examples

The following are not examples of change:

- Change in setpoint of an operating guide alarm
- Replacement in kind of piping
- Maintenance activities (light bulb replacement, for example)
- Building modifications (interior redesign)
- Instrument modifications that do not require change to the P&IDs (changes that are documented in claims).

**Requirement 2:
Points to include**

Review changes before they are made. Make sure the following are included in management of change (MOC) procedures:

- The technical reason for the suggested change
- How the change will affect safety and health
- Changes to operating procedures
- Necessary time period for the change
- Authorization requirements for the suggested change.

**Requirement 3:
Change training**

Obtain information on and training in the changes made to the process before start-up. This applies to:

- Employees involved in the process (can include operators and their first-line supervisors)
- Maintenance and contractor employees whose jobs will be affected by a change.

**Requirement 4:
Process safety information**

Changes to a process can cause changes in process safety information. If this happens, make the necessary changes to the information.

**Requirement 5:
Operating procedures**

Changes to a process can cause changes in operating procedures or practices. If this happens, make the necessary changes to procedures or practices.

Required Action: Incident Investigation

**Definition:
Incident investigation**

Incident investigation is the process of discovering basic causes of incidents and taking steps to prevent similar events from occurring.

Purpose

The purpose of incident investigation is to learn from experiences and avoid repeating mistakes.

Requirement (in general)

OSHA requires employers to investigate each serious or possibly serious incident as soon as possible.

**Definition:
Catastrophic release**

A catastrophic release is a major uncontrolled emission, fire or explosion. It involves one or more highly hazardous chemicals which present serious danger to employees in the workplace.

Specific requirements

Because the main purpose of process safety is to prevent incidents, incident investigation is a key element in any effective process safety management system. With this in mind, OSHA has made the following specific requirements.

**Requirement 1:
Investigate every incident**

OSHA expects employers to investigate every incident which results in or could have resulted in a catastrophic release (i.e., near miss) of highly hazardous chemicals in the workplace.

**Requirement 2:
Investigate ASAP**

Management must investigate every incident as soon as possible, beginning no later than 48 hours after the incident.

**Requirement 3:
Incident investigation team**

Management should form an incident investigation team. To thoroughly investigate and analyze the incident, the team should include at least:

- One person who knows the process being investigated
- A contractor employee if the incident involved the contractor's work
- Other persons with the proper knowledge and experience.

**Requirement 4:
Investigation report**

The team must write a report after they have finished the investigation. It must include at least the:

- Date of incident
- Date investigation began
- Incident description
- Contributing factors
- Recommendations.

**Requirement 5:
System for report findings**

Management must set up a system to quickly bring attention to and decide what to do about report findings and recommendations. Decisions and corrective actions must be written.

**Requirement 6:
Review report**

Appropriate operating, maintenance and other persons whose work assignments are within close proximity to the location of the incident must review the report. This might also include contractor employees.

Requirement 7: Keep reports

Keep all incident investigation reports for five years.

Required Action: Emergency Planning and Response

Introduction

This paragraph of the standard deals with OSHA's requirement concerning emergency planning and response. OSHA believes the employer must decide what actions to take when there is an unwanted release of highly hazardous chemicals.

Requirement: Emergency action plan

The standard states that employers must create and set in motion an Emergency Action Plan (EAP) for the entire plant. OSHA regulation 29 CFR 1910.38(a) gives the requirements for developing an emergency action plan. To comply, your EAP must be available in writing and integrated with the requirements of the PSM standard.

This plan must also include procedures for handling small releases.

It may also be necessary to comply with the hazardous waste and emergency response conditions of the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (29 CFR 1910.120).

Required Action: Compliance Audits

Definition: Compliance audit A compliance audit is the process of verifying that a facility's operations conform to:

- Provisions of the standard
 - Company policies, procedures and practices developed under the standard.
-

**Requirement 1:
Self-evaluation**

At least every three years, employers must certify that they are following the conditions of this standard. They will also evaluate how well their procedures and practices are working.

**Requirement 2:
Carrying out the audit**

At least one person who knows the process must carry out the compliance audit.

**Requirement 3:
Findings report**

The company must provide a report of audit findings.

**Requirement 4:
Response and action**

The employer must quickly correct all deficiencies and write a response to each of the findings of the compliance audit. In this response, they will certify that deficiencies have been corrected.

Requirement 5: Keep reports

Employers must keep the two most recent compliance audit reports.

Note: Compliance audit methods required under the PSM standard are equally applicable to other standards by removing PSM-specific words and inserting words more appropriate to the standard under consideration.

Required Action: Trade Secrets

Definition: Trade secret

OSHA has used the definition from its Hazard Communication Standard (29 CFR 1910.1200) in the Process Safety Management standard. 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.

**Requirement 1:
Information availability**

Regardless of whether the information is a trade secret, employers must make available all applicable information to persons involved in:

- Compiling process safety information
 - Developing of process hazard analysis
 - Developing operating procedures
 - Investigating incidents
 - Emergency planning and response
 - Compliance audits.
-

**Requirement 2:
Confidentiality agreement**

The employer can require certain receivers of information to sign a confidentiality agreement not to reveal information.

**Requirement 3:
Need to know**

OSHA believes that employees (and their representatives) may need to acquire such information. The federal standard does provide them access. However, in some situations, employers may substitute more general information. They may also have to weigh the need to know with the need to protect (the employer). Therefore, OSHA is including the access procedures in the Hazard Communication Standard (except for §1910.1200(i)(13)).

CHAPTER 3

Written Procedures**Table of Contents**

Chapter Overview	3-1
Section I: Developing & Implementing Operating Procedures	3-2
Section Overview	3-2
Written Operating Procedure Elements	3-4
Procedure Writing Guidelines	3-6
How to Write Operating Procedures.....	3-7
Rules for Developing Operating Procedures.....	3-8
Accessible Operating Procedures.....	3-11
Review of Operating Procedures	3-12
Safe Work Practices for Controlling Hazards.....	3-13
Hot Work	3-14
Section II: Mechanical Integrity	3-15
Section Overview	3-15
Mechanical Integrity Programs	3-17
Establishing an Effective Mechanical Integrity Program	3-18
Quality Assurance System.....	3-21
Section III: Management of Change	3-23
Section Overview	3-23
Changes Covered by MOC	3-24

*CHAPTER 3***Written Procedures****Chapter Overview****Chapter purpose**

This chapter will tell you:

- OSHA requirements concerning operating procedures
- What should be included in an operating procedure
- How to write an operating procedure
- How to maintain the integrity of process equipment
- How to develop and carry out procedures to manage changes.

In this chapter

This chapter contains the following topics:

Section	Content	Pages
I	Developing and Implementing Operating Procedures	3-2
II	Mechanical Integrity	3-15
III	Management of Change	3-23

Section I: Developing & Implementing Operating Procedures

Section Overview

Introduction

For a good process safety management program, OSHA requires that all tasks and procedures related to the process be:

- Appropriate
- Consistent
- Clear
- Communicated to employees.

What OSHA requires

The Process Safety Management standard requires that you develop, implement and keep up-to-date written operating procedures.

Importance

With written operating procedures, all workers can perform the same task in the same way. Incidents will be less likely to occur if you develop, follow and update written procedures.

Guidelines

Here are OSHA's guidelines for written operating procedures:

- Write operating procedures clearly enough to safely conduct chemical process activities covered by this standard.
 - Make operating procedures readily accessible. Employees who work in or maintain a process should be able to get to them easily.
 - Review procedures as often as necessary, but review annually, to make sure they reflect current operating practice.
 - Develop and begin safe work practices that would keep incidents from occurring during operations.
-

In this section

This section covers the following topics.

Topic	See Page
Written Operating Procedure Elements	3-4
Procedure Writing Guidelines	3-6
How to Write Operating Procedures	3-7
Rules for Developing Operating Procedures	3-8
Accessible Operating Procedures	3-11
Review of Operating Procedures	3-12
Safe Work Practices for Controlling Hazards	3-13
Hot Work	3-14

Written Operating Procedure Elements

Function

Operating procedures describe:

- Tasks you will perform
- Data you will record
- Operating conditions you will maintain
- Samples you will collect
- Safety and health precautions you will take.

Elements to be addressed

Written operating procedures must be consistent with process safety information. They must address at least these elements:

Category	Element
Steps for each operating phase	Initial start-up Normal operations Temporary operations Emergency shutdown Emergency operations Normal shutdown Start-up following: • Turnaround • Emergency shutdown
Operating limits	Consequences of deviation Steps needed to correct or avoid deviation

Continued on next page

Elements to be addressed

(continued)

Category	Element
Safety and health considerations	Chemicals used in the process: • Properties of • Hazards presented by. Precautions needed to prevent exposure: • Engineering controls • Administrative controls • Personal protective equipment. Control measures to be taken if there is an occurrence of: • Physical contact • Airborne exposure. Quality control of: • Raw materials • Hazardous chemical inventory levels. Any special or unique hazards
Safety systems and their functions	Alarms and instruments

Procedure Writing Guidelines

Purpose

Word-of-mouth should never be the chief means of delivering operating instructions. Unfortunately, this is the way many workers learn to operate equipment. This can cause confusion, miscommunication and operating errors.

Guidelines

Here are some guidelines to follow when writing operating procedures:

Guideline	Description
Process safety information	Write procedures to match the process safety information provided to the operating staff.
Safety and health considerations	Operating procedures should describe certain safety and health measures such as: • Properties of chemicals used in the process • Hazards of chemicals used in the process • Ways to prevent exposure • What to do if physical contact or airborne exposure occurs • Quality control for raw materials • Inventory limits of hazardous chemicals • Special or unique hazards. Safe work practices must apply to both employees and contractors.
Communication	Organize the procedures well, and write them at a reading grade level that the operators will easily understand.
Design	Write modular procedures. These are easier to update.
Deviations	Write the procedure to include what to do when a potentially dangerous deviation (abnormal operation) occurs.

How to Write Operating Procedures

Follow these steps

In some companies, employees write the procedures. Other companies hire professional writers to write an operating procedures manual. Here are the steps procedure writers must follow:

Step	Action
1	Determine tasks involved in operating a process unit. Arrange them in sequential order.
2	Analyze each task. Reach an agreement on how tasks should be performed. Senior operators and supervisors should do the analysis. Management and technical staff should provide input. The most effective way to do task analysis is to record actions with a video camera.
3	Write a manual of operating procedures. The procedure writers will do this by: • Interviewing operators and supervisors • Viewing the task analysis video tape.
4	Submit written procedures to operators for input and critique. Allow them sufficient time for review.
5	See to it that operating procedure users are trained in their meaning and use.
6	Write and structure procedures in a way that they will be easy to update on a regular basis.

Rules for Developing Operating Procedures

Rules

Here are four rules that can provide a useful basis for writing procedures:

No.	Rule								
1	Distinguish between information, rules and troubleshooting. Write operating procedures in different sections. Each section will perform a different function. The sections and their purposes are described below.								
	<table><tr><th>Section</th><th>Purpose</th></tr><tr><td>Information</td><td>This section provides information that operators will probably not use on a daily basis. Place information in the appendix. <i>Example:</i> Material safety data sheets and P&IDs.</td></tr><tr><td>Rules</td><td>Give guidance on operating the plant during non-standard conditions. You might develop rules to handle situations such as: • Operation at low and high rates • Operation during unusual market conditions • Changes in feedstock quality • Extreme weather conditions. <i>Note:</i> Place rules in the appendix.</td></tr><tr><td>Trouble-shooting procedures</td><td>Similar to operating rules. Senior operators and supervisors use them when they have to make decisions quickly. They cover safety problems such as: • Response to major emergencies (fire and explosions) • Options for handling off-specification product • Loss of utilities. </td></tr></table>	Section	Purpose	Information	This section provides information that operators will probably not use on a daily basis. Place information in the appendix. <i>Example:</i> Material safety data sheets and P&IDs.	Rules	Give guidance on operating the plant during non-standard conditions. You might develop rules to handle situations such as: • Operation at low and high rates • Operation during unusual market conditions • Changes in feedstock quality • Extreme weather conditions. <i>Note:</i> Place rules in the appendix.	Trouble-shooting procedures	Similar to operating rules. Senior operators and supervisors use them when they have to make decisions quickly. They cover safety problems such as: • Response to major emergencies (fire and explosions) • Options for handling off-specification product • Loss of utilities.
	Section	Purpose							
	Information	This section provides information that operators will probably not use on a daily basis. Place information in the appendix. <i>Example:</i> Material safety data sheets and P&IDs.							
Rules	Give guidance on operating the plant during non-standard conditions. You might develop rules to handle situations such as: • Operation at low and high rates • Operation during unusual market conditions • Changes in feedstock quality • Extreme weather conditions. <i>Note:</i> Place rules in the appendix.								
Trouble-shooting procedures	Similar to operating rules. Senior operators and supervisors use them when they have to make decisions quickly. They cover safety problems such as: • Response to major emergencies (fire and explosions) • Options for handling off-specification product • Loss of utilities.								

Continued on next page

Rules

(continued)

No.	Rule		
1	(continued)		
	<table> <tr> <th>Section</th><th>Purpose</th></tr> </table>	Section	Purpose
Section	Purpose		
	<table> <tr> <td>Procedures</td><td> Describe actual operation of a unit. Procedures should: • State what the operator must do • Explain why it has to be done in a specific way • Provide enough detail that an experienced operator not familiar with that unit can run it with little help. </td></tr> </table>	Procedures	Describe actual operation of a unit. Procedures should: • State what the operator must do • Explain why it has to be done in a specific way • Provide enough detail that an experienced operator not familiar with that unit can run it with little help.
Procedures	Describe actual operation of a unit. Procedures should: • State what the operator must do • Explain why it has to be done in a specific way • Provide enough detail that an experienced operator not familiar with that unit can run it with little help.		
	<table> <tr> <td>Checklists</td><td> Summary of the procedures. The two purposes of a checklist are to serve as a: • Memory jogger • Record of operator actions. </td></tr> </table>	Checklists	Summary of the procedures. The two purposes of a checklist are to serve as a: • Memory jogger • Record of operator actions.
Checklists	Summary of the procedures. The two purposes of a checklist are to serve as a: • Memory jogger • Record of operator actions.		
2	Use publicly declared, but privately maintained modules. This means that another procedure can reference (by title only) a module from any point in the manual. Other procedure modules cannot refer to the contents of any other module.		
3	Make text assist graphics, not vice-versa. Focus on using graphic material in the operating manual. Support it by text. For graphic materials use: • Photographs • Sketches • P&IDs • Maps.		
4	Write two-page modules. They can see the entire module without having to turn pages. This can increase reading comprehension.		

**Operating procedures
and the standard**

Development and maintenance of operating procedures is closely related to the other elements of a company's process safety management program. Here are some examples:

**Example 1:
Management
of change**

Any equipment change that is not a replacement in kind requires a change in procedures.

**Example 2:
Training**

Whenever a procedural change occurs, communication and training are required.

**Example 3:
Hot work**

Such policies will be explained in procedures.

**Example 4:
Emergency
planning and
response**

The writing of procedures may require at least integration, if not development of, an emergency response plan.

**Example 5:
Audits**

Facilities must perform an audit of the operation and its procedures.

For more information

For more information about:

- Rules for developing operating procedures, see *Process Reliability and Risk Management*, by I.S. Sutton.
- Writing operating procedures in modules, see *How to Write a Usable User Manual*, by E.H. Weiss.

Accessible Operating Procedures

Availability

OSHA requires that the facility have written procedures available for ready reference and review during production. This requirement ensures proper operation of the process. So, it is a good practice always to have at least one control room copy available.

The employer should have facilities available for making new copies if originals are damaged or lost.

If workers do not speak English fluently, procedures and instructions should be available in their language.

Review of Operating Procedures

OSHA precaution

OSHA added the review requirement as a precaution to avoid using outdated or inaccurate operating procedures. Employers must certify every year that operating procedures are current and accurate.

Changes

When reviewing operating procedures, find out if anyone has made changes to the system or the process in the last year. Some clues to look for are changes in:

- Process chemicals
 - Technology
 - Equipment
 - Facilities.
-

Additional precautions

Operating personnel and engineering staff should review operating procedures. They will make sure they are accurate and give practical instructions on how to perform job duties safely.

Safe Work Practices for Controlling Hazards

Introduction

OSHA requires employers to develop and begin using safe work practices that would prevent hazards during operations. Both company employees and contractor employees must use these practices.

Hazard occurrence

Hazards that might occur during operations:

- uncontrolled release of hazardous energy
- Confined space entry, work and exit
- Opening process equipment or piping
- Entrance into a facility by maintenance, contractor, laboratory or other support personnel.

Objectives

This requirement has three objectives:

Objective	Description
1	Make those who operate high hazard processes aware of any non-routine work going on. Non-routine work might include maintenance, construction or sampling.
2	Facility controllers must be in control of non-routine work. They must make sure that doing the work does not become more important than safely controlling the process.
3	Workers performing non-routine work should be given information about hazards and precautions they should take.

Manager's duty

This requirement ensures that production unit managers will inform workers doing non-routine work of existing hazards, appropriate precautions and emergency procedures.

Hot Work

Safe work permit procedures OSHA expects employers to use safe work permit procedures. Employers should make sure that employees and contractors follow permit procedures and practices for such work as lockout/tagout, confined space entry, pipeline breaking and hot work.

OSHA considers use of safe work permits so important that they have included a paragraph regarding hot work permits.

Definition

Hot work is defined as work involving electric or gas welding, cutting, brazing or similar flame-producing or spark-producing operations.

**Requirement 1:
Hot work permit**

Employers must issue a permit for hot work operations performed in or near processes or facilities.

**Requirement 2:
Permit information**

The permit must document:

- That fire prevention and protection requirements were in place before hot work began
- Date(s) approved for hot work
- On what item the hot work is to be performed
- That fire watch, if required, remains in place one-half hour after completion of hot work.

Note: Keep the permit on display until completion of the hot work operations.

Section II: Mechanical Integrity

Section Overview

Definition: Mechanical Integrity	Process equipment which has mechanical integrity is equipment that has been designed, constructed, installed and maintained to operate to expectations.
Requirement (in general)	The standard requires maintaining ongoing integrity of process equipment.
Application	Some of the process equipment included: • Pressure vessels and storage tanks • Piping systems (including valves) • Relief and vent systems/devices • Fire protection system components • Emergency shutdown systems • Controls (monitoring devices and alarms) • Pumps.
Purpose	Following this requirement ensures good process equipment operation. Well-designed and installed equipment will operate properly.
How must we do this?	To maintain the integrity of process equipment, OSHA requires: • Development of written procedures • Training of employees for process maintenance activities • Inspecting and testing • Correction of equipment deficiencies • Provision of quality assurance.

In this section

This section covers the following topics:

Topic	See Page
Mechanical Integrity Programs	3-17
Establishing an Effective Mechanical Integrity Program	3-18
Quality Assurance System	3-21

Mechanical Integrity Programs

Maintenance

Review maintenance programs and schedules. Look for areas where you might use "breakdown" maintenance instead of a mechanical integrity program.

Elements of mechanical integrity program

A mechanical integrity program should include:

- Identification and categorization of equipment and instruments
 - Inspections and tests
 - Testing and inspection frequencies
 - Development of maintenance procedures
 - Training of maintenance personnel
 - Determining if test results are acceptable
 - Documentation of inspection and test results
 - Documentation of manufacturer recommendations concerning how long equipment and instruments are expected to work properly.
-

Lines of defense

An effective mechanical integrity program will have built-in lines of defense. We classify these lines of defense as being either primary or secondary.

Primary lines of defense

Our first defenses, or ways to prevent unwanted releases, are to:

- Operate and maintain the process as designed
- Keep the chemicals contained.

Next, control release of chemicals through venting to:

- Use scrubbers
 - Use flares
 - Use surge or overflow tanks designed to receive such chemicals.
-

Secondary lines of defense

Secondary lines of defense include systems which would control or weaken hazardous chemicals once an unwanted release occurs. This includes:

- Sprinklers
 - Water spray
 - Deluge systems
 - Monitor guns
 - Dikes
 - Designed drainage systems.
-

Establishing an Effective Mechanical Integrity Program

Making a list

Write a list of process equipment and instruments that must be included in the program.

Equipment and instruments

Determine which instruments and listed equipment you should examine more closely than others. Place them in categories according to priority. You can determine priority by noting the meantime to failure.

**Definition:
Meantime to failure**

Meantime to failure is a term referring to how long equipment parts and instruments should last before they fail. This information can come from the data supplied by the manufacturer or from facility experience with these items.

Example

You remove and inspect a relief valve during an annual turnaround. Every year you find it is plugged with polymer. This indicates the valve has failed sometime before the turnaround. You should remove such valves more frequently until you determine how often they become plugged. This is a way of giving you the meantime to failure.

Inspection and testing

How else do you determine how often to inspect and test instruments and equipment parts? Besides looking at the meantime to failure, another way is to examine the codes and standards which apply.

Codes and standards provide a formula for determining how often you should inspect and test. The corrosion rate of the construction materials is the basis for this formula.

Applicable codes and standards

Examples of applicable codes and standards are the National Board Inspection Code, or those from:

- American Society for Testing and Material
- American Petroleum Institute
- National Fire Protection Association
- American National Standards Institute
- American Society of Mechanical Engineers.

External inspections

When examining these codes and standards, you will find standards for external inspections for such items as:

- Foundation and supports
- Anchor bolts
- Concrete or steel supports
- Guy wires
- Sprinklers and nozzles
- Pipe hangers
- Grounding connections
- Protective coatings and insulation
- External metal surfaces of piping and vessels.

Continued on next page

Internal inspection

Using these codes and standards, you can also get information on methodologies for internal inspection for such items as:

- Vessel shell, bottom and head
- Metallic linings
- Non-metallic linings
- Thickness measurements for vessels and piping
- Inspection for erosion, corrosion, cracking and bulges
- Internal equipment like trays, baffles, sensors and screens for:
 - Erosion, corrosion or cracking
 - Other deficiencies.

Piping and valves

Internal and external erosion needs to be considered along with corrosion effects.

In the codes, you should be able to find methods of developing the corrosion rate. However, if you cannot determine the corrosion rate, you should inspect with maximum frequency.

Performance of inspections

State or local government inspectors may perform some of these inspections under state and local statutes.

Employer's responsibility

Inspectors must conduct tests and inspections properly. Consistency must be maintained even if different employees are inspecting.

For these reasons, employers must develop procedures and follow them consistently.

Training

Maintenance personnel will receive training to ensure they understand:

- Preventive maintenance program procedures
- Safe practices
- Proper use and application of special equipment or unique tools.

Quality Assurance System

Necessity

The facility needs a quality assurance system to help ensure:

- Proper materials of construction are used
- Fabrication and inspection procedures are proper
- Installation procedures reflect field installation concerns.

Purpose

The quality assurance program is an essential part of the mechanical program. It helps to maintain primary and secondary lines of defense designed into the process to prevent unwanted chemical releases.

Practical application

Here are some examples of how the chemical process worker can contribute to the quality assurance system:

Area	Action
Documentation	Verify and retain these items in the quality assurance documentation: • "As built" drawings • Certifications of coded vessels and other equipment • Certifications of materials of construction.
Field inspections	Inspect equipment installation jobs to see that proper materials and procedures are being used and that qualified craftsmen are doing the job.
Verify materials	In particular, check to see that craftsmen are using proper: • Gaskets • Packets • Bolts • Valves • Lubricants • Welding rods.

Continued on next page

Practical Application

(continued)

Area	Action
Verify procedures	Verify that craftsmen are using proper procedures for installation of safety devices, such as: • Torque of bolts on rupture disc installations • Uniform torque on flange bolts • Proper installation of pump seals • Other procedures particular to your process.
Conduct audits	The quality of parts may be a problem. If so, conduct audits of equipment suppliers' facilities. This way you can better assure that purchased equipment is suitable for its intended use. If an audit causes changes in equipment, the changes will need to go through management of change procedures.

Section III: Management of Change

Section Overview

Introduction

The standard requires employers to write and perform procedures to manage changes. This refers to changes in equipment, procedures, raw materials and processing conditions.

Reason

Process changes are what caused many of the incidents OSHA has reviewed.

In this section

This section covers the following topic:

Topic	See Page
Changes Covered by MOC	3-24

Changes Covered by MOC

Process technology

Modifications in process technology are covered by the MOC provisions. These modifications can result from changes in:

- Production rates
- Raw materials
- Experimentation
- Equipment unavailability
- New equipment
- New product development
- Catalyst
- Operating conditions to improve yield or quality.

Equipment and instruments

The provision also covers changes to equipment and instruments. These include:

- Materials of construction
- Equipment specifications
- Piping prearrangements
- Experimental equipment
- Computer program revisions
- Changes in alarms and interlocks.

Temporary changes

Temporary changes have caused a number of disasters. Employers should create ways to prevent these changes from becoming a problem. Use the following suggestions as a guideline:

Set time limit Set a time limit for a temporary change. Otherwise, you might forget about it, then temporary change might become permanent.

Monitor time limit When the time limit has run out, return equipment and procedures to their original or designed conditions.

Documentation Develop a form or clearance sheet to record changes covered by MOC.

CHAPTER 4

Written Plans of Action

Table of Contents

Chapter Overview	4-1
Required Action: Employee Participation	4-2
Emergency Planning and Response	4-3
Investigating an Incident	4-4

CHAPTER 4**Written Plans of Action****Chapter Overview****Chapter purpose**

Plans of action are crucial to the safe operation of chemical process plants. Such plans should always be written rather than communicated by word-of-mouth. This helps assure that all people involved in operating or working near a process perform and respond in the same way.

Required plans

Plans of action that the regulation requires are employee participation plans and emergency action plans.

In this chapter

This chapter covers the following topics:

Topic	See Page
Required Action: Employee Participation	4-2
Emergency Planning and Response	4-3
Investigating An Incident	4-4

Required Action: Employee Participation

Purpose

OSHA wrote this requirement as a way of getting employees involved in their plant's process safety programs.

**Requirement 1:
Employee involvement**

OSHA requires that employers write a plan of action which tells how employees will be involved in the process safety plan.

**Requirement 2:
Process hazard analysis**

Conducting and developing process hazard analyses is a team effort. To do this, the employer must get help from employees and employee representatives. This is also true of developing other elements of process safety management in this standard.

**Requirement 3:
Access to information**

Employers must give employees and employee representatives access to process hazard analyses and other information developed under the standard.

**Employees and their
representatives**

This standard frequently mentions "employees and their representatives." The team may need the participation of an employee representative because of some expertise. However, OSHA believes the CAAA does not find it necessary to require team membership on the basis of union membership.

Emergency Planning and Response

Emergency action plan

OSHA requires that your plan include at least implementation of and training in the following procedures:

- Emergency escape procedures and escape route assignments
 - Performing critical plant operations before evacuation
 - Emergency shutdown procedures and qualified personnel assignment
 - Accounting for all employees after emergency evacuation
 - Rescue and medical duties for employees who will perform them
 - Preferred means of reporting fires and other emergencies
 - Names and job titles of persons to contact for more information about the plan.
-

Alarm systems

The company must establish a system to alert all employees of an emergency. If the alarm system will serve more than one purpose, it should emit a different sound for each purpose. As a result, no one should mistake an evacuation alarm for the one that signals the emergency response team.

Training

Employers must train all employees regarding use and purpose of the emergency action plan:

- When the plan is developed
 - Whenever emergency action plan responsibilities change
 - Whenever the plan changes.
-

Small releases and spills

A small release or spill may or may not be an emergency situation. Since one can't always tell, OSHA requires development of procedures to follow whenever this happens.

Note: Near-miss reports/unusual event reports cover small releases or those that could have resulted in a catastrophic release.

Investigating an Incident

Investigation guidelines

Here are OSHA's recommendations for investigating incidents. They address the following areas:

- Incident reporting
- Preplanning
- Management responsibilities
- Initial response
- Incident investigation team
- Determination of the facts
- Determination of the cause
- Recommendation of corrective and preventive actions
- Follow-up system
- Communication of results.

Incident reporting

The company should encourage workers to report incidents. Treat incident investigations as a search for facts, not a search for the guilty. This encourages everyone to work together, report incidents and correct deficiencies.

For reporting purposes, an incident is anything that happens which is unusual or out of the ordinary. Don't limit initial reporting to serious or possibly serious incidents. Safety experience indicates that you cannot always assess the seriousness at the scene of the incident. When you've reported all incidents, you can select which incident need further investigation.

Preplanning

Planning and organizing for incident investigations should happen before the incident. The amount and quality of information begins to diminish immediately after the incident. Valuable information can be lost through cleanup efforts or blurred memories of those people involved. That's why it's important to develop incident investigation steps ahead of time.

Management responsibilities Management has several important responsibilities that promote effective incident investigation:

- Show how important and useful incident investigation is as a tool for controlling potential hazards.
- Create an atmosphere of trust and respect. This leads to openness in reporting of incidents.
- Provide the means and priority attention necessary to perform a careful and complete investigation.
- Give the results to all who may benefit.
- Develop a way to ensure someone will follow the recommendations of the incident investigation to prevent similar future incidents.

Initial response

Initial responders to an incident should:

Step	Action
1	Provide medical and other safety and health help to personnel.
2	Bring the incident under control.
3	Direct investigation activities so as to preserve relevant information and evidence.

Preserving information

Activities to preserve information should include:

- Securing and barricading the scene
- Starting the collection of information
- Interviewing people involved and/or witnesses of the incident.

Note: Information will begin to disappear immediately following the incident. First responders should make every effort possible to begin information gathering promptly.

Incident investigation team

There are two factors of major importance to the incident investigation:

- Quick establishment of the incident investigation team
- The makeup of the team.

Chairperson

The team chairperson should be someone who can effectively complete the following responsibilities:

- Control the range of team activities by identifying which lines of investigation the team should follow, refer to another group for study or table.
- Call and lead meetings.
- Assign tasks and set up timetables.
- Ensure that no possibly useful data source is overlooked.
- Keep site management advised of the progress of the investigation.

Team membership

Team membership will vary according to the type of incident. A typical team investigating an operating area incident might include:

- A third-line or higher supervisor from the section where the incident took place
- Personnel from an area not involved in the incident
- Engineering and/or maintenance personnel
- The safety supervisor
- A first-line supervisor from the affected area
- Occupational health/environmental personnel
- Appropriate wage personnel (i.e., operators, mechanics, technicians)
- Research and/or technical personnel.

Note: Other specialists and/or consultants may be considered and included either on a part-time or full-time basis.

Determining the facts

A careful and all-inclusive search for the facts is a necessary step in the incident investigation. During the fact-finding phase of the investigation, team members should perform these steps:

Step	Action
1	Visit the incident scene before physical evidence is disturbed.
2	Sample unknown spills, vapors, residues, etc., noting conditions which may have affected the sample.
3	Prepare visual aids, such as photographs, field sketches, missile maps and other graphic representations to provide data for the investigation.
4	Obtain on-the-spot information from eye-witnesses, if possible. Soon after the incident schedule interviews with those directly involved and others whose input might be useful. <i>Note:</i> Conduct interviews individually, so comments of one witness will not influence response of others.
5	Observe "key" mechanical equipment as it is disassembled.
6	Review all sources of potentially useful information. These may include: • As-built drawings • Operating logs • Recorder charts • Previous reports • Procedures • Equipment manuals • Oral instructions • Computer simulations/laboratory tests • Change of design records indicating previous training and performance of employees involved.

Determining the facts

(continued)

Step	Action
7	Determine which incident-related items should be preserved. Sometimes a preliminary analysis may show an item could have failed to operate correctly or was damaged. Make arrangements either to preserve the item or carefully document any repairs or modifications.
8	Carefully record information sources contained in the incident report. <i>Note:</i> This will be valuable if the team decides it is necessary to further study the incident or potential incident.

Determining the causes

First, determine the basic cause of an incident in order to develop effective recommendations that would prevent it from happening again. We can use many methods to sort out the facts, inferences and judgments gathered by the investigation team. Formal analysis is recommended as protection against oversight or making hasty and wrong judgments. One approach to developing the cause and effect relationships is outlined below.

Step	Action
1	Develop the chronology of events, i.e., a list of what happened before, during and after the incident. The focus of the chronology should be only on what happened and what actions were taken. List alternatives when event status cannot be definitely established because of missing or contradictory information.
2	Identify abnormal conditions or circumstances, no matter how insignificant they may seem.
3	Identify all theories of the causes of the incident based on these abnormalities.
4	Test theories against all available evidence and information. List them in order of probability.
5	You might find a cause tree approach helpful in illustrating the many failures that led to the incident under investigation. This approach helps you narrow down the failures to more basic or fundamental initiating events.

**Recommending
corrective & preventive
actions**

Once you've determined the cause, it's usually easy to make recommendations for corrective and preventive action. The three parts of a recommendation for corrective action are:

Part	Description
1	The recommendation itself describes the actions you should take to prevent the incident from happening again.
2	The name of the person or position responsible for completing the recommendation.
3	Timing for completion of the recommendation.

Other recommendations

Some recommendations may be prerequisites for safe operation. You would need to complete them before resuming operations. Other recommendations you might not act upon until after resuming operations. These involve:

- Areas needing additional work or study
- Problems not directly related to the incident.

Follow-up system

Ensure follow-up and closure of recommendations from an incident investigation. Develop and operate a system to address open recommendations and to record actions you took to close out recommendations. This system should include periodic status reports to site management.

Communicating results

Two more steps in the effort to prevent an incident from happening again are:

- Documentation of incident investigation findings
- Review of the investigation results with appropriate personnel.

Documentation of incident Incident documentation should address the following topics:

- Description of the incident (including date, time and location)
- Facts determined during the investigation (including chronology as appropriate)
- Statement of cause(s)
- Recommendations for corrective and preventive action (including timing and responsibility for completion).

Review of investigation results

Review results of the incident investigation with appropriate personnel (i.e., operating and maintenance personnel) whose work assignments are within the facility where the incident took place.

Also, consider reviewing results with similar facilities to prevent occurrence there.

Note: This may be imperative should OSHA or other regulator determine you possessed knowledge of unsafe workplace conditions and did nothing to protect employees. See 1972 Occupational Safety and Health Act (OSH Act), "General Duty Clause," [5(a)(1)].

CHAPTER 5 **Training**

Table of Contents

Chapter Overview	5-1
Section I: Employee Training	5-2
Section Overview	5-2
Goals and Objectives	5-3
Initial Training	5-4
Refresher Training	5-5
Section II: Contractor Training	5-6
Section Overview	5-6
Types of Contract Employers	5-7
Use of Contractors	5-8
Chapter Summary: Training	5-10

CHAPTER 5 Training

Chapter Overview

Introduction

All employees (maintenance and contractors included) involved with highly hazardous chemicals must fully understand the safety and health hazards of chemicals and processes with which they work. This is for the protection of themselves, fellow employees and citizens of nearby communities.

Purpose

This training gives employees more knowledge about the chemicals with which they work. It will also familiarize them with reading and understanding Material Safety Data Sheets (MSDS).

Training is an important part of any process safety management program. Proper training of personnel is a must for keeping complicated process equipment and machinery in safe operation.

In this chapter

This chapter contains the following topics:

Section	Content	Pages
I	Employee Training	5-2
II	Contractor Training	5-6

Section I: Employee Training

Section Overview

Introduction

The employer is required to provide workers with initial training. This includes all workers currently involved in a process as well as newly assigned workers. Training must consist of process basics and operating procedures.

Workers must also receive refresher training every three years. After training, the employer must certify that each worker received and successfully completed specified training.

Purpose

Training programs are set up as part of the overall process management program. This training should ensure that highly hazardous chemicals are handled safely and consistently.

Goal

Effective training programs:

- Produce properly trained operators to handle highly hazardous chemicals
- Help operators understand the makeup and origins of problems that stem from process operations
- Make employees more aware of the unique hazards of specific processes.

In this section

This section covers the following topics:

Topic	See Page
Goals and Objectives	5-3
Initial Training	5-4
Refresher Training	5-5

Goals and Objectives

Defining training

In setting up the training program, employers must clearly:

- State who they will train and the subjects they will teach
 - Define employee training goals and objectives.
-

Writing goals & objectives

Write goals and objectives:

- In clear, measurable terms
 - Tailored to each specific training module or segment
 - To describe important actions employees perform
 - To describe conditions under which employees demonstrate ability, knowledge or acceptable performance.
-

Initial Training

How much?

To decide how much initial training to give, the company looks at:

- Chemicals involved
- How complicated the process is
- How complicated job functions are.

What's included?

Initial training may include general plant safety overview, classroom training or on-the-job training.

General plant safety overview

This is a review of plant safety and emergency procedures that all plant personnel should receive.

Classroom training

This consists of reviewing:

- Process and chemical hazards
- Safe work practices
- Standard operating procedures.

On-the-job training

The trainee works with an experienced operator to review standard operating procedures. Training includes:

- Equipment familiarization
- Operating data collection and entry
- Equipment startup and shutdown
- Process control.

Operating procedures

Standard Operating Procedures (SOP) should be finished or nearly finished before training is conducted.

Training needs

Facility management should decide which processes are most important and concentrate on training operators in the areas with the most hazards. Results of the hazard analysis help here. Create a training priority list based on:

- Process hazards
- How complicated the operations are
- Number of operators who will receive training.

Other required training

This training is not a part of other required training. Although other training will cover similar topics, such as chemical hazards, OSHA recommends an integrated training program, meeting more than one requirement.

Refresher Training

What's included?

Refresher training covers:

- Unchanged procedures and policies
- New information
- Changed procedures and policies.

Unchanged procedures

Refresher training for unchanged procedures and policies would include review of:

- Items covered in classroom and on-the-job training
- All accidents and near misses related to highly hazardous chemicals.

Changed procedures

Facility personnel might require refresher training in new information or changed procedures and policies when:

- New highly hazardous chemicals are introduced
- New process equipment is installed
- Changes process parameters (such as pressure, flow or temperature) are implemented
- New products requiring changes to the standard operating procedures are introduced.

Frequency

The employer and employees may have decided it is necessary to complete refresher training more than once a year. This decision would be based on:

- Chemicals involved
 - How complicated the process is
 - How complicated the employee's job functions are.
-

Section II: Contractor Training

Section Overview

Introduction

Some segments of industries covered by the rule use a large number of contractor employees. The standard gives duties for both the employer and any contractor working on or immediately near a covered process.

Purpose

The purpose of this section is to assure that contractor employee actions do not lead to disastrous releases, fires or explosions. It assures that contractor employees know about the hazards of the work, safe procedures to carry out their work and actions they should take during emergencies.

In this section

This section covers the following topics:

Topic	See Page
Types of Contract Employers	5-7
Use of Contractors	5-8
Chapter Summary: Training	5-10

Types of Contract Employers

Definition

Contract employers are owners and operators of contract companies.

Duties

Contract employers are responsible for training contractor employees. However, facility employers also play a part in contractor safety since they must give hazard information to contract employers. It is the duty of contract employers to pass this information on to their employees. Contract employers train contractor employees. Facility employers manage and periodically evaluate contractor employee training.

Contract labor

Many types of contract labor might be present at a job site. It's important to understand the differences among them.

Example 1

Contractors might operate a facility for an owner who is not involved in daily operation of the facility. In this example, the contractor is the facility employer and has facility employer responsibilities.

Example 2

Some contractors are hired to work a specific aspect of a job because they have a specialized skill or knowledge the host employer doesn't. An example is asbestos removal.

Example 3

Other contractors work on-site when the operation needs more manpower quickly, and for a short time. An example would be those involved in a turnaround operation.

Extent of responsibilities

The facility employer has certain responsibilities to the contractor. The extent of those responsibilities depends on the type of contractor present. Contractor employee process operators must receive the same training as facility process operators.

OSHA standards coverage

Generally, all OSHA standards apply to all job-site employees, including contractors. The process safety standard is no exception.

Use of Contractors

Hiring Contractors

The standard requires that facility employers evaluate contract employer safety records before hiring.

Screening

Evaluating these records requires setting up a screening process to hire contractors who will complete the job tasks without endangering the safety and health of facility employees.

Getting information

When considering a contractor whose on-the-job safety performance is not known, get the following information:

- Injury and illness rates (reflected in OSHA 200 Logs for past three years)
- Experience (such as insurance Experience Modification Rate)
- Contractor references.

Make sure the contractor has the right job skills, knowledge and certifications. Evaluate contractor work methods and experiences.

Example

Find out if the contract company doing demolition work swings loads over operating processes or if they avoid such hazards.

Tracking activities

When contractor employees work on or next to covered processes, employers should have current knowledge of their work activities.

Injury and illness log

Maintaining a site injury and illness log for contractors is one method employers use to do this. Using these logs, an employer can have full knowledge of process injury and illness experience of employees and contractor employees. Information in this log will also be of use to process safety management compliance auditors and incident investigators.

Work authorization system

Contract employees must perform work safely. They often perform very specialized and potentially hazardous tasks such as confined space entry activities and non-routine repair activities. These activities must be controlled while they are working on or near a covered process.

Using a work authorization system, or permit system, is another way employers can keep track of the work activities of contractor employees. It also gives the employer better coordination and more management control over work being performed in the process area.

A well-run and well-maintained process where employee safety is fully recognized will benefit everyone who works in the facility—contractor employees and facility employees.

Chapter Summary: Training

Summary chart

Here is a summary of facility and contract employer responsibilities:

Training: Employee & Contractor		
Responsibilities	Facility	Contractor
Review contractor safety record.	✓	
Provide information on hazards to: • Contractor • Contractor employees.	✓	✓
Explain emergency action plan to: • Contractor • Contractor employees.	✓	✓
Safe work practices: • Execute • Make sure they are followed.	✓	✓
Control entrance, presence and exit of contractors and contractor employees.	✓	
Evaluate contractor performance and training.	✓	
Maintain contractor employee injury, illness log.	✓	✓
Assure, document contractor employee training.		✓
Advise facility of unusual hazards.		✓

CHAPTER 6

Process Requirements

Table of Contents

Chapter Overview	6-1
Section I: Process Safety Information	6-2
Section Overview	6-2
What Is Process Safety Information?	6-3
Process Hazards Information	6-4
Process Technology Information	6-5
Process Equipment Information	6-7
Section II: Process Hazard Analysis	6-8
Section Overview	6-8
Identifying, Evaluating and Controlling Hazards	6-9
Performing a PHA	6-10
Selecting the PHA Team	6-12
Techniques Overview	6-13
Checklist Analysis	6-14
What-If Analysis	6-15
What-If/Checklist Analysis	6-17
Hazard and Operability Study	6-18
Failure Modes and Effects Analysis	6-20
Fault Tree Analysis	6-22
Selecting a PHA Technique	6-23
Applying a PHA	6-26
PHAs for Small Businesses	6-28
Setting Up a PHA Priority System	6-29
Section III: Pre-Startup Safety Review	6-30
Section Overview	6-30
Further Information	6-31
Pre-Startup Safety Checklist	6-32

CHAPTER 6**Process Requirements****Chapter Overview****Chapter purpose**

The chapter covers process requirements of the Process Safety Management standard. Its purpose is to provide information concerning:

- Process which is essential for an effective process safety management program
- Development of a thorough, orderly, systematic approach for identifying, evaluating and controlling hazards of processes involving highly hazardous chemicals
- Conduct of a pre-startup safety review for new and significantly modified facilities before introduction of chemicals.

In this chapter

This chapter contains the following topics:

Section	Content	Pages
I	Process Safety Information	6-2
II	Process Hazard Analysis	6-8
III	Pre-Startup Safety Review	6-30

Section I: Process Safety Information

Section Overview

Introduction

Employers are required to develop and maintain certain information about a covered process.

Purpose

Information is provided to form a basis for understanding process hazards and to enhance safe process operations.

In this section

This section covers the following topics.

Topic	See Page
What Is Process Safety Information?	6-3
Process Hazard Information	6-4
Process Technology Information	6-5
Process Equipment Information	6-7

What Is Process Safety Information?

Definition:
Process safety information

Process Safety Information is written material about process:

- Chemicals
- Technology
- Equipment.

It is essential to an effective process safety management program and to a Process Hazard Analysis (PHA).

Information users

This compiled information is a necessary resource. It will be used by many groups such as the:

- Process Hazard Analysis team
 - Training program developers
 - Operating procedure writers
 - Contractors who work with the process
 - Pre-startup safety reviewers
 - Local emergency preparedness planners
 - Insurance and enforcement officials.
-

Process Hazard Information

Information included

OSHA requires that you gather information about the chemicals in your plant. This includes process intermediates. The information should be thorough enough to determine:

- Fire and explosion characteristics
 - Reactivity hazards
 - Safety and health hazards to workers
 - Corrosion and erosion effects on process equipment and monitoring tools.
-

Gathering the information

To help assemble the information, you can use manufacturer-supplied Material Safety Data Sheets (MSDS). You must also add process chemistry information and runaway reaction and over-pressure hazards if applicable.

Process Technology Information

Information included

Process technology information will be part of the process safety information package. It should include:

- Diagrams such as block flow or process flow diagrams
- Employer-established criteria for maximum inventory levels for process chemicals
- Limits beyond which would be considered upset conditions
- An estimate of what would happen if process operation exceeded established limits.

Diagrams

Employers are encouraged to use diagrams which will help users understand the process. Here are some of the diagrams that you could use:

Diagram	Description
Block flow diagram	This diagram is a simplified diagram. Use it to show: • Flow rates • Stream composition • Temperatures • Pressures • Major process equipment and interconnecting process flow lines.
Process flow diagram	Process flow diagrams are more complex. They show: • All main flow streams, including valves • Pressures and temperatures on all feed and product lines within all major vessels • Flow directions (in and out) of headers and heat exchangers • Points of pressure and temperature control.
	To clarify the diagram, you could show: • Materials of construction information • Pump capacities and pressure heads • Compressor horsepower • Vessel design pressures and temperatures • Major components of control loops along with key utilities.

P&IDs

To show the just-mentioned details, it might be better to use piping and instrument diagrams (P&IDs). This is the best kind of drawing to use for showing information to the designer and engineering staff. You can also use P&IDs to describe the relationships between instruments and equipment. Generally, P&IDs are good to use for making relevant information clearer.

You may use computer software programs to do P&IDs and other diagrams.

Process Equipment Information

Documentation

You must document the process equipment design information. This will include information such as codes and standards relied upon to establish good engineering practice. Codes and standards are published by such organizations as

- American Society of Mechanical Engineers
- American Petroleum Institute
- American National Standards Institute
- National Fire Protection Association
- American Society for Testing and Materials
- National Board of Boiler and Pressure Vessel Inspectors
- National Association of Corrosion Engineers
- American Society of Exchange Manufacturers Association
- Model building code groups.

Technical reports

Various engineering societies issue technical reports which affect process design.

Example

The American Institute of Chemical Engineers has published technical reports on topics such as two-phase flow for venting devices.

Many engineers would recognize this type of technical report as being good engineering practice.

Existing equipment

The company might have good equipment designed and constructed many years ago and would like to continue using it. The employer must document which codes and standards were used to build it and that the following are still suitable for the intended use:

- Design and construction
- Testing
- Inspection
- Operations.

Note: Sometimes process technology requires a design which departs from applicable codes and standards. In this case, the employer must document that the design and construction is suitable for the intended purpose.

Section II: Process Hazard Analysis

Section Overview

Introduction

Process hazard analysis is the foundation of any effective program for managing hazards. It is a thorough, orderly, efficient way of identifying, evaluating and controlling processes involving highly hazardous chemicals. When the employer performs a hazard analysis, he can:

- Determine where problems may occur
- Plan actions that would be necessary if safety controls failed
- Take corrective measures to improve the process safety.

Purpose

A process hazard analysis (PHA) lets you identify accidents or hazardous situations that might happen. In particular, situations that include potential for serious injury to employees.

In this section

This section covers the following topics.

Topic	See Page
Identifying, Evaluating and Controlling Hazards	6-9
Performing a PHA	6-10
Selecting the PHA Team	6-12
Techniques Overview	6-13
Checklist Analysis	6-14
What-If Analysis	6-15
What-If Checklist Analysis	6-17
Hazard and Operability Study	6-18
Failure Modes and Effects Analysis	6-20
Fault Tree Analysis	6-22
Selecting a PHA Technique	6-23
Applying a PHA	6-26
PHAs for Small Businesses	6-28
Setting Up a PHA Priority System	6-29

Identifying, Evaluating, and Controlling Hazards

Introduction

Controlling hazards involves conducting a PHA. This is done in three stages. The PHA is a systematic approach for identifying, evaluating and controlling processes involving highly hazardous chemicals. These stages are explained below.

Stage	Description	Question
Identify	A hazard is a physical situation that could possibly cause harm to people, property or the environment. The first stage in controlling the hazard is to identify it.	<i>What can go wrong?</i>
Evaluate	To evaluate a hazard is to make an organized effort to identify and analyze the importance of events related to a process or activity. Specifically, you would pinpoint weaknesses in the design and operation of facilities that could lead to accidental chemical releases, fires or explosions.	<i>What are all the causes?</i> <i>How bad can it be?</i>
Control	This is largely a management concern. The best way to control is to eliminate the hazard. This is not always possible. When it cannot be eliminated, try to reduce the seriousness of the hazard and its effects. Most facilities have some form of hazard control in place.	<i>What should be done about it?</i>

Synonyms

Facilities use many different terms for process hazard analysis. Listed below are some of those terms.

- Hazard evaluation
- Predictive hazard evaluation
- Process hazard(s) review
- Process risk review
- Risk assessment
- Hazard assessment
- Hazard study
- Process safety review
- Process risk survey
- Risk review

Performing a PHA

Phases

Successful PHAs require extensive effort throughout the facility. Here are the three phases followed by appropriate actions to take.

Phase	Description	
Preparation	Adequate preparation is the foundation for a successful PHA study. Management is primarily responsible for this phase.	
	Step	Action
	1	Clearly define the objectives, scope and deadlines for the PHA.
	2	Gather all pertinent information such as: • Preliminary flowsheet sketches • Complete set of chemical process data • Piping, instrumentation and control drawings • Data sheets • Procedures.
	3	Select team members.
	4	Schedule review meetings and tours (for an existing process) necessary to perform the evaluation.
Evaluation	This includes the actual analysis activity performed with the selected PHA technique.	
	5	Identify the potential hazards. • Analyze causes • Analyze consequences.
	6	Make recommendations for reducing or eliminating a potential hazard.
	7	Identify items of concern for more detailed study.

Continued on next page

Phases

(continued)

Phase	Description	
Evaluation	(continued)	
	Step	Action
	8	Assess risks of the remaining potential hazards. Use hazard assessment techniques to determine: • How often these hazards might occur • Degree of protection required.
Documentation	This phase involves writing recommendations and conclusions. These are given to the management who controls the PHA follow-up.	
	Step	Action
	9	Document the PHA. This includes: • Recording PHA team meetings results • Developing a formal and complete PHA report.
	10	Team members review PHA results.
	11	Communicate PHA results with appropriate plant management.
	12	Follow up on recommendations.

Selecting the PHA Team

Composition of the team

Here are some of the characteristics of a process hazard analysis team.

Element	Characteristic
The PHA team...	• Needs to understand the methodology they will be using • Can vary in size from two people to a number of people with varied operational and technical backgrounds • Have at least one member who is familiar with the process • May have some team members who are a <i>part of the team for a limited time</i> • Will have an intimate knowledge of the relevant standards, codes, specifications and regulations • Should be able to work together to: 1. Resolve issues 2. Reach a consensus on the findings of the study and recommendations.
Team leaders must be able to...	• Conduct the methodology the team uses both impartially and properly. • Manage the team and the PHA study.
Full or part-time team members must be experts in such areas as...	• Process technology • Process design • Operating procedures and practices • Alarms • Emergency procedures • Instrumentation • Maintenance procedures • Routine and nonroutine tasks • Procurement of parts and supplies • Safety and health.

Techniques Overview

Purpose

We will briefly describe the use of the techniques mentioned in the PHA standard. Here are those techniques and their uses.

Technique	More appropriately used...
Checklist	For performing general process hazard studies
What-If Analysis	Early in the life of the process For taking a broad-brush look at large plant or complex process hazards Before initiating a process to greatly improve the cost-effectiveness of succeeding safety improvement efforts.
What-If/Checklist Analysis	For performing detailed analyses of a wide range of hazards during design and operation
Hazard and Operability Study	To identify hazardous situations, which can later be studied using more advanced techniques.
Failure Modes and Effects Analysis	
Fault Tree Analysis	For use in special situations that require detailed analyses of one or more situations of concern By specially trained and skilled practitioners On tightly focused, time-consuming problems.

Checklist Analysis

Definition

Checklist analysis is a commonly used hazard evaluation/analysis methodology. The analyst uses a detailed list of either:

- Desired system attributes
- Steps for a system or operator to perform.

Description

It is usually developed from process operating experience. The analysis uses it also to check the status of the system or operation compared to established norms.

Purpose

The checklist analysis approach is easy to use. The analyst can use it:

- At any stage of process lifetime
- To familiarize inexperienced personnel with a process by having them compare process properties to checklist requirements
- To provide a common basis for management review of assessments of a process or operation
- To control development of a project — from initial design through plant decommissioning.

Limitations

The checklist author's experience can limit the effectiveness and completeness of the checklist analysis. Authors with varied backgrounds and extensive experience with the particular system should develop checklists.

Types of checklists

Checklists can be specific or generic.

Type	Description
Specific	• Promote standard evaluation of process hazards, but only for one specific process. • Contain a list of specific features normally required for safe process operation. • Used by individuals.
Generic	• Stimulate more original thought. • Suggest broad areas for investigation — not specific, prepared solutions to problems. • Used often in a team approach because they help provide a mix of expertise and opinion.

What-If Analysis

Definition

What-if analysis is a brainstorming approach. A group of experienced people ask pertinent questions about each step of the process. They address hazards, hazardous situations or specific accident events that could result in a negative effect in a system or a process.

Description

It is a more unstructured approach than the others. It requires little or no training because the approach is straightforward. The analyst must adapt the basic concept to the specific application. It is difficult to find any written information on the what-if analysis method or its application.

Purpose

The what-if analysis approach is easy to use. The analyst can use it:

- At any stage of process lifetime
- For reviewing a complete process or portions of it, depending on the complexity of the process
- To examine any aspect of facility design and operation
- For simple systems using only one or two people with which to brainstorm.

Limitations

This approach has two distinct disadvantages when handling unique complex processes. Compared to the more sophisticated and time-consuming methods, the what-if approach:

- Doesn't greatly improve an understanding of the process and its consequences
- May not be as effective in detecting remaining hazards.

Scope of a what-if

A what-if analysis usually:

- Reviews the process from beginning to end (or some other pre-defined boundary set by the chairman)
- Focuses on a particular type of consequence (for example, process safety, personnel safety, electrical, boiler and machinery, fire protection and material handling).

Conducting a what-if

This is an example of conducting a what-if analysis.

Step	Action
1	The chairman defines the scope of the review.
2	The project engineer gives a quick orientation and hands the team a copy of a schematic drawing and the operating procedures.
3	Begin the review process with free flowing questions and responses for the entire operation. Encourage the review team to think of questions that begin with "What if." However, they can express any process concern, even if it's not phrased as a question. <i>Examples:</i> • It really bothers me that I don't receive deliveries on time. • What if the seal on the pump leaks? • What if a leak occurs or the tank overflows?
4	The scribe records all the questions.
5	Divide the questions into specific areas of investigation.
6	Assign each group of questions to a person who has the expertise necessary to answer them.
7	Typically, members answer questions and make risk reduction recommendations outside of the meeting. They report back to the team at a future meeting.

What-If/Checklist Analysis

Definition

What-if/checklist analysis combines the creative, brainstorming what-if approach with the systematic checklist analysis method.

Description

This method combines the strengths and offsets the weaknesses of the separate approaches.

What-If Checklist Analysis		
	Checklist	What-if
Strengths	• Lends a more systematic structure. • Can use it to generate what-if questions and issues that might be left out.	Encourages hazard evaluation team to consider any potential hazard or accident event; does not restrain the team.
Weaknesses	• Analysis results depend greatly on the contents of the checklist. • Can restrict the creativity and imagination of the team.	Not as detailed and systematic as the more rigid techniques.

Purpose

The what-if/checklist analysis approach is easy to use. Normally, its uses are more general than more detailed approaches. The analyst can use it:

- At any stage of process lifetime
- As the first technique performed on a process.

Conducting a what-if analysis

Conducting a what-if/checklist analysis is much the same as conducting a what-if analysis. The only differences are:

- Review team uses a checklist first.
- Leader tries to stimulate "what-if" thinking for each entry on the checklist.
- Checklists are usually more generic.

Hazard and Operability Study

Definition

The chemical industry developed the hazard and operability study (HAZOP) technique to identify and evaluate process plant safety and environmental hazards as well as processing problems. These problems could affect operating efficiency issues such as productivity, product quality or operating cost.

Description

To conduct the study, a PHA team uses a structured brainstorming approach to identify and analyze hazard and operability studies. These studies focus on deviations from process design intent that could lead to undesirable consequences. The technique uses a standard set of words which they apply to applicable process parameters. These guidewords form deviations they will analyze.

Purpose

This technique was originally developed to anticipate hazard and operability problems for technologies new to a company. However, it is also used for evaluating:

- Continuous or batch processes
- Written procedures (requires adaptation of the technique)
- Some types of human error
- Existing operations
- Processes in, or recently out, of the design stage.

Conducting a HAZOP study

Here is an example of conducting a HAZOP. An experienced team leader systematically guides the team through the plant design using guide words. He instructs the team in the following areas:

Step	Action		
1	Apply these guide words at specific points or study nodes in the plant design. <i>Example:</i> a vessel or pipeline section.		
2	Combine them with specific process parameters to identify potential deviations from intended operation. <i>Example:</i>		
	Guide Word	Parameter	Resultant Deviation
	No More Reverse	Flow Pressure Pressure	No Flow High Pressure Vacuum
3	The team agrees on the deviation's: • Possible causes • Consequences • Applicable safeguards.		
4	The team makes a recommendation.		
	IF the...	THEN the team may recommend...	
	(<i>Example:</i> No Flow) causes are credible	a follow-up action for management to consider.	
	(<i>Example:</i> Operator error blocks in-pump) consequences are significant		
	(<i>Example:</i> Pump overheats) safeguards are not adequate		
	(<i>Example:</i> Pressure relief valve on pump discharge line) deviation has a realistic cause but unknown or undefined consequences	follow-up studies to determine the possible consequences.	

Failure Modes and Effects Analysis

Definition

Failure mode and effects analysis (FMEA) is a methodology which analyzes the failure modes of a process item for effects on other components and on the entire system.

Definition: Failure mode

Failure mode describes how equipment fails. It could be identified as:

- Loss of function
 - Premature function
 - Out-of-tolerance condition
 - Something as simple as a leak discovered during inspection.
-

Description

This method is largely equipment-oriented. Determine the effects of the failure mode by evaluating system response to the equipment failure. It is a bottom-up methodology. The analyst looks at each individual item or component to determine if it has hazard potential.

Purpose

Analysts use a FMEA to identify single-failure modes that either directly result in or contribute to an accident. They don't usually examine human operator errors directly in a FMEA. However, an equipment failure mode usually indicates that human error caused the effects of a misoperation. After using the FMEA, the team usually generates recommendations for increasing equipment reliability. This improves process safety.

Conducting the FMEA

Follow these steps to conduct a FMEA.

Step	Action
1	Determine the extent of detail needed in the FMEA.
2	Define boundary conditions for the analysis. This includes: • Identifying plant and/or systems that are the subject of the analysis. • Establishing physical system boundaries for the FMEA. • Establishing system analytical boundaries, including: • Failure modes, operating consequences, causes or existing safeguards that will not be considered • Initial operating condition or position of equipment. • Collecting up-to-date reference information that identifies equipment and its functional relationship to the facility and/or system.
3	Perform the FMEA in a deliberate, systematic way to ensure its completeness. Create a FMEA table format to promote consistent information. Here are standard items to include in a FMEA table: • Equipment identification • Equipment description • Failure modes • Effects • Safeguards • Actions.
4	Document the results.

Fault Tree Analysis

Definition

Fault tree analysis (FTA) is a graphic representation that shows how the basic causes of an undesired system accident relate to one another. It is developed using deductive logic.

Description

The FTA displays the many combinations of equipment failures and human errors that can result in the main system failure of interest (the top event). It is a deductive technique that the analyst can use as a qualitative tool. Its strength is an ability to identify the combinations of basic equipment failures and human errors that can lead to an accident. This lets the hazard analyst concentrate preventive measures on significant basic causes to reduce accident likelihood.

Purpose

FTA identifies combinations of equipment failures and human errors that can result in an accident. FTA is best used for:

- Analyses of highly redundant systems
- Situations where another analysis technique has pinpointed an important accident of interest that needs more detailed analysis.

Note: For systems prone to single failures that would cause accidents, it is better to use a single-failure-oriented technique such as FMEA or HAZOP analysis.

Selecting a PHA Technique

PHA function

A PHA provides information that will help employers and employees make decisions for improving safety and reducing the consequences of unwanted or unplanned releases of hazardous chemicals.

PHA purpose

Conduct a PHA to analyze potential causes and consequences of:

- Fires
- Explosions
- Releases of toxic or flammable chemicals
- Major hazardous chemical spills.

PHA focus

A PHA focuses on factors that might affect the process. This includes equipment, instruments, utilities, human actions (routine and non-routine) and other outside factors.

Influencing factors

Many factors influence selection of a methodology or technique.

Factor	Explanation
Motivation for the study	The hazard analyst must understand why the study is being done. Is it being done: • Because it is a new process? • To meet a regulatory or legal requirement? • To help make management decisions about improving an old, existing process?
Type of results needed	It is important to define the type of information needed to meet the objective of the analysis. Here are five information product types: • List of hazards • List of potential accident situations • Prioritization of results • Input for a quantitative risk analysis • List of alternatives for reducing risk or areas needing further study.
Type of information available	Certain techniques require specific types of information. The information available depends on: • The maturity of the process or activity • Whether the documentation is up-to-date.

Influencing factors

(continued)

Factor	Explanation	
Characteristics of analysis problem	The analyst must look at the following process attributes:	
	Attribute	Description
	Size and complexity	The size and complexity of a problem depends upon factors such as number of: • Processes or systems being analyzed • Pieces of equipment in process • Operating steps • Number and types of hazards and effects being analyzed.
	Type of process	Certain techniques work better with specific processes than others. Some process types are: • Chemical • Mechanical • Electrical • Human.
	Type of operations	Technique selection also depends upon the process operation types such as: • Fixed facility or transportation system • Permanent or transient • Continuous, semi-batch or batch.
	Nature of hazards	Selection is affected only slightly by this characteristic. Most hazards can use any of the covered techniques.
	Hazardous events of concern	Technique selection can depend on the sort of event upon which the PHA focuses. • Loss of containment • Loss of function • Process upsets • Single failures vs. multiple failures • Hardware, procedure, software or human failures

Influencing factors

(continued)

Factor	Explanation
Possible risk	For processes considered high-risk, it is most important to use techniques that lessen the chance of missing an important accident situation.
Resource availability	Other factors that can affect technique selection are: • Knowledgeable personnel availability • Financial resources • Target dates • Preference of PHA analysts • Management preferences.

Limitations

All PHA methodologies are subject to certain limitations. The checklist methodology works well when the process is very stable and no changes are made; however, it is not as effective when the process has undergone extensive change. The checklist may miss the most recent changes. Consequently, the changes would not be evaluated.

Another limitation concerns the assumptions made by the team or analyst. The basis of the PHA is good judgement. The assumptions made during the study need to be documented and understood by team and reviewer and kept for a future PHA.

Applying a PHA

Multiple techniques

The application of a PHA to a process may involve using different methodologies for various parts of the process.

Example 1: A process involving a series of unit operations of varying sizes, complexities, and ages may use different methodologies and team members for each operation. Then you can integrate the conclusions into one final study and evaluation.

Example 2: Another example is the use of a checklist PHA for a standard boiler or heat exchanger and the use of a Hazard and Operability PHA for the overall process.

Generic PHAs

Applying a PHA to a process may involve using generic PHAs.

Batch processes For batch-type processes like custom batch operations, you may use a generic PHA of a representative batch where:

- There are only small changes of monomer or other ingredient ratios.
- The chemistry is documented for the full range and ratio of batch ingredients.

Gas plants Gas plants might consider using a generic PHA. These plants are often simply moved from site to site. A generic PHA may be used for these movable plants.

When an employer has several similar size gas plants, and they process no sour gas at the site, then consider a generic PHA. In the PHA, they must account for the variations of the individual sites.

Generic PHAs

(continued)

Large continuous processes

When an employer has a large continuous process and has several control rooms for different portions of the process (such as for a distillation tower and a blending operation), do each segment separately integrating the final results.

Summary chart

Here are some examples of when to use multiple techniques and/or generic PHAs.

	When an employer operates...	And...	Then the employer can...
<i>Multiple techniques</i>	a process involving a series of unit operations of various sizes, complexities and ages	uses different methodologies and team members for each operation	combine conclusions into one final study and evaluation
	a process	uses, for example, a heat exchanger or a standard boiler	use checklist PHA for this equipment and Hazard & Operability PHA for overall process.
<i>Generic PHAs</i>	several similar size gas plants	processes no sour gas at the site	conduct a generic PHA (<i>Employer must account for variations of individual sites in the PHA</i>).
	several gas plants	moves them from site to site	conduct a generic PHA.
	a large continuous process	operates several control rooms for different portions of the process (i.e., for a distillation tower and a blending operation)	perform separate PHA for each segment and then combine the final results.
	batch-type processes with only small changes of monomer or other ingredient ratios	records the chemistry for the full range and ratio of batch ingredients	conduct a generic PHA.

PHAs for Small Businesses

Small business processes

Small businesses often have processes with less storage volume, less capacity and less complicated than processes at a large facility. Therefore, OSHA expects they would use the less complex methodologies to meet the process hazard analysis criteria in the standard. They can do these process hazard analyses more quickly and with fewer people. A simpler process generally means that business needs less data, P&IDs and process information to perform a process hazard analysis.

Generic PHAs

Many small businesses have processes that are not unique, such as cold storage lockers or water treatment facilities. Employer associations may have many members with such facilities. They could develop a generic PHA, modeled after a checklist or what-if questions. Each employer could tailor it to particular process needs. This would simplify compliance for them.

Setting Up a PHA Priority System

Top priority

When you have several processes which require a PHA, you must first set up a priority system of which PHAs to conduct first. To determine the order of importance of covered processes, you might consider using a preliminary or gross hazard analysis. The most important processes are those which could adversely affect the largest number of employees.

Prioritizing

Which factors should you consider when determining the importance or priority of a process? Here are some considerations:

- Potential severity of a chemical release
 - Number of potentially affected employees
 - Operating history of the process, such as, frequency of chemical releases, process age and any other relevant factors
-

Ranking order

Use either a weighing factor system or a systematic ranking method to determine a ranking order.

Preliminary hazard analysis

Using a preliminary hazard analysis would help you determine which process should have the highest priority. In this way, you can have the greatest safety improvement at your facility.

Section III: Pre-Startup Safety Review

Section Overview

Definition

Pre-startup safety review is a review of:

- Equipment
- Safety, operating, maintenance and emergency procedures
- Completed training.

It should come before the start of operations at new or significantly modified facilities or the introduction of a highly hazardous chemical to a process.

Purpose

OSHA wrote this section to ensure that a new plant, or a significantly modified, existing plant, is ready to operate safely. Perform the required actions just before startup. They are a "final check" that all is ready to go.

In this section

This section covers the following topics:

Topic	See Page
Further Information	6-31
Pre-Startup Safety Checklist	6-32

Further Information

Management of change

Pre-startup safety review is the next logical step after management of change. Here are some important management of change considerations to keep in mind when you must shut down existing processes for turnaround or modification.

- Any changes made during shutdown other than “replacement in kind” must go through the management of change procedures.
- Update P&IDs, operating procedures and instructions as necessary.
- Sometimes changes made to the process during shutdown are significant and affect training. Personnel with any sort of involvement in the process area may need some refresher or additional training because of the changes.
- Before beginning startup, review any incident investigation recommendations, compliance audits or PHA recommendations to see what effects they may have on the process.

New processes

For new processes, a PHA helps improve reliability and quality of process design and construction. Enhance the safe operation of the new process by making use of the PHA recommendation before completing final installations. Before process startup, make sure:

- P&IDs are complete
- Operating procedures are in place
- Operating staff are trained to run the process.

Pre-startup review

As part of the pre-startup review, fully evaluate the normal operating and initial startup procedures. Doing this will assure safe transfer into normal operating mode for meeting process parameters.

Deadlines

Perform pre-startup safety reviews before starting up a new process or a significantly modified existing one.

Conduct pre-startup safety reviews as sections of construction are finished. In certain instances, construction will be completed except for final tie-in. The period between construction completion and startup can be weeks or months, so it pays to delay training until just before startup.

Pre-Startup Safety Checklist

Example

Perform a pre-startup safety survey using a checklist to help assure that it's carried out thoroughly. In the table below you will find examples of the subjects typically covered by a pre-startup safety survey checklist.

Category	Yes	No	Subject
Management & operations			Have you thoroughly tested all computer control logic?
			Are field change authorization procedures in place? Have you completed and approved all operating manuals?
			Have you written standard operating procedures, including startup and shutdown?
Training			Have operators and maintenance personnel received orientation on process and health hazards of the plant?
			Have operators been sufficiently trained in plant operating procedures?
Safety			Have you prepared the safety-critical equipment list?
			Have you properly installed all safety-critical equipment, and does it work?
			Have you addressed all hazard review recommendations?
			Have you assembled an emergency response organization and assigned responsibilities?
			Have you prepared a written response plan and run practice drills?

A

7

CHAPTER 7

Management Issues

Table of Contents

Chapter Overview	7-1
Compliance Audit Essentials	7-2
Planning for the Audit	7-3
What Is An Effective Audit?	7-5
Taking Corrective Action	7-6
Using a Corrective Action Tracking System	7-7
Keeping Trade Secrets Secret	7-8

CHAPTER 7**Management Issues****Chapter Overview****Chapter purpose**

This chapter explains what OSHA requires of employers concerning conducting compliance audits and protecting trade secrets.

In this chapter

This chapter contains the following topics.

Topic	See Page
Compliance Audit Essentials	7-2
Planning for the Audit	7-3
What Is An Effective Audit?	7-5
Taking Corrective Action	7-6
Using a Corrective Action Tracking System	7-7
Keeping Trade Secrets Secret	7-8

Compliance Audit Essentials

Auditors

The facility must have a trained individual or a trained team of people to audit the process safety management system and program. A small process or plant may need only one knowledgeable person to conduct an audit.

The audit

The auditor must evaluate the design and effectiveness of the process safety management system. He must also inspect safety and health conditions and practices. This verifies that the employer's systems are in place and effective.

Audit leader

The person who leads the audit should know audit techniques and be impartial toward the facility or audit area.

Audit program elements

The key elements of an audit program include:

- Planning
- Staffing
- Conducting the audit
- Evaluation and corrective action
- Follow-up
- Documentation.

Planning for the Audit

The audit

An audit is a method used to gather adequate facts and information, including statistical information, to verify compliance with standards. In preplanning, auditors should select a sample size to audit. It should be large enough that they feel they will be able to give a fair evaluation of the level of compliance.

Successful auditing

The success of the auditing process depends upon advance planning. Before conducting the audit each employer needs to establish:

- Format
- Staffing
- Scheduling and verification methods.

Format

Design the format to give the lead auditor a procedure or checklist which details requirements of each section of the standard.

Staffing

List the names of audit team members as part of the format as well.

Scheduling and verification methods

A properly designed checklist can serve as the auditor's verification sheet. It makes it easier for the auditor to perform the review more quickly and also assures that no requirements of the standards are omitted.

This verification sheet format could also tell the auditor what he will need to evaluate or correct. He could also use this sheet for developing follow-up and documentation requirements.

Choosing the team

Selecting effective audit team members is important for a successful program. Choose team members for their experience, knowledge and training. They should be familiar with processes and auditing techniques, practices and procedures.

Team size

The size of the team depends on the size and complexity of the process being evaluated.

A large, complex plant with many complicated instruments might need to have team members with expertise in:

- Process engineering and design
- Process chemistry
- Instrumentation and computer controls
- Electrical hazards and classifications
- Safety and health disciplines
- Maintenance
- Emergency preparedness
- Warehousing or shipping
- Process safety auditing.

Part-time team members

The team may also use part-time members for expert input. They can compare what is done or followed to what is written.

What Is An Effective Audit?

Effective audit includes

An effective audit includes:

- A review of proper documentation and process safety information
- Inspection of physical facilities
- Interviews with all levels of plant personnel.

Analyzing compliance

The audit team can thoroughly analyze how closely plant personnel follow the standard and any other appropriate corporate policies. To do this, they should use the audit procedure and checklist developed in the preplanning stage.

Example

For example, the audit team will review all sides of the training program as part of the overall audit. Using this approach, the team can identify weaknesses and decide where the company can correct or improve the process.

Step	Action
1	Review the written training program for: • Sufficient content • Training frequency • Effectiveness of training: • Does it meet its goals and objectives? • How well does it meet standard requirements? • Documentation.
2	Conduct interviews to determine employee knowledge and awareness of: • Safety procedures • Duties • Rules • Emergency response assignments.
3	During inspection, observe actual practices such as safety and health policies, procedures and work authorization practices.

Taking Corrective Action

Audit documentation

The audit team should document areas which need corrective action. Auditors should also document those areas where process safety management is working, and working effectively. This gives a record of the audit procedures and findings. It also provides a record that can be used as a comparison by future auditors in determining changes or trends from previous audits.

Corrective action

Corrective action is one of the most important parts of the audit. It includes:

- Addressing the identified deficiencies
 - Planning
 - Follow-up
 - Documentation.
-

Corrective action begins

The corrective action process normally begins with a management review of the audit findings. The purpose of the review is to determine what actions are appropriate and to establish:

- Priorities
 - Timetables
 - Resource allocations
 - Requirements
 - Responsibilities.
-

Levels of corrective action

In some cases, corrective action may involve a simple change in procedure or minor maintenance effort to relieve the concern. You need to use management of change procedures even for a minor change.

Not all deficiencies can be taken care of quickly. Some may require engineering studies or in-depth review of actual procedures and practices. For others, no action is necessary. This is a legitimate response to an audit finding. Document all actions taken as well as actions not taken. Explain what was done and why.

Using a Corrective Action Tracking System

Assurance of compliance

The employer must assure that the:

- Company has addressed each deficiency identified
 - Corrective action to be taken was noted
 - Company has properly documented the audit person or team responsible.
-

The tracking system

To control the corrective action process, the employer should consider using a tracking system. This tracking system might include:

- Routine status reports shared with affected levels of management
- Specific reports such as completion of an engineering study
- Final implementation report.

The final implementation report will close out audit findings that:

- Have been through management of change, if appropriate
- Were then shared with affected employees and management.

This type of tracking system gives the employer the status of corrective action. It also provides documentation required to prove that the plant has corrected deficiencies identified in the audit.

Keeping Trade Secrets Secret

Protection

OSHA believes that, from the information employers must gather under this standard, they have very few genuine trade secrets. Regardless, OSHA added provisions to protect trade secrets. This will give adequate protection to employers with reasonable trade secret concerns. However, it allows them to conceal information only if they have a good, legal reason.

Information access

Persons involved in complying with the standard can have access to all information. Employers must make it available, but can try to make confidentiality agreements with those people. Employees and their representatives are permitted access to information developed under the standard. However, this access falls under provisions of the Hazard Communication Standard found in paragraphs (i)(1-12) (trade secret provisions).

CHAPTER 8

Other Related Regulations

Table of Contents

29 1910.38	8-1
29 1910.1200	8-3

CHAPTER 8

Other Related Regulations**29 1910.38****Employee emergency plans and fire prevention plans.**

(a) Emergency action plan—(1) Scope and application. This paragraph (a) applies to all emergency action plans required by a particular OSHA standard. The emergency action plan shall be in writing (except as provided in the last sentence of paragraph (a)(5)(iii) of this section) and shall cover those designated actions employers and employees must take to ensure employee safety from fire and other emergencies.

(a)(2) Elements. The following elements, at a minimum, shall be included in the plan:

(a)(2)(i) Emergency escape procedures and emergency escape route assignments;

(a)(2)(ii) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;

(a)(2)(iii) Procedures to account for all employees after emergency evacuation has been completed;

(a)(2)(iv) Rescue and medical duties for those employees who are to perform them;

(a)(2)(v) The preferred means of reporting fires and other emergencies; and

(a)(2)(vi) Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.

(a)(3) Alarm system. (i) The employer shall establish an employee alarm system which complies with 1910.165.

(a)(3)(ii) If the employee alarm system is used for alerting fire brigade members, or for other purposes, a distinctive signal for each purpose shall be used.

(a)(4) Evacuation. The employer shall establish in the emergency action plan the types of evacuation to be used in emergency circumstances.

(a)(5) Training. (i) Before implementing the emergency action plan, the employer shall designate and train a sufficient number of persons to assist in the safe and orderly emergency evacuation of employees.

(a)(5)(ii) The employer shall review the plan with each employee covered by the plan at the following times:

(a)(5)(ii)(A) Initially when the plan is developed,

(a)(5)(ii)(B) Whenever the employee's responsibilities or designated actions under the plan change, and

(a)(5)(ii)(C) Whenever the plan is changed.

(a)(5)(iii) The employer shall review with each employee upon initial assignment those parts of the plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept at the workplace and made available for employee review. For those employers with 10 or fewer employees the plan may be communicated orally to employees and the employer need not maintain a written plan.

(b) Fire prevention plan—(1) Scope and application. This paragraph (b) applies to all fire prevention plans required by a particular OSHA standard. The fire prevention plan shall be in writing, except as provided in the last sentence of paragraph (b)(4)(ii) of this section.

(b)(2) Elements. The following elements, at a minimum, shall be included in the fire prevention plan:

(b)(2)(i) A list of the major workplace fire hazards and their proper handling and storage procedures, potential ignition sources (such as welding, smoking and others) and their control procedures, and the type of fire protection equipment or systems which can control a fire involving them;

(b)(2)(ii) Names or regular job titles of those personnel responsible for maintenance of equipment and systems installed to prevent or control ignitions or fires; and

(b)(2)(iii) Names or regular job titles of those personnel responsible for control of fuel source hazards.

(b)(3) Housekeeping. The employer shall control accumulations of flammable and combustible waste materials and residues so that they do not contribute to a fire emergency. The housekeeping procedures shall be included in the written fire prevention plan.

(b)(4) Training. (i) The employer shall apprise employees of the fire hazards of the materials and processes to which they are exposed.

(b)(4)(ii) The employer shall review with each employee upon initial assignment those parts of the fire prevention plan which the employee must know to protect the employee in the event of an emergency. The written plan shall be kept in the workplace and made available for employee review. For those employers with 10 or fewer employees, the plan may be communicated orally to employees and the employer need not maintain a written plan.

(b)(5) Maintenance. The employer shall regularly and properly maintain, according to established procedures, equipment and systems installed on heat producing equipment to prevent accidental ignition of combustible materials. The maintenance procedures shall be included in the written fire prevention plan.

[45 FR 60703, Sept. 12, 1980]

29 1910.1200

Hazard communication.

(a) Purpose. (1) The purpose of this section is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to employers and employees. This transmittal of information is to be accomplished by means of comprehensive hazard communication programs, which are to include container labeling and other forms of warning, material safety data sheets and employee training.

(a)(2) This occupational safety and health standard is intended to address comprehensively the issue of evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, and to preempt any legal requirements of a state, or political subdivision of a state, pertaining to the subject. Evaluating the potential hazards of chemicals, and communicating information concerning hazards and appropriate protective measures to employees, may include, for example, but is not limited to, provisions for: developing and maintaining a written hazard communication program for the workplace, including lists of hazardous chemicals present; labeling of containers of chemicals in the workplace, as well as of containers of chemicals being shipped to other workplaces; preparation and distribution of material safety data sheets to employees and downstream employers; and development and implementation of employee training programs regarding hazards of chemicals and protective measures. Under section 18 of the Act, no state or political subdivision of a state may adopt or enforce, through any court or agency, any requirement relating to the issue addressed by this Federal standard, except pursuant to a Federally-approved state plan.

(b) Scope and application. (1) This section requires chemical manufacturers or importers to assess the hazards of chemicals which they produce or import, and all employers to provide information to their employees about the hazardous chemicals to which they are exposed, by means of a hazard communication program, labels and other forms of warning, material safety data sheets, and information and training. In addition, this section requires distributors to transmit the required information to employers.

(b)(2) This section applies to any chemical which is known to be present in the workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

(b)(3) This section applies to laboratories only as follows:

(b)(3)(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(b)(3)(ii) Employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees; and,

(b)(3)(iii) Employers shall ensure that laboratory employees are apprised of the hazards of the chemicals in their workplaces in accordance with paragraph (h) of this section.

(b)(4) In work operations where employees only handle chemicals in sealed containers which are not opened under normal conditions of use (such as are found in marine cargo handling, warehousing, or retail sales), this section applies to these operations only as follows:

(b)(4)(i) Employers shall ensure that labels on incoming containers of hazardous chemicals are not removed or defaced;

(b)(4)(ii) Employers shall maintain copies of any material safety data sheets that are received with incoming shipments of the sealed containers of hazardous chemicals, shall obtain a material safety data sheet for sealed containers of hazardous chemicals received without a material safety data sheet if an employee requests the material safety data sheet, and shall ensure that the material safety data sheets are readily accessible during each work shift to employees when they are in their work area(s); and,

(b)(4)(iii) Employers shall ensure that employees are provided with information and training in accordance with paragraph (h) of this section (except for the location and availability of the written hazard communication program under paragraph (h)(1)(iii)), to the extent necessary to protect them in the event of a spill or leak of a hazardous chemical from a sealed container.

(b)(5) This section does not require labeling of the following chemicals:

(b)(5)(i) Any pesticide as such term is defined in the *Federal Insecticide, Fungicide, and Rodenticide Act* (7 U.S.C. 136 et seq.), when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Environmental Protection Agency;

(b)(5)(ii) Any food, food additive, color additive, drug, cosmetic, or medical or veterinary device, including materials intended for use as ingredients in such products (e.g. flavors and fragrances), as such terms are defined in the *Federal Food, Drug, and Cosmetic Act* (21 U.S.C. 301 et seq.) and regulations issued under that Act, when they are subject to the labeling requirements under that Act by the Food and Drug Administration;

(b)(5)(iii) Any distilled spirits (beverage alcohols), wine, or malt beverage intended for nonindustrial use, as such terms are defined in the *Federal Alcohol Administration Act* (27 U.S.C. 201 et seq.) and regulations issued under that Act, when subject to the labeling requirements of that Act and labeling regulations issued under that Act by the Bureau of Alcohol Tobacco, and Firearms; and,

(b)(5)(iv) Any consumer product or hazardous substance as those terms are defined in the *Consumer Product Safety Act* (15 U.S.C. 2051 et seq.) and *Federal Hazardous Substances Act* (15 U.S.C. 1261 et seq.) respectively, when subject to a consumer product safety standard or labeling requirement of those Acts, or regulations issued under those Acts by the Consumer Product Safety Commission.

(b)(6) This section does not apply to:

(b)(6)(i) Any hazardous waste as such term is defined by the *Solid Waste Disposal Act*, as amended by the *Resource Conservation and Recovery Act of 1976*, as amended (42 U.S.C. 6901 et seq.), when subject to regulations issued under that Act by the Environmental Protection Agency;

(b)(6)(ii) Tobacco or tobacco products;

(b)(6)(iii) Wood or wood products;

(b)(6)(iv) Articles;

(b)(6)(v) Food, drugs, cosmetics, or alcoholic beverages in a retail establishment which are packaged for sale to consumers;

(b)(6)(vi) Foods, drugs, or cosmetics intended for personal consumption by employees while in the workplace;

(b)(6)(vii) Any consumer product or hazardous substance, as those terms are defined in the *Consumer Product Safety Act* (15 U.S.C. 2051 et seq.) and *Federal Hazardous Substances Act* (15 U.S.C. 1261 et seq.) respectively, where the employer can demonstrate it is used in the workplace in the same manner as normal consumer use, and which use results in a duration and frequency of exposure which is not greater than exposures experienced by consumers; and,

(b)(6)(viii) Any drug, as that term is defined in the *Federal Food, Drug, and Cosmetic Act* (21 U.S.C. 301 et seq.), when it is in solid, final form for direct administration to the patient (i.e. tablets or pills).

(c) Definitions.

"Article" means a manufactured item: (i) Which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which does not release, or otherwise result in exposure to, a hazardous chemical, under normal conditions of use.

"Assistant Secretary" means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

"Chemical" means any element, chemical compound or mixture of elements and/or compounds.

"Chemical manufacturer" means an employer with a workplace where chemical(s) are produced for use or distribution.

"Chemical name" means the scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry (IUPAC) or the Chemical Abstracts Service (CAS) rules of nomenclature, or a name which will clearly identify the chemical for the purpose of conducting a hazard evaluation.

"Combustible liquid" means any liquid having a flashpoint at or above 100 °F (37.8 °C), but below 200 °F (93.3 °C), except any mixture having components with flashpoints of 200 °F (93.3 °C), or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.

"Common name" means any designation or identification such as code name, code number, trade name, brand name or generic name used to identify a chemical other than by its chemical name.

"Compressed gas" means:

(c)(i) A gas or mixture of gases having, in a container, an absolute pressure exceeding 40 psi at 70 °F (21.1 °C); or

(c)(ii) a gas or mixture of gases having, in a container, an absolute pressure exceeding 104 psi at 130 °F (54.4 °C) regardless of the pressure at 70 °F (21.1 °C); or

(c)(iii) A liquid having a vapor pressure exceeding 40 psi at 100 °F (37.8 °C) as determined by ASTM D-323-72.

"Container" means any bag, barrel, bottle, box, can, cylinder, drum, reaction vessel, storage tank, or the like that contains a hazardous chemical. For purposes of this section, pipes or piping systems, and engines, fuel tanks, or other operating systems in a vehicle, are not considered to be containers.

"Designated representative" means any individual or organization to whom an employee gives written authorization to exercise such employee's rights under this section. A recognized or certified collective bargaining agent shall be treated automatically as a designated representative without regard to written employee authorization.

"Director" means the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.

"Distributor" means a business, other than a chemical manufacturer or importer, which supplies hazardous chemicals to other distributors or to employers.

"Employee" means a worker who may be exposed to hazardous chemicals under normal operating conditions or in foreseeable emergencies. Workers such as office workers or bank tellers who encounter hazardous chemicals only in non-routine, isolated instances are not covered.

"Employer" means a person engaged in a business where chemicals are either used, distributed, or are produced for use or distribution, including a contractor or subcontractor.

"Explosive" means a chemical that causes a sudden, almost instantaneous release of pressure, gas, and heat when subjected to sudden shock, pressure, or high temperature.

"Exposure" or "exposed" means that an employee is subjected to a hazardous chemical in the course of employment through any route of entry (inhalation, ingestion, skin contact or absorption, etc.), and includes potential (e.g. accidental or possible) exposure.

"Flammable" means a chemical that falls into one of the following categories:

(c)(i) "Aerosol, flammable" means an aerosol that, when tested by the method described in 16 CFR 1500.45, yields a flame projection exceeding 18 inches at full valve opening, or a flashback (a flame extending back to the valve) at any degree of valve opening;

(c)(ii) "Gas, flammable" means:

(c)(ii)(A) A gas that, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or

(c)(ii)(B) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit;

(c)(iii) "Liquid, flammable" means any liquid having a flashpoint below 100 °F (37.8 °C), except any mixture having components with flashpoints of 100 °F (37.8 °C) or higher, the total of which make up 99 percent or more of the total volume of the mixture;

(c)(iv) "Solid, flammable" means a solid, other than a blasting agent or explosive as defined in 190.109(a), that is liable to cause fire through friction, absorption of moisture, spontaneous chemical change, or retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious hazard. A chemical shall be considered to be a flammable solid if, when tested by the method described in 16 CFR 1500.44, it ignites and burns with a self-sustained flame at a rate greater than one-tenth of an inch per second along its major axis.

"Flashpoint" means the minimum temperature at which a liquid gives off a vapor in sufficient concentration to ignite when tested as follows:

(c)(i) Tagliabue Closed Tester (See American National Standard Method of Test for Flash Point by Tag Closed Tester, Z11.24-1979 (ASTM D 56-79)) for liquids with a viscosity of less than 45 Saybolt University Seconds (SUS) at 100 °F (37.8 °C), that do not contain suspended solids and do not have a tendency to form a surface film under test; or

(c)(ii) Pensky-Martens Closed Tester (See American National Standard Method of Test for Flash Point by Pensky-Martens Closed Tester, Z11.7-1979 (ASTM D 93-79)) for liquids with a viscosity equal to or greater than 45 SUS at 100 °F (37.8 °C), or that contain suspended solids, or that have a tendency to form a surface film under test; or

(c)(iii) Setaflash Closed Tester (see American National Standard Method of Test for Flash Point by Setaflash Closed Tester (ASTMD 3278-78))

Organic peroxides, which undergo autoaccelerating thermal decomposition, are excluded from any of the flashpoint determination methods specified above.

"Foreseeable emergency" means any potential occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment which could result in an uncontrolled release of a hazardous chemical into the workplace.

"Hazardous chemical" means any chemical which is a physical hazard or a health hazard.

"Hazard warning" means any words, pictures, symbols, or combination thereof appearing on a label or other appropriate form of warning which convey the hazard(s) of the chemical(s) in the container(s).

"Health hazard" means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system, and agents which damage the lungs, skin, eyes, or mucous membranes. Appendix A provides further definitions and explanations of the scope of health hazards covered by this section, and Appendix B describes the criteria to be used to determine whether or not a chemical is to be considered hazardous for purposes of this standard.

"Identity" means any chemical or common name which is indicated on the material safety data sheet (MSDS) for the chemical. The identity used shall permit cross-references to be made among the required list of hazardous chemicals, the label and the MSDS.

"Immediate use" means that the hazardous chemical will be under the control of and used only by the person who transfers it from a labeled container and only within the work shift in which it is transferred.

"Importer" means the first business with employees within the Customs Territory of the United States which receives hazardous chemicals produced in other countries for the purpose of supplying them to distributors or employers within the United States.

"Label" means any written, printed, or graphic material, displayed on or affixed to containers of hazardous chemicals.

"Material safety data sheet (MSDS)" means written or printed material concerning a hazardous chemical which is prepared in accordance with paragraph (g) of this section.

"Mixture" means any combination of two or more chemicals if the combination is not, in whole or in part, the result of a chemical reaction.

"Organic peroxide" means an organic compound that contains the bivalent -O-O-structure and which may be considered to be a structural derivative of hydrogen peroxide where one or both of the hydrogen atoms has been replaced by an organic radical.

"Oxidizer" means a chemical other than a blasting agent or explosive as defined in 1910.109(a), that initiates or promotes combustion in other materials, thereby causing fire either of itself or through the release of oxygen or other gases.

"Physical hazard" means a chemical for which there is scientifically valid evidence that it is a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive.

"Produce" means to manufacture, process, formulate, or repackage.

"Pyrophoric" means a chemical that will ignite spontaneously in air at a temperature of 130 °F (54.4 °C) or below.

"Responsible party" means someone who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

"Specific chemical identity" means the chemical name, Chemical Abstracts Service (CAS) Registry Number, or any other information that reveals the precise chemical designation of the substance.

"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 sets out the criteria to be used in evaluating trade secrets.

"Unstable (reactive)" means a chemical which in the pure state, or as produced or transported, will vigorously polymerize, decompose, condense, or will become self-reactive under conditions of shocks, pressure or temperature.

"Use" means to package, handle, react, or transfer.

"Water-reactive" means a chemical that reacts with water to release a gas that is either flammable or presents a health hazard.

"Work area" means a room or defined space in a workplace where hazardous chemicals are produced or used, and where employees are present.

"Workplace" means an establishment, job site, or project, at one geographical location containing one or more work areas.

(d) Hazard determination. (1) Chemical manufacturers and importers shall evaluate chemicals produced in their workplaces or imported by them to determine if they are hazardous. Employers are not required to evaluate chemicals unless they choose not to rely on the evaluation performed by the chemical manufacturer or importer for the chemical to satisfy this requirement.

(d)(2) Chemical manufacturers, importers or employers evaluating chemicals shall identify and consider the available scientific evidence concerning such hazards. For health hazards, evidence which is statistically significant and which is based on at least one positive study conducted in accordance with established scientific principles is considered to be sufficient to establish a hazardous effect if the results of the study meet the definitions of health hazards in this section. Appendix A shall be consulted for the scope of health hazards covered, and Appendix B shall be consulted for the criteria to be followed with respect to the completeness of the evaluation, and the data to be reported.

(d)(3) The chemical manufacturer, importer or employer evaluating chemicals shall treat the following sources as establishing that the chemicals listed in them are hazardous:

(d)(3)(i) 29 CFR Part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA); or,

(d)(3)(ii) Threshold Limit Values for Chemical Substances and Physical Agents in the Work Environment, American Conference of Governmental Industrial Hygienists (ACGIH) (latest edition).

The chemical manufacturer, importer, or employer is still responsible for evaluating the hazards associated with the chemicals in these source lists in accordance with the requirements of this standard.

(d)(4) Chemical manufacturers, importers and employers evaluating chemicals shall treat the following sources as establishing that a chemical is a carcinogen or potential carcinogen for hazard communication purposes:

(d)(4)(i) National Toxicology Program (NTP), Annual Report on Carcinogens (latest edition);

(d)(4)(ii) International Agency for Research on Cancer (IARC) Monographs (latest editions); or

(d)(4)(iii) 29 CFR Part 1910, subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration.

NOTE: The Registry of Toxic Effects of Chemical Substances published by the National Institute for Occupational Safety and Health indicates whether a chemical has been found by NTP or IARC to be a potential carcinogen.

(d)(5) The chemical manufacturer, importer or employer shall determine the hazards of mixtures of chemicals as follows:

(d)(5)(i) If a mixture has been tested as a whole to determine its hazards, the results of such testing shall be used to determine whether the mixture is hazardous;

(d)(5)(ii) If a mixture has not been tested as a whole to determine whether the mixture is a health hazard, the mixture shall be assumed to present the same health hazards as do the components which comprise one percent (by weight or volume) or greater of the mixture, except that the mixture shall be assumed to present a carcinogenic hazard if it contains a component in concentrations of 0.1 percent or greater which is considered to be a carcinogen under paragraph (d)(4) of this section;

(d)(5)(iii) If a mixture has not been tested as a whole to determine whether the mixture is a physical hazard, the chemical manufacturer, importer, or employer may use whatever scientifically valid data is available to evaluate the physical hazard potential of the mixture; and,

(d)(5)(iv) If the chemical manufacturer, importer, or employer has evidence to indicate that a component present in the mixture in concentrations of less than one percent (or in the case of carcinogens, less than 0.1 percent) could be released in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health hazard to employees in those concentrations, the mixture shall be assumed to present the same hazard.

(d)(6) Chemical manufacturers, importers, or employers evaluating chemicals shall describe in writing the procedures they use to determine the hazards of the chemical they evaluate. The written procedures are to be made available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director. The written description may be incorporated into the written hazard communication program required under paragraph (e) of this section.

(e) Written hazard communication program. (1) Employers shall develop, implement, and maintain at the workplace, a written hazard communication program for their workplaces which at least describes how the criteria specified in paragraphs (f), (g), and (h) of this section for labels and other forms of warning, material safety data sheets, and employee information and training will be met, and which also includes the following:

(e)(1)(i) A list of the hazardous chemicals known to be present using an identity that is referenced on the appropriate material safety data sheet (the list may be compiled for the workplace as a whole or for individual work areas); and,

(e)(1)(ii) The methods the employer will use to inform employees of the hazards of non-routine tasks (for example, the cleaning of reactor vessels), and the hazards associated with chemicals contained in unlabeled pipes in their work areas.

(e)(2) Multi-employer workplaces. Employers who produce, use, or store hazardous chemicals at a workplace in such a way that the employees of other employer(s) may be exposed (for example, employees of a construction contractor working on-site) shall additionally ensure that the hazard communication programs developed and implemented under this paragraph (e) include the following:

(e)(2)(i) The methods the employer will use to provide the other employer(s) with a copy of the material safety data sheet, or to make it available at a central location in the workplace, for each hazardous chemical the other employer(s)' employees may be exposed to while working;

(e)(2)(ii) The methods the employer will use to inform the other employer(s) of any precautionary measures that need to be taken to protect employees during the workplace's normal operating conditions and in foreseeable emergencies; and,

(e)(2)(iii) The methods the employer will use to inform the other employer(s) of the labeling system used in the workplace.

(e)(3) The employer may rely on an existing hazard communication program to comply with these requirements, provided that it meets the criteria established in this paragraph (e).

(e)(4) The employer shall make the written hazard communication program available, upon request, to employees, their designated representatives, the Assistant Secretary and the Director, in accordance with the requirements of 29 CFR 1910.20(e).

(f) Labels and other forms of warning. (1) The chemical manufacturer, importer, or distributor shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged or marked with the following information:

(f)(1)(i) Identity of the hazardous chemical(s);

(f)(1)(ii) Appropriate hazard warnings; and

(f)(1)(iii) Name and address of the chemical manufacturer, importer, or other responsible party.

(f)(2) For solid metal (such as a steel beam or a metal casting) that is not exempted as an article due to its downstream use, the required label may be transmitted to the customer at the time of the initial shipment, and need not be included with subsequent shipments to the same employer unless the information on the label changes. The label may be transmitted with the initial shipment itself, or with the material safety data sheet that is to be provided prior to or at the time of the first shipment. This exception to requiring labels on every container of hazardous chemicals is only for the solid metal itself and does not apply to hazardous chemicals used in conjunction with, or known to be present with, the metal and to which employees handling the metal may be exposed (for example, cutting fluids or lubricants).

(f)(3) Chemical manufacturers, importers, or distributors shall ensure that each container of hazardous chemicals leaving the workplace is labeled, tagged, or marked in accordance with this section in a manner which does not conflict with the requirements of the Hazardous Materials Transportation Act (49 U.S.C. 1801 et seq.) and regulations issued under that Act by the Department of Transportation.

(f)(4) If the hazardous chemical is regulated by OSHA in a substance-specific health standard, the chemical manufacturer, importer, distributor or employer shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard.

(f)(5) Except as provided in paragraphs (f)(6) and (f)(7) the employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with the following information:

(f)(5)(i) Identity of the hazardous chemical(s) contained therein; and

(f)(5)(ii) Appropriate hazard warnings.

(f)(6) The employer may use signs, placards, process sheets, batch tickets, operating procedures, or other such written materials in lieu of affixing labels to individual stationary process containers, as long as the alternative method identifies the containers to which it is applicable and conveys the information required by paragraph (f)(5) of this section to be on a label. The written materials shall be readily accessible to the employees in their work area throughout each work shift.

(f)(7) The employer is not required to label portable containers into which hazardous chemicals are transferred from labeled containers, and which are intended only for the immediate use of the employee who performs the transfer.

(f)(8) The employer shall not remove or deface existing labels on incoming containers of hazardous chemicals, unless the container is immediately marked with the required information.

(f)(9) The employer shall ensure that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift. Employers having employees who speak other languages may add the information in their language to the material presented, as long as the information is presented in English as well.

(f)(10) The chemical manufacturer, importer, distributor or employer need not affix new labels to comply with this section if existing labels already convey the required information.

(g) Material safety data sheets. (1) Chemical manufacturers and importers shall obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers shall have a material safety data sheet for each hazardous chemical which they use.

(g)(2) Each material safety data sheet shall be in English and shall contain at least the following information:

(g)(2)(i) The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets:

(g)(2)(i)(A) If the hazardous chemical is a single substance, its chemical and common name(s);

(g)(2)(i)(B) If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or,

(g)(2)(i)(C) If the hazardous chemical is a mixture which has not been tested as a whole:

(g)(2)(i)(C)(1) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under paragraph (d)(4) of this section shall be listed if the concentrations are 0.1% or greater; and,

(g)(2)(i)(C)(2) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise less than 1% (0.1 % for carcinogens) of the mixture, if there is evidence that the ingredient(s) could be released from the mixture in concentrations which would exceed an established OSHA permissible exposure limit or ACGIH Threshold Limit Value, or could present a health hazard to employees; and,

(g)(2)(i)(C)(3) The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture;

(g)(2)(ii) Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);

(g)(2)(iii) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity;

(g)(2)(iv) The health hazards of the hazardous chemical, including signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical;

(g)(2)(v) The primary route(s) of entry;

(g)(2)(vi) The OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the material safety data sheet, where available;

(g)(2)(vii) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by OSHA;

(g)(2)(viii) Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks;

(g)(2)(ix) Any generally applicable control measures which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, such as appropriate engineering controls, work practices, or personal protective equipment;

(g)(2)(x) Emergency and first aid procedures;

(g)(2)(xi) The date of preparation of the material safety data sheet or the last change to it; and,

(g)(2)(xii) The name, address and telephone number of the chemical manufacturer, importer, employer or other responsible party preparing or distributing the material safety data sheet, who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

(g)(3) If no relevant information is found for any given category on the material safety data sheet, the chemical manufacturer, importer or employer preparing the material safety data sheet shall mark it to indicate that no applicable information was found.

(g)(4) Where complex mixtures have similar hazards and contents (i.e. the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture), the chemical manufacturer, importer or employer may prepare one material safety data sheet to apply to all of these similar mixtures.

(g)(5) The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination. If the chemical manufacturer, importer or employer preparing the material safety data sheet becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again.

(g)(6) Chemical manufacturers or importers shall ensure that distributors and employers are provided an appropriate material safety data sheet with their initial shipment, and with the first shipment after a material safety data sheet is updated. The chemical manufacturer or importer shall either provide material safety data sheets with the shipped containers or send them to the employer prior to or at the time of the shipment. If the material safety data sheet is not provided with a shipment that has been labeled as a hazardous chemical, the employer shall obtain one from the chemical manufacturer, importer, or distributor as soon as possible.

(g)(7) Distributors shall ensure that material safety data sheets, and updated information, are provided to other distributors and employers. Retail distributors which sell hazardous chemicals to commercial customers shall provide a material safety data sheet to such employers upon request, and shall post a sign or otherwise inform them that a material safety data sheet is available. Chemical manufacturers, importers, and distributors need not provide material safety data sheets to retail distributors which have informed them that the

retail distributor does not sell the product to commercial customers or open the sealed container to use it in their own workplaces.

(g)(8) The employer shall maintain copies of the required material safety data sheets for each hazardous chemical in the workplace, and shall ensure that they are readily accessible during each work shift to employees when they are in their work area(s).

(g)(9) Where employees must travel between workplaces during a workshift, i.e., their work is carried out at more than one geographical location, the material safety data sheets may be kept at a central location at the primary workplace facility. In this situation, the employer shall ensure that employees can immediately obtain the required information in an emergency.

(g)(10) Material safety data sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, the employer shall ensure that in all cases the required information is provided for each hazardous chemical, and is readily accessible during each work shift to employees when they are in their work area(s).

(g)(11) Material safety data sheets shall also be made readily available, upon request, to designated representatives and to the Assistant Secretary, in accordance with the requirements of 29 CFR 1910.20(e). The Director shall also be given access to material safety data sheets in the same manner.

(h) Employee information and training. Employers shall provide employees with information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area.

(h)(1) Information. Employees shall be informed of:

(h)(1)(i) The requirements of this section;

(h)(1)(ii) Any operations in their work area where hazardous chemicals are present; and,

(h)(1)(iii) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section.

(h)(2) Training. Employee training shall include at least:

(h)(2)(i) Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);

(h)(2)(ii) The physical and health hazards of the chemicals in the work area;

(h)(2)(iii) The measures employees can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment to be used; and,

(h)(2)(iv) The details of the hazard communication program developed by the employer, including an explanation of the labeling system and the material safety data sheet, and how employees can obtain and use the appropriate hazard information.

(i) Trade secrets. (1) The chemical manufacturer, importer, or employer may withhold the specific chemical identity, including the chemical name and other specific identification of a hazardous chemical, from the material safety data sheet, provided that:

(i)(1)(i) The claim that the information withheld is a trade secret can be supported;

(i)(1)(ii) Information contained in the material safety data sheet concerning the properties and effects of the hazardous chemical is disclosed;

(i)(1)(iii) The material safety data sheet indicates that the specific chemical identity is being withheld as a trade secret; and,

(i)(1)(iv) The specific chemical identity is made available to health professionals, employees, and designated representatives in accordance with the applicable provisions of this paragraph.

(i)(2) Where a treating physician or nurse determines that a medical emergency exists and the specific chemical identity of a hazardous chemical is necessary for emergency or first-aid treatment, the chemical manufacturer, importer, or employer shall immediately disclose the specific chemical identity of a trade secret chemical to that treating physician or nurse, regardless of the existence of a written statement of need of a confidentiality agreement. The chemical manufacturer, importer, or employer may require a written statement of need and confidentiality agreement, in accordance with the provisions of paragraphs (i)(3) and (4) of this section, as soon as circumstances permit.

(i)(3) In non-emergency situations, a chemical manufacturer, importer, or employer shall, upon request, disclose a specific chemical identity, otherwise permitted to be withheld under paragraph (i)(1) of this section, to a health professional (i.e. physician, industrial hygienist, toxicologist, epidemiologist, or occupational health nurse) providing medical or other occupational health services to exposed employee(s), and to employees or designated representatives, if:

(i)(3)(i) The request is in writing;

(i)(3)(ii) The request describes with reasonable detail one or more of the following occupational health needs for the information:

(i)(3)(ii)(A) To assess the hazards of the chemicals to which employees will be exposed;

(i)(3)(ii)(B) To conduct or assess sampling of the workplace atmosphere to determine employee exposure levels;

(i)(3)(ii)(C) To conduct pre-assignment or periodic medical surveillance of exposed employees;

(i)(3)(ii)(D) To provide medical treatment to exposed employees;

(i)(3)(ii)(E) To select or assess appropriate personal protective equipment for exposed employees;

(i)(3)(ii)(F) To design or assess engineering controls or other protective measures for exposed employees; and,

(i)(3)(ii)(G) To conduct studies to determine the health effects of exposure.

(i)(3)(iii) The request explains in detail why the disclosure of the specific chemical identity is essential and that, in lieu thereof, the disclosure of the following information to the health professional, employee, or designated representative, would not satisfy the purposes described in paragraph (i)(3)(ii) of this section:

(i)(3)(iii)(A) The properties and effects of the chemical;

(i)(3)(iii)(B) Measures for controlling workers' exposure to the chemical;

(i)(3)(iii)(C) Methods of monitoring and analyzing worker exposure to the chemical; and,

(i)(3)(iii)(D) Methods of diagnosing and treating harmful exposures to the chemical;

(i)(3)(iv) The request includes a description of the procedures to be used to maintain the confidentiality of the disclosed information; and,

(i)(3)(v) The health professional, and the employer or contractor of the services of the health professional (i.e. downstream employer, labor organization, or individual employee), employee, or designated representative, agree in a written confidentiality agreement that the health professional, employee, or designated representative, will not use the trade secret information for any purpose other than the health need(s) asserted and agree not to release the information under any circumstances other than to OSHA, as provided in paragraph (i)(6) of this section, except as authorized by the terms of the agreement or by the chemical manufacturer, importer, or employer.

(i)(4) The confidentiality agreement authorized by paragraph (i)(3)(iv) of this section:

(i)(4)(i) May restrict the use of the information to the health purposes indicated in the written statement of need;

(i)(4)(ii) May provide for appropriate legal remedies in the event of a breach of the agreement, including stipulation of a reasonable pre-estimate of likely damages; and,

(i)(4)(iii) May not include requirements for the posting of a penalty bond.

(i)(5) Nothing in this standard is meant to preclude the parties from pursuing non-contractual remedies to the extent permitted by law.

(i)(6) If the health professional, employee, or designated representative receiving the trade secret information decides that there is a need to disclose it to OSHA, the chemical manufacturer, importer, or employer who provided the information shall be informed by the health professional, employee, or designated representative prior to, or at the same time as, such disclosure.

(i)(7) If the chemical manufacturer, importer, or employer denies a written request for disclosure of a specific chemical identity, the denial must:

(i)(7)(i) Be provided to the health professional, employee, or designated representative, within thirty days of the request;

(i)(7)(ii) Be in writing;

(i)(7)(iii) Include evidence to support the claim that the specific chemical identity is a trade secret;

(i)(7)(iv) State the specific reasons why the request is being denied; and,

(i)(7)(v) Explain in detail how alternative information may satisfy the specific medical or occupational health need without revealing the specific chemical identity.

(i)(8) The health professional, employee, or designated representative whose request for information is denied under paragraph (i)(3) of this section may refer the request and the written denial of the request to OSHA for consideration.

(i)(9) When a health professional, employee, or designated representative refers the denial to OSHA under paragraph (i)(8) of this section, OSHA shall consider the evidence to determine if:

(i)(9)(i) The chemical manufacturer, importer, or employer has supported the claim that the specific chemical identity is a trade secret;

(i)(9)(ii) The health professional, employee, or designated representative has supported the claim that there is a medical or occupational health need for the information; and,

(i)(9)(iii) The health professional, employee, or designated representative has demonstrated adequate means to protect the confidentiality.

(i)(10)(i) If OSHA determines that the specific chemical identity requested under paragraph (i)(3) of this section is not a bona fide trade secret, or that it is a trade secret, but the requesting health professional, employee, or designated representative has a legitimate medical or occupational health need for the information, has executed a written confidentiality agreement, and has shown adequate means to protect the confidentiality of the information, the chemical manufacturer, importer, or employer will be subject to citation by OSHA.

(i)(10)(ii) If a chemical manufacturer, importer, or employer demonstrates to OSHA that the execution of a confidentiality agreement would not provide sufficient protection against the potential harm from the unauthorized disclosure of a trade secret specific chemical identity, the Assistant Secretary may issue such orders or impose such additional limitations or conditions upon the disclosure of the requested chemical information as may be appropriate to assure that the occupational health services are provided without an undue risk of harm to the chemical manufacturer, importer, or employer.

(i)(11) If a citation for a failure to release specific chemical identity information is contested by the chemical manufacturer, importer, or employer, the matter will be adjudicated before the Occupational Safety and Health Review Commission in accordance with the Act's enforcement scheme and the applicable Commission rules of procedure. In

accordance with the Commission rules, when a chemical manufacturer, importer, or employer continues to withhold the information during the contest, the Administrative Law Judge may review the citation and supporting documentation in camera or issue appropriate orders to protect the confidentiality or such matters.

(i)(12) Notwithstanding the existence of a trade secret claim, a chemical manufacturer, importer, or employer shall, upon request, disclose to the Assistant Secretary any information which this section requires the chemical manufacturer, importer, or employer to make available. Where there is a trade secret claim, such claim shall be made no later than at the time the information is provided to the Assistant Secretary so that suitable determinations of trade secret status can be made and the necessary protections can be implemented.

(i)(13) Nothing in this paragraph shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information which is a trade secret.

(j) Effective dates. (1) Chemical manufacturers, importers, and distributors shall ensure that material safety data sheets are provided with the next shipment of hazardous chemicals to employers after September 23, 1987.

(j)(2) Employers in the non-manufacturing sector shall be in compliance with all provisions of this section by May 23, 1988. (Note: Employers in the manufacturing sector (SIC Codes 20 through 39) are already required to be in compliance with this section.)

(Approved by the Office of Management and Budget under Control No. 1218-0072)

(Approved by the Office of Management and Budget under control number 1218-0072, except for: (1) The requirement that material safety data sheets be provided on multi-employer worksites; (2) coverage of any consumer product excluded from the definition of "hazardous chemical" under section 311 (e)(3) of the Superfund Amendments and Reauthorization Act of 1986; and (3) coverage of any drugs regulated by the Food and Drug Administration in the non-manufacturing sector.)



*CHAPTER 9***Appendixes****Table of Contents**

Questions About the PSM Standard	9-1
Application	9-1
Employee Participation	9-4
Process Safety Information	9-5
Process Hazard Analysis	9-6
Operating Procedures	9-7
Training	9-7
Mechanical Integrity	9-8
Sample Operating Procedures Outline	9-9
Change Request Forms	9-13
Management of Change Form	9-13
Management of Change Flowchart	9-18
Sample Emergency Action Plan Outline	9-19
Process Technology Information	9-25
Block Flow Diagram	9-25
Process Flow Diagram	9-26
Pipe and Instrument Diagram	9-29

Compliance Guidelines and Enforcement Procedures 9-31

Introduction	9-31
Types of Inspections	9-33
PQV Inspection Scheduling	9-35
Scope of PQV Inspection	9-36
PQV Inspection Procedures	9-37

Recommended Guidelines for PQV Inspection Preparation 9-45

OSHA Area Office Coordination	9-45
Inspection Team Composition	9-46
Pre-Inspection Preparation	9-48
Documents	9-49
Inspection Facilities and Equipment	9-50
Critical Inspection Areas	9-51
Contractors	9-52
Critical Expertise	9-53
Documentation	9-54
Case File and Request Preparation	9-55
Pre-Inspection Preparation Checklist	9-57
Document Request List	9-60

Questions About the PSM Standard

Application

Registration

Do covered establishments have to register with OSHA?

No. There is no requirement that establishments covered by the standard register with or otherwise notify OSHA.

Explosives (fireworks manufacture)

How does the PSM standard apply to pyrotechnics (fireworks) and explosives?

Employers who manufacture explosives and fireworks must comply with both 29 CFR 1910.119 and OSHA instruction CPL 2.73, Fireworks Manufacturers: Compliance Policy, describes how 29 CFR 1910.119 applies to employers. That directive states that OSHA can cite a fireworks plant employer for violation of the standard.

What is the role of the Bureau of Alcohol, Tobacco, and Firearms (BATF) in relation to the PSM standard and fireworks manufacture?

BATF regulates the storage of explosive materials, including fireworks, in the workplace. For example, BATF has set the following limits on explosive materials:

500 lbs.

Maximum amount of special fireworks, pyrotechnic composition and explosive materials used to assemble fireworks in the processing building.

10 lbs.

Maximum amount of flash powder permitted by BATF in any fireworks processing building.

Don't confuse these BATF limitations with how the PSM Standard applies to the amount of fireworks manufactured.

Laboratories***Does the PSM standard apply to laboratory and research operations?***

A laboratory or research operation involving at least the threshold quantity of one or more highly hazardous chemicals is subject to the PSM standard.

Flammable liquids***Are processes involving flammable liquids (e.g., ethyl alcohol) covered by the standard?***

A vehicle refueling facility uses 350-gallon tote tanks containing flammable liquids. Does the standard cover them?

Use this chart to answer the above questions.

If the process...	Then...
involves 10,000 lbs. or more of flammable liquids directly connects to the storage tanks and the storage tanks' combined quantity of flammable liquids equals 10,000 lbs. or more <i>and</i> an explosion, fire or release could reasonably involve the storage area	the PSM standard covers the flammable liquids of this process.
is strictly transferring and storage facility stores hydrocarbon fuels only for workplace consumption as a fuel (e.g. gasoline for vehicle refueling) <i>and</i> if they are not part of a process containing another highly hazardous chemical covered by the standard	the PSM standard does not cover them (the liquids are covered under 1910.106).

Definition: Retail facilities

What is the definition of "retail facilities" that are exempted from coverage by the PSM standard?

A retail facility means an establishment that would otherwise be subject to the PSM standard at which more than half of the income is obtained from direct sales to end users.

Meaning of facility

Can a facility contain more than one process?

A facility can include multiple processes. If multiple processes are interconnected, consider them a single process for purposes of this standard.

Employee Participation

Consultation

What does consult mean?

Can the employer simply inform the employees?

Consult means to exchange information, and solicit input and participation from the employees and their representatives. It requires more than simply informing employees.

The employer needs to consult with employees and their representatives to develop a personnel information base. This would include information about individual employees' knowledge and expertise in various processes and aspects of the facility. This would help ensure that employees and representatives have adequate:

- Written action plan and process hazard analyses development input
- Access to information required under the standard.

The standard requires employers to consult with "employees and their representatives." Is the term broad enough to include a representative of the international union? A consultant designated by the union local or international?

Employee representative means union representative (if you have a union), or a representative you have chosen (if you don't have a union). The term has a broad meaning. It may include:

- Local union
- International union
- An individual designated by these parties (such as the safety and health committee representative at the site or a non-employee consultant).

If there is no union, the standard gives you the right to appoint a representative to participate in the consultation process.

Access

What does "access" mean? Does this mean simply make it available at a central location? Does the employer have to make copies for employees if requested?

The intent of access under this standard is for the employer to make information available for employees and their representatives in a reasonable manner. Reasonable access may require providing copies or loaning documents. The trade secret provision of the standard permits the employer to require confidentiality agreements before providing the information.

Process Safety Information

Retention of information

How long must the employer maintain process safety information?

Keep the process safety information for the lifetime of the process. Update it whenever changes other than "replacement-in-kind" are made.

Process Hazard Analysis

PHA priority

What rationale must employers use to determine the priority for conducting process hazard analyses? May rationale include age, history, extent of employee exposure, etc.?

Determine the priority for conducting PHA's by using all of the criteria identified in the standard, for example:

- Extent of the process hazards (catastrophic potential)
- Age of the process
- Number of potentially exposed employees
- Operating history.

You may also consider other appropriate factors in establishing the priority. The documentation required by this paragraph will demonstrate the underlying rationale for prioritization.

Timeliness

Employers must address the problems identified in the PHA in a timely manner, and complete actions as soon as possible. What time frame did OSHA intend here?

The standard's intent is for the employer to take corrective action as soon as possible. This means that the employer must act as quickly as possible, considering how complicated and difficult the recommendation is to implement. OSHA expects employers to develop a schedule for completion of corrective actions and to document the basis for the amount of time needed.

Retention

How long must the process hazard analyses, updates and revalidations be retained?

For the life of the process.

Operating Procedures

Control measures

The standard mentions "control measures to be taken if physical contact or airborne exposure occurs." Does this mean "first aid" or "industrial hygiene" services?

It primarily means first aid procedures or emergency medical attention, which should be consistent with the information on the material safety data sheet.

Training

Training documentation

This paragraph requires the employer to make sure that operators understand training provided to them under this section. Is some method of testing required?

The employer must positively determine if employees have understood their training and are capable of following current process operating procedures. This could include administration of a written test, although the standard does not require that a formal written test be used. Other means of determining training comprehension, such as on-the-job demonstrations, are acceptable, as long as they are adequately documented.

Mechanical Integrity

Written procedures

Do these written procedures need to be specific to each vessel, each type of vessel or each group of equipment types listed?

The procedures need to be specific to the type of vessel or equipment. Identical or very similar vessels and items of equipment in similar service don't need to have individualized maintenance procedures. Each procedure must clearly identify the equipment to which it applies.

Quality assurance

If contractors are doing an installation, does this require the employer to implement a quality assurance program to monitor the activities of these contractors?

The employer is responsible for ensuring that equipment is installed according to design specifications and manufacturer's instructions. This may require the employer to be involved in the review, inspection, certification and quality assurance of contractor work.

Sample Operating Procedures Outline

The following Table of Contents is included as an example of Sample Operating Procedures in use by a major chemical corporation. It is offered to provide you with a starting place should you need to initiate written operating procedures or as a sharing of expertise for companies whose written Operating Procedures are under review as a result of 1910.119.

Page numbers are included to give you an idea of the length of each entry. Obviously, your data dictates the required length and actual entries.

PRIMARY EXTRUSION/TRANSFER PROCEDURE

SUBJECT: POWDER SURGE

SECTION: PRIMARY EXTRUSION/TRANSFER PROCEDURE

CORPORATION NAME

DATE

This procedure is a revision of Procedure VI-1 issued 00/00/00 and 00/00/00.

In addition to (Name), Plant Manager; this procedure was revised under the supervision of (Name), Production Manager; (Name), Process Engineer; (Name), Process Technician; (Name), Staff Environmental Engineer and (Name), Quality Assurance Manager.

Revision: Month/Year

1.0 PURPOSE	5
2.0 DESIGN	6
2.1 Process	6
2.1.1 Powder Surge Bins	7
Table #1 Powder Surge Bins	8
2.1.2 Bin Filters	8
2.1.3 Powder Bin Operation	9
2.2 Mechanical	11
2.2.1 Powder Surge Bins V-3102, V-3202, V-3302 and V-3402	11
2.2.2 Powder Surge Bins V-3451 and V-3452	12
2.2.3 Powder Surge Bin V-3501	14
2.2.4 Powder Surge Bin V-3551	14
2.2.5 Powder Surge Bin V-3601	15
2.3 Instrumentation (Operating Controls)	16
2.3.1. Nitrogen Flowmeters to Bin Fluidizing Membranes	16
2.3.2 Pressure	17
2.3.3 Level Indicator	17
2.3.4 Internal Powder Transfer Instrumentation	17
2.3.5 Bin Filter Nitrogen Blowback System	18
2.4. Safety Systems	18
2.4.1 Alarms	18
2.4.2 Safety Valves	19
2.4.3 Vacuum Breakers Utilizing Nitrogen as Make-up Gas	20

3. HS&E CONSIDERATIONS	21
3.1 Process Materials	21
3.1.1 Nitrogen (N ₂)	21
3.1.2 Polypropylene Powder (PP)	21
3.2 Health	21
3.2.1 Potential Personnel Hazards	21
3.2.2 Employee Protection	22
3.2.3 Emergency First Aid Procedures	23
3.3 Safety	24
3.3.1 Fire and Explosion Hazards	24
3.3.2 Leaks	25
3.3.3 Special Safety Considerations	25
3.4 Environmental Control	26
3.4.1. Spill and Leak Procedures	26
3.4.2 Waste Disposal	27
 4.0 PRODUCT QUALITY CONSIDERATIONS	 28
4.1 Prevent Powder Contamination	28
4.2 Maintain Nitrogen Flow	28
 5.0 OPERATION	 29
5.1 Normal Conditions	29
5.1.1 Start-Up	29
5.1.1.1 Initial Start-Up	29
5.1.1.2 Normal Start-Up (system full of Nitrogen)	30
5.1.2 Normal Operations	31
5.1.2.1 Pressure	32
5.1.2.2 Temperature	32
5.1.2.3 Powder Levels	32
5.1.2.4 Hydrocarbon Levels in the Internal System	32
5.1.3 Shutdown	33
5.1.3.1 Normal Shutdown	33
5.1.3.2 Decontamination	34
5.2 Abnormal Conditions	34
5.2.1 Definition	34
5.2.2 Process Deviations, Consequences and Corrective Action	34
5.2.2.1 Nitrogen Failure—5 PSIG System	34
5.2.2.2 Wet Powder	35
5.2.2.3 Contaminated Powder	35
5.2.2.4 Erratic Powder Feed	36
5.2.2.5 Electrical Failure	37
5.2.2.6 Instrument Air Failure	38
5.2.2.7 Utility Air	38

5.3 Emergency Conditions	39
5.3.1 Definition	39
5.3.2.1 Nitrogen Failure—100 PSIG	39
5.3.2.2 Wet Powder	40
5.3.2.3 High Volatiles Powder	40
5.3.2.4 Powder Release to the Atmosphere from Bin(s)	42
5.3.3 Emergency Shutdown	42
6.0 EQUIPMENT	43
7.0 AUXILIARY SYSTEMS	45
8.0 JOB RESPONSIBILITIES	46
8.1 Regular Duties	46
8.1.1 General	46
8.1.2 Key Points	47
8.1.3 Specific Expectations	47
8.2 Special Duties	49
8.3 Equipment Under Technician's Control	49
9.0 RESPONSIBILITIES/TRAINING	51
9.1 Requirements	51
9.1.1 Initial Training	51
9.1.2 Refresher and Supplemental Training	51
9.2 Job Observation Checklist and Job Safety Analysis	51
9.3 Powder Surge Training Model	51
APPENDIX A: GLOSSARY	59
APPENDIX B: STORES STOCK FOLIO NUMBERS	60
APPENDIX C: CHANGES SINCE LAST MAJOR REVISION	61
ATTACHMENTS:	
Surge Bin Airslide	(88-10A)
Powder Surge Bin	(88-13)
Powder Surge Bin	(88-13A)

Change Request Forms

MANAGEMENT OF CHANGE FORM

Name of person requesting change: _____

Signature: _____

Date: _____

Description of Change

Is item considered urgent? ☐ Yes ☐ No

Exactly what is being proposed? _____

Test details: _____

Technology to change: _____

Facilities to change: _____

Reason to propose change: _____

Rate the necessity of change: _____

Describe technical basis for change: _____

Describe safety and health considerations: _____

Does this procedure require a formal process hazards review? ☐ Yes ☐ No

Who will perform the review?

List review considerations:

Are other risk analyses involved? ☐ Yes ☐ No

Analysis	Completed	To be performed
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Proposed dates of change: _____

Duration: _____

Estimated completion date: _____

Change Approval

Signature	Printed Name	Title	Date
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

If the MOC form is sufficient, you still may need to document changes in order to ensure that all affected employees and contractors are aware of changes. The standard also requires that you gather written documentation of the change in one place and that it is kept up to date.

Documenting Change

What changes are required? _____

- ☐ Production rates
- ☐ Raw materials
- ☐ Experimentation
- ☐ Equipment unavailability
- ☐ New equipment
- ☐ New product development
- ☐ Catalyst
- ☐ Operating conditions
- ☐ Other? _____

If equipment and instruments are to be changed, describe: _____

- ☐ Materials of construction
- ☐ Equipment specifications
- ☐ Piping prearrangements
- ☐ Experimental equipment
- ☐ Computer program revisions
- ☐ Changes in alarms
- ☐ Changes in interlocks
- ☐ Other? _____

Why are changes required? _____

Were operating procedures changed? ☐ Yes ☐ No

Describe: _____

Were mechanical procedures changed? ☐ Yes ☐ No

Describe: _____

☐ Attach updated piping and instrument diagrams.

☐ Include any other documentation which will ensure pass-down of change information.

Training for Change

Describe what training will be necessary:

Who needs training? _____

How will they be trained? _____

Who will provide training? _____

Describe communication of change necessary:

Who needs to know? _____

How will they find out? _____

Who will provide the communication? _____

Describe pre-startup inspection:

Who will inspect? _____

How will findings be reported? _____

Who needs to approve pre-startup findings? _____

Findings reported:

Approval

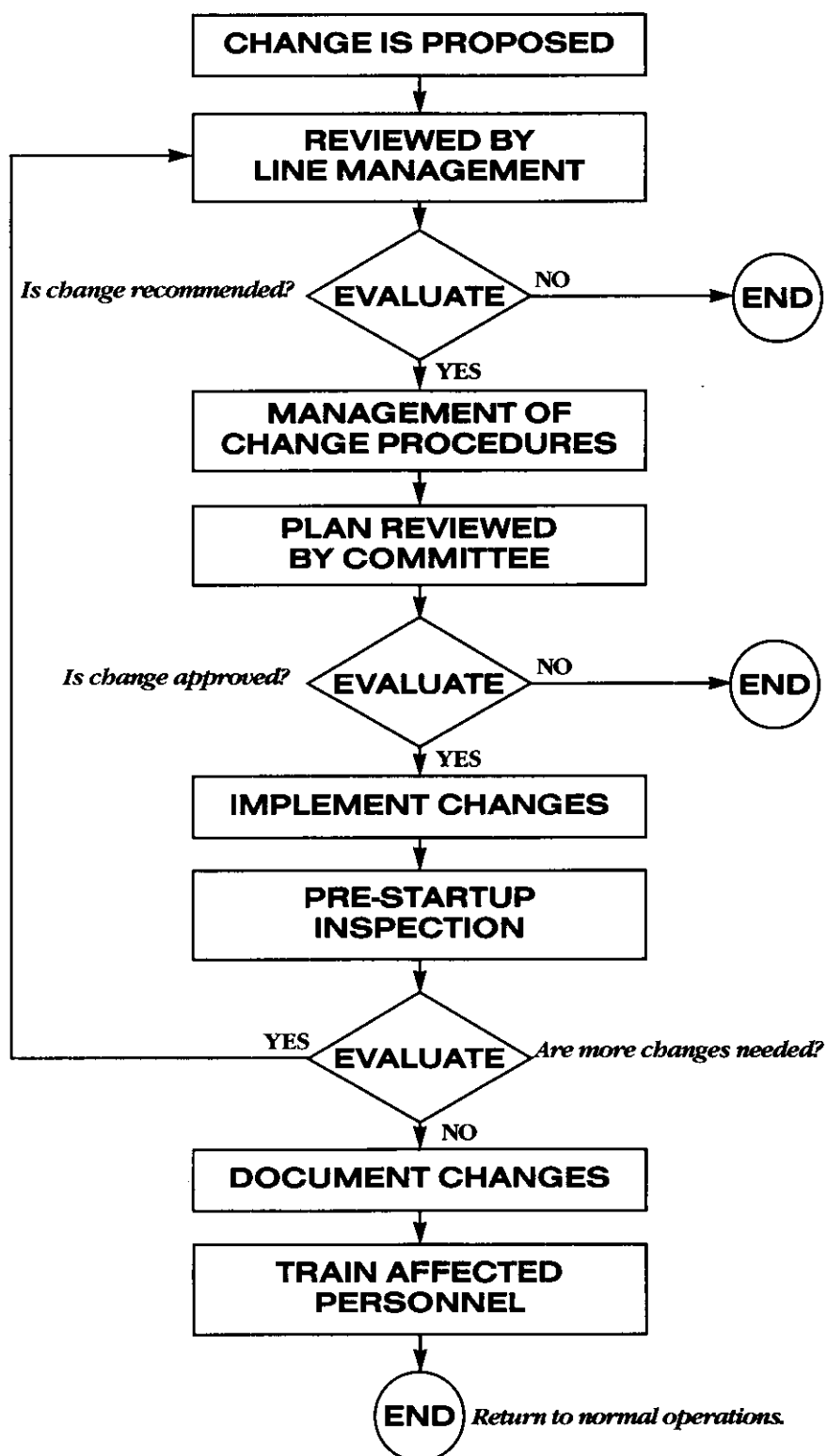
Signature

Printed Name

Title

Date

MANAGEMENT OF CHANGE FLOWCHART



Sample Emergency Action Plan Outline

The following Table of Contents is included as an example of an Emergency Action Plan in use by a major chemical corporation. It is offered to provide you with a starting place should you need to initiate a written emergency Action Plan as required by 1910.38.

Page numbers are included to give you an idea of the length of each entry. Obviously, your data dictates the required length and actual entries.

EMERGENCY ACTION PLAN

CORPORATION NAME

EMERGENCY RESPONSE STANDARD OUTLINE

DATE

This procedure is a revision of Procedure VI-1 issued 00/00/00 and 00/00/00.

In addition to *(Name)*, Plant Manager; this procedure was revised under the supervision of *(Name)*, Production Manager; *(Name)*, Process Engineer; *(Name)*, Process Technician; *(Name)*, Staff Environmental Engineer and *(Name)*, Quality Assurance Manager.

Revision: Month/Year

TABLE OF CONTENTS

1.0 Authorization	5
1.1 Authority	
1.2 Policy	
1.3 Objectives	
1.4 Purpose	
2.0 Site	6
2.1 Business	
2.2 Facility	
2.3 Personnel	
3. Hazard Assessment	7
3.1 Overview	
4.0 Plan Activation and Organization	8
4.1 Level 0: A Non-Call-out Incident	
4.2 Level 1: A Call-out Incident	
4.3 Level 2: A Major Call-out Incident	
5.0 Emergency Response Personnel	10
5.1 Level 0 Emergency Response	
5.2 Level 1 Emergency Response	
5.3 Level 2 Emergency Response	

6.0 Operational Centers	15
6.1 Guard House	
6.2 Field Command Post (FCP)	
6.3 Emergency Operations Center (EOC)	
7.0 Emergency Response Cycle	20
7.1 Plan Activation	
7.2 Assessment	
7.3 Containment	
7.4 Response	
8.0 Emergencies	22
8.1 Bomb Threat	
8.2 Civil Disturbance	
8.3 Criminal Incidents	
8.4 Data Processing	
8.5 Fire	
8.6 Hazardous Materials Releases	
8.7 Medical Emergency	
8.8 Natural Disaster	
8.9 Off-site Emergencies	
8.10 Spills	
8.11 Telecommunications	
8.12 Trespass	
8.13 Utilities	
8.14 Weather (see Natural Disaster)	
8.15 Miscellaneous Disruptions	
9.0 Emergency Notifications	25
9.1 Internal	
9.2 External	
9.3 Corporate	
9.4 Telephone List	
10.0 Communications	27
10.1 Activation of initial communications	
10.2 Monitoring radio and other communications	
10.3 Arrange additional communications equipment	
10.4 Log communications equipment issued	
10.5 Notifications	
10.6 Control call-ins from non-essential staff	
10.7 Maintain communications log	

11.0 Supplies and Equipment	27
12.0 Health and Safety	28
12.1 Shutdown	
12.2 Evacuation and Shelter	
12.3 Casualties and Missing Persons	
13.0 Media	30
14.0 Security	31
14.1 Access and Perimeter Controls	
14.2 Investigative Functions	
15.0 Mutual Aid	33
15.1 Mutual Aid Agreements	
15.2 Requesting Mutual Aid	
15.3 Mutual Aid Requests From Others	
16.0 Nearby Locations and Facilities	33
16.1 Mutual Aid Assistance	
16.2 Notify Nearby Facilities	
16.3 Notify Nearby Localities	
16.4 Monitor Effect on Nearby Localities	
17.0 Utilities and Services	34
17.1 Services and Repairs	
17.2 Log Utilities/Service Activities	
17.3 Outside Officials	
17.4 Laboratory	
17.5 Transportation and Traffic	
18.0 Recovery	35
18.1 Restoration	
18.2 Customer Response	
18.3 Supplies	
18.4 Distribution	
19.0 Administration and Finance	36
19.1 Loss Control	
19.2 Arrange Safe Custody of Documents	
19.3 Finance	

20.0 Worksheets, Logs and Checklists	37
20.1 Guard House	
20.2 Field Command Post	
20.3 Emergency Operations Center	
20.4 Nurse	
20.5 Personnel	
21.0 Training	38
21.1 Training	
21.2 Drills	
22.0 Updating and Plan Assessment	38

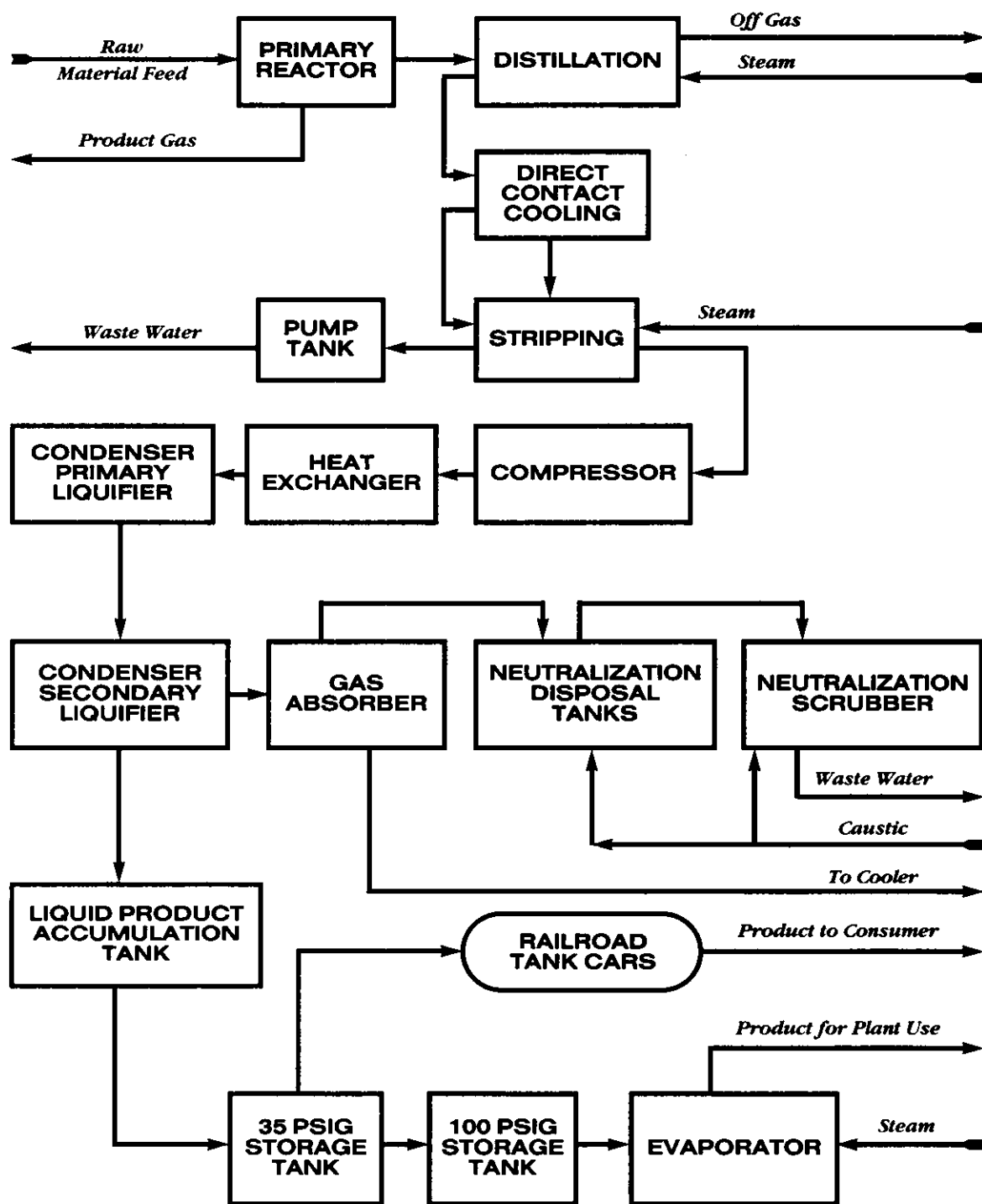
Process Technology Information

Introduction

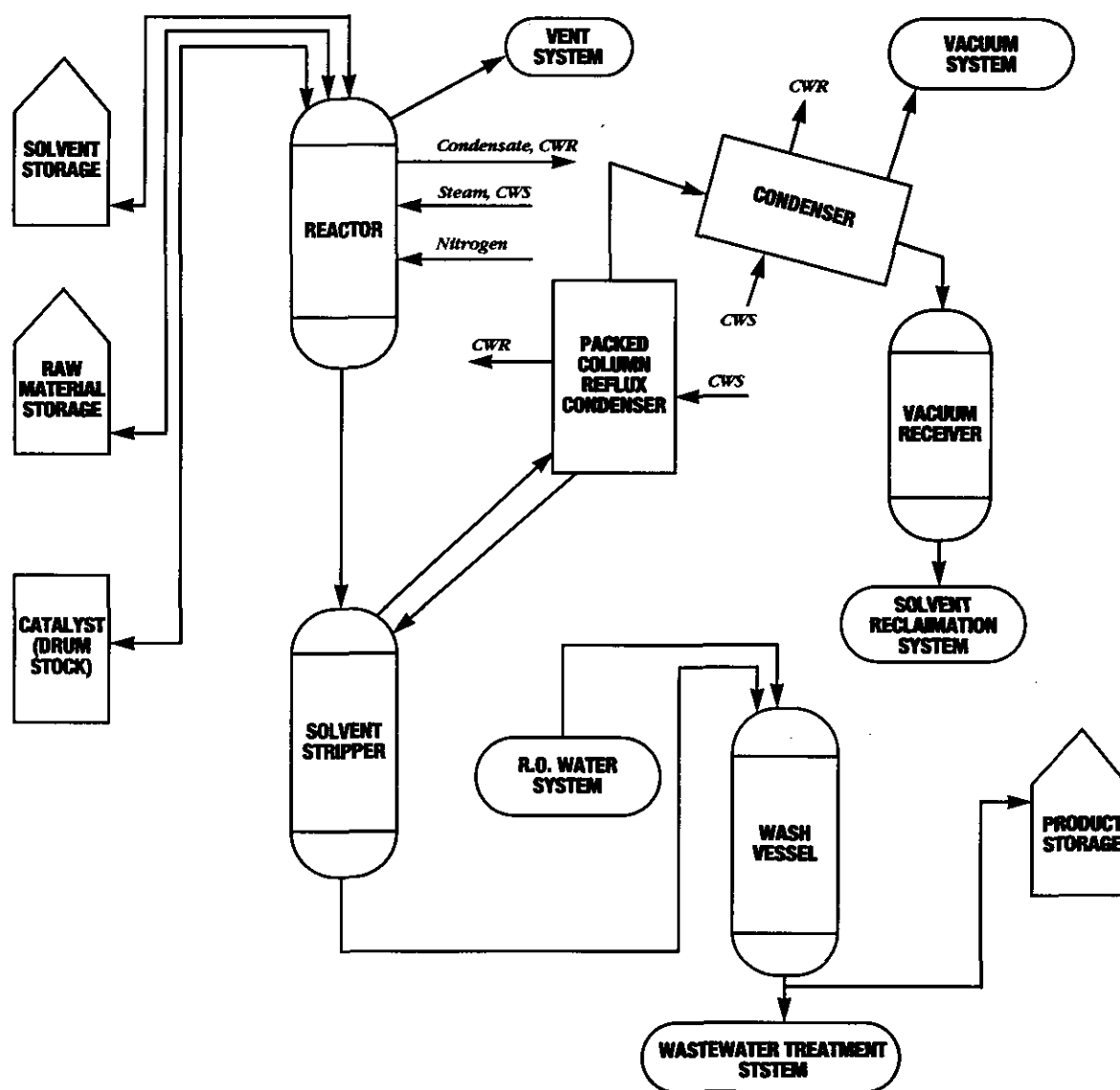
The following block flow, process flow and piping and instrument diagram are offered here as examples of successful means of visually representing the processes.

To be useful, the diagrams used for your PSM program must show your processes exactly.

Block Flow Diagram



Process Flow Diagram



Compliance Guidelines and Enforcement Procedures

Introduction

Purpose

OSHA Instruction CPL 2-2.45A establishes uniform policies, procedures, standard clarifications and compliance guidance for enforcement of the standard for Process Safety Management of Highly Hazardous Chemicals, 29 CFR 1910.119 (PSM standard), and amendments to the standard for Explosives and Blasting Agents, 29 CFR 1910.109. A copy of OSHA Instruction CPL 2-2.45A is included in this manual.

OSHA's enforcement process

Employers who must comply with OSHA requirements often find the enforcement process complicated and confusing. Enforcement of health and safety standards depends on:

- Network of OSHA's compliance officers
- Enforcement resources of states with OSHA-approved occupational health and safety programs.

Inspections

OSHA compliance safety and health officers (CSHOs) enforce health and safety standards by inspecting the workplace. They have a right to enter and inspect a workplace only with a warrant supported by justification. During inspections, OSHA:

- Reviews records
- Observes conditions in the workplace
- Collects samples
- Takes photographs
- Records observations
- Interviews employees and employer representatives.

Inspection system

OSHA has three types of inspections.

Type	Description
Pre-scheduled, programmed	OSHA regional offices plan these at the beginning of the fiscal year. OSHA has a limited number of inspection resources, consequently they create schedules that target specific industries or health and safety standards.
Accident-initiated	These two types of unprogrammed inspections must meet certain probable cause requirements; then OSHA can issue a warrant.
Complaint-initiated	

Types of Inspections

Enforcement activity

The PSM standard applies broadly to potentially hazardous processes that may exist in a wide variety of industries. OSHA may perform an inspection, either to determine if an employer is covered by the standard, or to assess the employer's compliance with it. Consequently, enforcement activities may take place in any of the inspection types described below. The following guidelines apply to PSM-related compliance activity.

Inspection Type	Guideline
Programmed	The program quality verification (PQV) inspection will be the primary enforcement model for the PSM standard. We will describe the PQV inspection and scheduling procedures later.
	OSHA will screen for PSM coverage in all programmed safety and health inspections in general industry. The agency will determine whether the PSM standard applies to such establishments. Affected establishments will receive: • Copies of the OSHA publications <i>Process Safety Management</i>, OSHA Publication 3132 (including §1910.119), and <i>Process Safety Management—Guidelines for Compliance</i> • A letter notifying the establishment that it is covered by the PSM standard and may be inspected under the standard.

Continued on next page

Enforcement activity (continued)

Inspection Type	Guideline	
Unprogrammed	In all unprogrammed inspection activity relating to the PSM standard, OSHA will determine if the standard covers the establishment.	
	IF the ...	THEN...
	• Inspection is complaint-initiated and: • Establishment is classified under the standard industrial classification (SIC) codes in Appendix C of Instruction CPL 2-2.45A • Response is related to an accident or catastrophe involving PSM	OSHA will: • Investigate the complaint or referral item(s) • Screen for obvious violations all programs required by the PSM standard • Consider a CSHO referral for a PQV inspection if major deficiencies are indicated. OSHA must follow: • Chapter 8 guidelines of the Field Operations Manual (FOM) • OSHA Instruction CPL 2.94 (where appropriate) • Guidelines of this instruction
	IF the...	THEN...
	Establishment is classified under the standard industrial classification (SIC) codes in Appendix C of Instruction CPL 2-2.45A.	OSHA will: • Consider a PQV inspection • Document the reasons for the determination in the case file.

PQV Inspection Scheduling

Introduction

Inspecting for compliance with the PSM standard requires extensive OSHA resources. Consequently, they will be able to perform only a few PQV inspections each year. The agency has developed a special targeting and scheduling system to fully and effectively use inspection resources.

Targeting

To most effectively use their limited resources, OSHA will consider the factors below to determine which SIC codes they will inspect. OSHA will choose the SICs that have had the greatest number of accidents/incidents. Their information will come from:

- Published insurance industry reports of major accidents/incidents
- Integrated Management Information Systems (IMIS) Forms Manual data, including the OSHA-170 Investigation Summary File
- EPA Accident Release Information Program (ARIP) data.

Currently targeted SICs

OSHA Instruction CPL 2-2.45A includes a list of targeted SIC codes based on current data. The list may be updated once in a while.

Scheduling

Every year, OSHA will schedule PQV inspections as follows. For detailed information on scheduling see the Instruction.

Step	Action
1	OSHA's Office of Statistics will create an initial list including all known establishments within each of the identified SICs for each region.
2	The Directorate of Compliance Programs will forward the initial lists to the proper regions.
3	Each region will choose five candidates for a PQV inspection. They will forward the resulting list to the Directorate of Compliance Programs.
4	With input from each of their states, each region will submit recommendations as to whether the state's candidate should be included in the national selection.
5	The Directorate of Compliance Programs will notify each region of the final list of establishments they will schedule for PQV inspections.

Scope of PQV Inspection

Comprehensive inspections

Under the PSM standard, OSHA inspectors must evaluate specific employer and process-related contract employer procedures. They must evaluate procedures to manage hazards associated with processes using highly hazardous chemicals. Normally, these inspections will consist of a three-fold approach called Program Quality Verification (PQV).

Step	Action
1	CSHOs will evaluate employer and contract employer programs for complying with each of the listed elements of the PSM standard. To do this, they will use the PSM Guidelines from Appendix A of the Instruction.
2	To determine compliance, CSHOs compare the quality of employer and the contract employer procedures to acceptable industry practices as described in the standard.
3	The team leader selects one or more processes (see PQV inspection procedures) to evaluate. CSHOs verify employer and contract employer effective implementation of the program by: • Reviewing written programs and records of activity • Interviewing employees at different levels • Observing site conditions.

PQV Inspection Procedures

Procedures to follow

To perform a PQV inspection, the OSHA team follows procedures given in the FOM. However, modify them as follows in these sections.

Section	Modification
Opening Conference	When appropriate, include one of the following in the opening conference: • Facility safety and health director • Process Safety Manager • Other person who can explain company Process Safety Management Program. During the opening conference, CSHOs must: • Become familiar with establishment emergency response procedures and emergency alarms • Request a reasonably detailed overview of the chemical process at the facility. This should include block diagrams indicating chemicals and processes involved.
PSM Overview	Before beginning the walkaround inspection, CSHOs must request an explanation of company Process Safety Management Program. This should include at least: • Method for implementing elements of the standard • Personnel responsible for implementing various elements of the standard • Description of company records used to verify compliance with the standard.

Continued on next page

Procedures to follow

(continued)

Section	Modification
Initial Walkaround	Begin the inspection with a brief walkaround inspection of those portions of the facility within the scope of the standard. You might need to make additional walkarounds after selecting process units. The purpose of the initial walkaround is to • Give CSHOs a basic overview of the facility operations • Let CSHOs observe possible hazards such as: • Pipework in risk of impact • Corroded or leaking equipment • Unit or control room siting • Location of relief devices • Get input from the employee representative concerning possible PSM program deficiencies.
Personal Protective Equipment	CSHOs conducting these inspections must wear normal inspection protective equipment. The establishment must also give them: • Flame retardant coveralls for protection from flash fires • NIOSH-approved emergency escape respirators for use during any emergency conditions. During inspection, the following rules concerning CSHOs must be observed. CSHOs must: • Wear flame-retardant coveralls in all areas of the plant where there is potential for flash fires and as company policy requires • Carry emergency escape respirators (if respirator-trained), as needed, during the inspection walkarounds • Be provided with proper alert monitors (for example, HCN, Cl₂) when needed • Make sure that any still cameras and/or video cameras are safe for use in process areas being inspected.

Continued on next page

Procedures to follow

(continued)

Section	Modification
Process documentation requested	At the conclusion of the opening conference, the CSHO will request access to or copies of the following process-related documents.
	OSHA 200 logs OSHA 200 logs for the past three years for both the employer and all process-related contractor employer(s)
	Process safety information Written process safety information for the unit(s) selected <i>Example:</i> flow diagrams, P&IDs and process narrative descriptions
	Process hazard analyses • Documented priority order and rationale for conducting process hazard analyses • Copies of any process hazard analyses performed after May 25, 1987 • Team members • Actions to promptly address findings • Written schedules for actions to be completed • Documentation of findings resolution • Documentation verifying communication to appropriate personnel • 5-year revalidation of original PHA required by standard
	Operating procedures • Written operating procedures for safely conducting activities in each selected unit • Annual certification that operating procedures are current and accurate • Written procedures describing safe work practices for potentially hazardous operations

Continued on next page

Procedures to follow

(continued)

Section	Modification
Process documentation requested	Process-related documents (continued)
	Training records • Initial and refresher training records for all employees involved in operating a process in the selected unit(s) • Methods for determining training content and frequency of refresher training • Certification of required knowledge, skills and abilities to safely perform job <i>Note:</i> This is for employees with no initial training and already involved in operating a process on May 26, 1992. • Training material
	Pre-startup safety review • Pre-startup safety review for new facilities and significantly modified facilities requiring a change in the process safety information • Documentation of employee training
	Mechanical integrity • Written procedures and schedules to maintain the ongoing integrity of process equipment • Relevant portions of applicable manufacturers' instructions, codes, and standards • Inspection and tests performed on process equipment in the unit(s) selected

Continued on next page

Procedures to follow

(continued)

Section	Modification
General documentation requested	At the conclusion of the opening conference, the CSHO will request access to or copies of the following general documents.
Employee participation	Employer's written plan of action for starting a policy of employee participation.
Hot work permit	Hot work permit program and active permits issued for the unit(s) selected
Incident investigation	Incident investigation reports for the unit(s) selected, resolutions and corrective actions
Emergency planning and response	Written emergency action plan including procedures for handling small releases and evidence of compliance with §1910.120 (a), (p) and (q) when applicable
Compliance audits	• Two most recent compliance audit reports • Proper responses to each of the findings • Verifications that deficiencies have been corrected

Continued on next page

Procedures to follow

(continued)

Section	Modification
Contractor documentation requested	The CSHO will request the following information relating to contractor compliance. Here is documentation the employer will supply: • Information relating to contract employer safety performance and programs • Methods of informing contract employers of: •• Known potential hazards related to contractor's work •• Process and applicable provisions of the emergency action plan • Safe work practices to control entrance, presence and exit of contract employers and contract employees in covered process areas • Evaluation of contract employer performance in meeting required responsibilities • Contract employee injury and illness logs related to work in process areas • List of: •• Unique hazards presented by contractor work or •• Hazards found in the workplace and reported to the employer.
	The CSHO will request the following information relating to contractor compliance. The contract employer will supply: • Records showing employees receive training in and understand process-related safe work practices. This applies to processes they will work on or near. • Known potential fire, explosion or toxic release hazards related to job, and applicable provisions of emergency action plan • List of: •• Unique hazards presented by contractor work •• Hazards found in the workplace and reported to the employer. <i>Note:</i> OSHA might also require the contract employer to supply documentation described on pages K6-K12. This depends on the scope of contract employer activities.

Continued on next page

Procedures to follow

(continued)

Section	Modification
Selection of process(es)	To evaluate compliance with the standard, the team leader must choose one or more processes. The team leader will base this selection on the factors listed below and will document choices in the case file: • Factors seen during the walkthrough • Incident reports and other history • Company priorities for or completed PHA • Age of process unit • Nature and amount of chemicals involved • Employee representative input • Number of employees present • Current hot work, equipment replacement or other maintenance activities.

Recommended Guidelines for PQV Inspection Preparation

OSHA Area Office Coordination

Introduction

This appendix contains guidelines from OSHA Instruction CPL 2-2.45A. They are suggested as background and preparation for a Program-Quality-Verification (PQV) inspection.

Assignments

To effectively conduct a PQV inspection, it is important to have coordination with the OSHA area office. The OSHA Area Director and all those involved in a PQV inspection must commit the resources with the understanding that the project is long-term. Team members must complete all outstanding assignments before the PQV inspection. Equally important, team participants should not do any other assignments while they are performing the PQV inspection. An obvious exception would be court hearings.

Contact person

The OSHA Area Director should appoint a contact person in the Area Office. This person should be a supervisor from safety or industrial hygiene (IH), who is familiar with the PQV concept. The duties of the contact person would be to:

- Organize and manage the inspection
- Review the entire case file/report
- Communicate at least weekly with the team leader
- Brief the OSHA Area Director as appropriate
- Advise the supervisor(s) of team members about the team members' conduct and performance.

The latter is especially important so team members get a fair appraisal from their supervisors. They could not rate them on their PQV performance because they would have no knowledge of previous circumstances.

Inspection Team Composition

The team

The inspection team must consist only of experienced journey or senior level compliance officers. They must be familiar with the chemical industry and have taken appropriate OSHA training. Newer compliance officers can be used in the inspections, but not as a substitute for regular team members. Specifically, the OSHA team must consist of:

- Two safety compliance officers/engineers
- Two industrial hygiene compliance officers
- An administrative support person
- A construction specialist.

Team leader qualities

The team leader could be either a health or safety specialist. A safety specialist is preferred because most of the critical PSM and construction-related hazards concern safety. The team leader should:

- Be a GS-12 Senior Compliance Officer experienced in large team inspections
- Have excellent organizational and communication skills (oral and written)
- Be experienced in word processing and data base management computer operations
- Have demonstrated leadership abilities
- Be able to answer questions concerning the inspection.

Team leader responsibilities

The team leader is responsible for:

- Conducting the overall inspection including planning, on-site activities and report preparation
- Determining what, if any, special expertise is needed
- Assigning inspection areas to team members based on their abilities
- Keeping the Area Office contact informed of activities
- Providing and tracking requests for documents
- Resolving problems with the company
- Ensuring that the report addresses all questions in the directive.

Administrative support

An administrative support person would greatly increase the overall inspection efficiency. This position would be ideal for an accommodated compliance safety health officer (CSHO) with some computer skills and organizational abilities. The support person would:

- Answer directly to the team leader
- Be responsible for organizing, labeling and filing case file documents
- Assist inspecting team members with conducting interviews
- Be responsible for inspection supplies and equipment
- Review documents and document requests to assure the request was properly fulfilled.

Team member responsibilities

Safety and IH team members are responsible for:

- Carrying out the PQV inspection activities as directed by the team leader
- Keeping the team leader informed of their activities and potential problems when they arise.

Most of the time, the construction specialist works apart from the rest of the team under the direction of the team leader. Expect some crossover of inspection areas because many contractor and company responsibilities overlap.

Pre-Inspection Preparation

Planning

Effective planning and preparation is essential to efficient implementation and successful completion of any large inspection, especially a PQV. Here are some suggested steps to follow.

Step	Action
1	Select the inspection team.
2	Get establishment histories for reviewing before the inspection begins.
3	Develop inspection strategy and schedule.
4	Conduct a pre-inspection meeting with all members and the Area Office contact person.
5	Set up the case file. • Log and identify for easy retrieval any documents received. • Start an activity log/diary to record all important actions. • Set up a database management program to: •• Keep track of document requests •• Provide ready index of the obtained documents •• Eliminate duplicate requests for documents •• Use the OSHA identification number, document topic, company identification number, date of request to search for relevant documents.
6	The team should develop a weekly schedule of activities, taking into account: • Travel days • Holidays • Start time • Stop time • Company briefings • Internal briefings.
7	Allow time each week for completing necessary paper-work and documentation and tying up loose ends.

Documents

Case file

To conduct PQV inspections, OSHA compliance officers review numerous company documents. These documents must be organized and identified so they may be readily referenced and reviewed. We highly recommend that all requests for copies of company documents be in writing. Establish a standard document request format that contains at least the following information:

- Name of requester
- To whom the request is made
- Identity of the document (in company terms if possible)
- Company document number
- Date of request
- Priority for request
- Internal I.D. number or docket number (for filing)
- Date request fulfilled
- Comment section (Did the response fulfill the request?).

Document requests

Different companies have different names for the same type of documents. Therefore, you should know precisely what information you need before writing the request. Write the requests in duplicate—one copy for the company and the other for the OSHA case file.

Filing system

Before receiving any documents, the administrative support person should develop a filing system. This system should be:

- Secure
- Accessible to all team members
- Easy to use.

Note: Maintain only appropriate documents in the filing system. Field notes, document “clips” and document review/evaluation notes should remain with the corresponding 1Bs.

For more information

This manual contains a list of those documents most commonly requested. It is divided into two sections: Pre-Unit Selection and Unit-Specific Documents.

Inspection Facilities and Equipment

Command center

The PQV team needs a suitable work area/command center from which they can conduct and coordinate the inspection. Most often, the company will provide the on-site space. Almost any room will do if it meets some basic requirements.

No.	Requirement
1	The work area must be secure 24 hours a day with access limited to the inspection team and those company officials who would respond in an emergency.
2	The room should have enough desks and/or tables for reviewing documents and writing the report.
3	Provisions should be made for communications—one phone line as a minimum. Outgoing calls should be charged on the OSHA Area Office calling card. <i>Note:</i> Where phone service is not provided, the team should have a portable cellular phone.
4	Sufficient power outlets should be available for charging pumps, batteries and other inspection equipment.

Company provisions

The team leader must determine as soon as possible which necessary facilities and/or equipment (such as a copier) the company will provide. The company might not provide all necessary facilities voluntarily or put inconvenient restrictions on their use. If this happens, contact the ARA for Technical Support as soon as possible so alternate facilities can be arranged. This might mean the OSHA PQV team would need to rent office space or equipment.

Equipment preparation

Upon entry to the site, the inspection team should have all the necessary inspection equipment and personal protective equipment. Exhibit 3 of the Instruction contains a list of equipment useful for inspection preparation. The list also includes an inspection kit which the team can use to set up the command center. Maintaining supplies throughout the inspection is the responsibility of the administrative support person.

Critical Inspection Areas

Assignments

The team leader should assign specific subjects and areas for team members to investigate. This should be done before entry with input from team members. This helps to avoid confusion and duplication of effort. It also prepares team members for their individual tasks.

Team leader review

Before the CSHO can proceed to the next assignment, the team leader should review an inspection subject with the team member as it is completed. Depending on the state of compliance or noncompliance, the team leader may have to modify the assignment list. This would make the most of the available resources.

Contractors

Definition: Contractor

A contractor is one who agrees to furnish materials or perform services at a specified price.

Types of contractors

The term contractor is not limited to construction-type activities. Many chemical facilities use contract employees who stay at the facility year-round or are called in at regular intervals. Such non-construction contractors might be:

- Maintenance workers
 - Vessel and piping inspectors
 - Vessel heat treaters and cleaners
 - Engineers.
-

Contractor activity

Contractors are an important part of any PSM inspection. A facility may have only a few contractors or dozens, with several hundred contractor employees. This depends on whether the facility is undergoing a shutdown or turnaround.

Before the OSHA inspection team enters the facility, the scope of contractor activity should have been determined. The construction specialist on the team will design an inspection plan and set appropriate priorities. The intent of the PQV inspection is

- *Not* to inspect all outside contractors on-site
- *Rather* to inspect only those contractors who may be exposed to, or could cause or be affected by a catastrophic incident.

Example: The PQV inspection would not normally include:

- Food service workers
 - Certain janitorial employees
 - Remote construction projects not associated with catastrophic potential.
-

Quality assurance

Quality assurance is a shared responsibility for contractors and the company. All materials and workmanship must meet engineering standards. Contractor and company workers should make sufficient checks to ensure they use appropriate materials such as proper:

- Alloy or carbon steel pipe
- Size and grade of studs and/or bolts.

Note: This is especially important in contractor-supplied materials.

Critical Expertise**Areas needing expertise**

PQV inspectors may discover situations that require outside technical expertise. The OSHA team will develop a list of OSHA personnel and/or private sector experts and how to contact them. Areas that might need this expertise:

- Pressure equipment
- Fire protection (fire brigades)
- Facility siting
- Emergency medical services
- Hazardous waste operations
- Dispersion modeling and incident command centers
- Process hazard analysis/HAZOPS
- Process chemistry
- Industry practice

Note: This list is not all-inclusive. The OSHA team will modify it as needed to reflect current technology and hazards.

Documentation

Written documentation

To withstand probable legal challenges, the OSHA team will thoroughly document all items. All OHSA-1B forms will be complete and legible. On the proper 1B, the OSHA team will reference appropriate company:

- Documents
- Logs
- Procedures
- Permits.

Shortcuts for employer knowledge are not acceptable.

Example: • Should have known
• Reasonable diligence

Visual documentation

As soon as practicable, the OSHA team will review photographic documentation (stills or video) to ensure that the condition or violation is appropriately depicted. They may retake any photos that are not good quality.

Case File and Report Preparation

On-site survey efficiency

A PQV inspection will take weeks or months of on-site activity. This generates a large amount of paper, both in field notes and documents. The OSHA team will organize the paper flow and keep it well-maintained. This results in a more efficient on-site survey and greatly reduces write-up time.

Daily log

The OSHA team will maintain a daily log, either handwritten or computer-generated, indicating team member:

- On-site daily activities
- Meetings
- Problems
- Other details as necessary.

OSHA 1-B forms

When the team records violations, they keep the following guidelines in mind.

Facts	When completing the OSHA 1-B form, document: • Employees exposed • Date, time and location • Management representative who accompanied the CSHO.
Single 1B	Each incident should have a separate 1B.
Multiple violations	For multiple violations, photocopy the form and highlight each instance and corresponding documentation.
Write ASAP	Write alleged violation descriptions as soon as practicable.
Multi-employer citations	Coordinate multi-employer policy citations with respect to exposing, controlling, correcting and creating employer files.

Case file structure

Begin case file structure and organization before entry into the facility. Observe these guidelines.

Document log and index	Log all documents and generate an index indicating: • Subject matter • Document identification number • File number • Location of the document (box number).
DBM program	Set up a database management program for the PCs.
Back up disks	Back up computer disks daily, or more often as necessary.
Photos and video tapes	Keep photos and video tapes taken during the inspection in a separate file. Identify them with: • Photographer • Date • Roll or tape number • Subject.

Pre-Inspection Preparation Checklist

Preparation list

This is the list of tasks the OSHA team will complete before your PQV inspection. They will check off each task as completed. Write NA if it does not apply.

A. Previous OSHA history — nationwide search	
B. All citations and/or reports • Litigation results • Outstanding issues, items in contest • Health response team reports • NIOSH evaluations, if any	
C. EPA history	
D. Reportable releases • Reports of any kind • Complaints and pending actions	
E. Other Agency histories — local/State/Federal	
F. Department of Transportation • Coast Guard • ESDA/FEMA • State Fire Marshall • State Boiler and Pressure Vessel	
G. Previous PetroSEP/PSM inspection results	
H. Citations • Team members and expertise • Settlement agreements or litigation results	
I. Identify contact people — other jurisdictions • EPA, DOT, Coast Guard, etc.	
J. Acquire necessary codes or standards • ASME, API, ANSI, NFPA, etc.	

Inspection strategy

When the OSHA team prepares for a PQV inspection, they will check off each strategy as you use it. Use the following as a guideline. Write NA if it does not apply to your situation.

A. Identify critical needs and expertise.	
B. Select team members.	
C. Identify expertise with the team.	
D. Identify critical inspection areas.	
E. Assign areas according to expertise.	
F. Identify areas lacking expertise.	
G. Provide training. • Bring in additional resources.	
H. Develop a tracking system for documents	
I. Develop a daily log of on-site activities.	
J. Identify known scheduling conflicts. • Team members and/or employer.	
K. Develop weekly schedule of activities.	
L. Travel, write up, start/stop times. • Employer/employee and Area Office updates.	

Planning and scheduling

When the OSHA team prepares for a PQV inspection, they will check off each strategy as you use it. Use the following as a guideline. Write NA if it does not apply to your situation.

A. Create a Projected Time Line	
B. Projected records and program review time	
• Projected walkaround time	
• Projected write-up time	
C. Resource Scheduling	
D. Team leader and construction specialist enter first for program and records review; present document request list.	
• Full team enters following acquisition of requested documents for program/record review and walkaround.	
• Expert assistance enters as needed.	
E. Equipment Acquisition	
F. Required PPE	
• Technical equipment	

Document Request List

PRE-UNIT SELECTION	
A. OSHA 200 logs for past three years ☐	O. Fire brigade records ☐
B. Employer ☐ • Contractors ☐	P. Organizational statement ☐ • Training records ☐ • Callouts/Responses ☐ • Roster ☐ • Equipment inspection ☐
C. Incident reports ☐	Q. Respirator program and inspections (emergency use) ☐
D. Near miss ☐ • Fires ☐ • All releases (cross check with EPA documents) ☐	R. Infection/Exposure control program (bloodborne) ☐
E. Site plan/Facility overview ☐	S. Safety and health outline ☐
F. Simplified flow diagrams ☐	T. Minutes of safety and health committee meetings and walkaround reports ☐
G. All permit procedures ☐	U. Committee roster ☐
H. Confined space ☐ • Hot work ☐ • Others ☐	V. Disaster preparedness program ☐
I. Hazard communication ☐	W. Safety and health complaints ☐
J. Overall emergency response plan (emergency action plan, evacuation plan) ☐	X. Accident investigation logs ☐
K. Lockout/Tagout ☐	Y. Industry hazard alerts (fire and explosion information from other facilities) (Lessons learned by API) ☐
L. PPE Plan/Requirements ☐	Z. Process hazard analysis scheduling procedure ☐
M. Audits ☐	
N. Internal ☐ • Corporate ☐ • Contracted ☐ • Insurance/Consultant ☐	

UNIT-SPECIFIC DOCUMENTS	
A. Written operating procedures	☐
B. All current procedures	☐
•• Normal	☐
•• Abnormal	☐
•• Emergency	☐
• Startup procedures	☐
• Partial (swoop-down procedures)	☐
•• Full (cold)	☐
• Shutdown procedures	☐
• Normal	☐
•• Emergency	☐
• Upset conditions (beyond normal operating parameters)	☐
C. Process safety information	☐
D. Process chemistry	☐
• Capacity (volume)	☐
• Operating temperatures and pressures	☐
•• Alarm settings (high, high-high, low, low-low, etc.)	☐
• Operating parameters	☐
• Consequences of deviations	☐
• Flow rates	☐
E. Operating logs (past 6 months)	☐
F. Foreman	☐
• Operator	☐
• Manual and computer	☐
G. Piping and instrumentation diagrams (P&IDs)	☐
H. Working (unit level)	☐
<i>Note: Must be current</i>	☐
• Archival	☐
• Simplified (detailed, at a later date)	☐
• Product	☐
• Utility	☐
• Fire protection	☐

I. Training records	☐
J. Operator and supervisory	☐
• Training records (summary) for all safety and health programs	☐
• Hazard communication	☐
•• Emergency response	☐
•• Bloodborne	☐
•• Respirators and PPE	☐
•• SCBA	☐
•• Fire	☐
•• Others.	☐
K. Permits for the units	☐
• Hot work, confined space, etc.	☐
L. Pressure vessel records	☐
M. For at least 20 different vessels, selection based on age, pressure, temperature, toxic chemical involved (corrosive nature, i.e. sulfuric acid), repair history, environmental stress cracking, etc.	☐
• Inspection records	☐
• All previous records	☐
•• Analysis of defects	☐
•• Nondestructive testing records	☐
•• Inspection schedule and frequency	☐
•• Internal	☐
•• External	☐
•• On-stream	☐
•• Special	☐
•• U-1 and U-2 records	☐
• Inspector qualifications	☐
• ASNT or equivalent levels (1, 2, or 3)	☐
•• Roster of inspectors	☐
•• Training history and documentation	☐
• Pressure relief valve (PRV) inspection records	☐
• Selection criteria for PRVs, vessels, etc.	☐
N. Unit plot plan—detailed	☐
O. Instrumentation calibration records	☐
P. Unit emergency response/action plan	☐

Q. Control room blueprint and schematic	☐
R. Work orders	☐
S. Outstanding • Obtain a sample of completed work order • Written work order procedure • All safety work orders	☐ ☐ ☐
T. Environmental sampling records • Noise • Air containments/toxins • Asbestos	☐ ☐ ☐
U. Product sampling procedures	☐
V. Calibration records for IH sampling equipment	☐
W. Pre-startup review	☐
X. Rotating equipment inspection records	☐
Y. Schedule • Repair records	☐ ☐
Z. Operator certification	☐
AA. Flare system diagram (P&ID)	☐
AB. Process hazard analysis (HAZOP, What-If, etc.)	☐
AC. Piping inspection program	☐
AD. Records/Results • Schedule • Inspector qualifications	☐ ☐ ☐

U.S. Department of Labor

Assistant Secretary for
Occupational Safety and Health
Washington, D.C. 20210



OSHA Instruction CPL 2-2.45A

SEP 28 1992

Directorate of Compliance Programs

Subject: 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals--Compliance Guidelines and Enforcement Procedures

- A. Purpose. This instruction establishes uniform policies, procedures, standard clarifications, and compliance guidance for enforcement of the standard for Process Safety Management of Highly Hazardous Chemicals, 29 CFR 1910.119 ("PSM standard"), and amendments to the standard for Explosives and Blasting Agents, 29 CFR 1910.109.
- B. Scope. This instruction applies OSHA-wide.
- C. References.
1. 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals; Final Rule; February 24, 1992, Federal Register Vol. 57, No. 36, pp. 6356-6417.
 2. OSHA Instruction CPL 2.45B, June 15, 1989, the Field Operations Manual (FOM).
 3. OSHA Instruction STP 2.22A, CH-2, January 29, 1990, State Plan Policies and Procedures Manual.
 4. OSHA Instruction CPL 2.94, July 22, 1991, OSHA Response to Significant Events of Potentially Catastrophic Consequence.
 5. OSHA Instruction ADM 1-1.12B, December 29, 1989, Integrated Management Information System (IMIS) Forms Manual.
- D. Cancellation. This instruction cancels:
1. OSHA Instruction CPL 2-2.45, September 6, 1988, Systems Safety Evaluation of Operations with Catastrophic Potential.
 2. OSHA Notice CPL 2, March 9, 1992, Special Emphasis Program in Petrochemical Industries, Standard Industrial Classification (SIC) Codes 2821, 2869, and 2911.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

- E. Action. OSHA Regional Administrators and Area Directors shall ensure that all compliance and enforcement activities related to the PSM standard adhere to the guidelines of this instruction.
- F. Federal Program Change. This instruction describes a Federal program change which affects State programs. Each Regional Administrator shall:
1. Ensure that a copy of this change is promptly forwarded to each State designee, using a format consistent with the Plan Change Two-Way Memorandum in Appendix P of OSHA Instruction STP 2.22A, CH-3.
 2. Explain the technical content of this change to the State designees as requested.
 3. Advise the State designees that, in order to ensure uniform enforcement of the Explosives and Blasting Agents Standard and the Process Safety Management of Highly Hazardous Chemicals Standard addressed by this instruction, State implementation of the procedures in this instruction, or comparable State procedures, must be carefully coordinated with OSHA.
 4. Coordinate with the State to ensure appropriate staff training (as discussed at I.4. of this instruction), participation in the Program-Quality-Verification inspection scheduling process (as discussed at J.3.d. of this instruction), and to provide appropriate technical assistance.
 5. Ensure that State designees are asked to acknowledge receipt of this Federal program change in writing to the Regional Administrator as soon as the State's intention is known, but not later than 70 calendar days after the date of issuance (10 days for mailing and 60 days for response). This acknowledgment must include the State's intention to follow OSHA's policies and procedures described in this instruction, or a description of the State's alternative policy and/or procedure which is "at least as effective" as the Federal policy and/or procedure.
 6. Ensure that the State designees submit a plan supplement, in accordance with OSHA Instruction STP 2.22A, CH-2, as appropriate, following the established schedule that is agreed upon by the State and the

OSHA Instruction CPL 2-2.45A

~~SECRET~~
 Directorate of Compliance Programs

Regional Administrator to submit non-Field Operations Manual/Technical Manual Federal Program Changes.

- a. If the State intends to follow the revised inspection procedures described in this instruction, the State must submit either a revised version of this instruction, adapted as appropriate to reference State law, regulations and administrative structure, or a cover sheet describing how references in this instruction correspond to the State's structure. The State's acknowledgment letter may fulfill the plan supplement requirement if the appropriate documentation is provided.
 - b. If the State adopts an alternative to Federal enforcement inspection procedures, the State's plan supplement must identify and provide a rationale for all substantial differences from Federal procedures in order for OSHA to judge whether a different State procedure is as effective as the comparable procedure.
7. After Regional review of the State plan supplement and resolution of any comments thereon, forward the State submission to the National Office in accordance with established procedures. The Regional Administrator shall provide a judgment on the relative effectiveness of each substantial difference in the State plan change and an overall assessment thereon with a recommendation for approval or disapproval by the Assistant Secretary.
 8. Review policies, instructions, and guidelines issued by the States to determine that this change has been communicated to State program personnel.
- G. Background. On February 24, 1992, OSHA promulgated the Final Rule for Process Safety Management of Highly Hazardous Chemicals. This standard originally became effective on May 26, 1992. An administrative stay delayed the effective date of paragraphs (f), (h), (j), and (l) until August 26, 1992. That stay has expired and the stayed provisions are now fully effective.
1. In recent years, a number of catastrophic accidents in the chemical industry have drawn attention to the safety of processes involving highly hazardous chemicals. OSHA has determined that employees have

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

been and continue to be exposed in their workplaces to the hazards of releases of highly hazardous chemicals which may be toxic, reactive, flammable, or explosive.

2. The requirements of the PSM standard are intended to eliminate or mitigate the consequences of such releases. The standard emphasizes the application of management controls when addressing the risks associated with handling or working near hazardous chemicals.
3. In addition, the PSM standard has been developed in fulfillment of OSHA's obligation under the Clean Air Act Amendments (CAAA) of 1990, section 304(a). The final rule is consistent with the mandate of the CAAA.
4. It is anticipated that joint inspection activities related to the PSM standard will arise between OSHA, the Environmental Protection Agency, and the Chemical Safety and Hazard Investigation Board, which was mandated by the CAAA.

H. Enforcement Activity Related to the PSM Standard--Types of Inspections. 29 CFR 1910.119 has broad applicability to potentially hazardous processes that may exist in a wide variety of industries. Accordingly, enforcement activities related to the PSM standard--either to determine if an employer is covered by the standard or to assess the employer's compliance with it--may take place in any of the inspection types described below. The following guidelines shall apply to PSM-related compliance activity:

1. Program-Quality-Verification (POV) Inspections. The primary enforcement model for the PSM standard shall be the POV inspection, as described at K. and L. of this instruction. Programmed POV inspections shall be scheduled as described at J. of this instruction.
2. Other Programmed Inspections: Screening for PSM Coverage. In all programmed safety and health inspections in general industry, a determination shall be made as to whether the establishment is covered by the PSM standard.
 - a. This determination shall follow the criteria presented at 29 CFR 1910.119(a), including appropriate reference to Appendix A of §1910.119. The determination may be made in conjunction with

OSHA Instruction CPL 2-2.45A

2014
Directorate of Compliance Programs

an assessment of the employer's Hazard Communication program.

b. If the establishment is found to be covered by the standard:

(1) It shall be further determined if the establishment is included in the universe of affected establishments from which PQV inspections may be scheduled. (See J. of this instruction.)

(2) The employer shall be provided:

(a) Copies of the OSHA publications "Process Safety Management," OSHA Publication 3132, which also contains the full text of §1910.119; and "Process Safety Management--Guidelines for Compliance;" and

(b) A letter notifying the employer that the subject establishment is covered by the PSM standard and may be inspected under the standard. The letter shall also emphasize the employer's obligation to comply with the standard. An example of such a letter is provided as Appendix F of this instruction.

c. The Area Director shall ensure proper coding of the OSHA-1 (as described at Q. and Appendix H of this instruction) to identify the establishment as either known to be covered by the PSM standard or known not to be covered by the standard.

3. Unprogrammed PSM-related Inspections. In all unprogrammed inspection activity relating to the PSM standard, a determination shall be made as to whether the establishment is covered by 29 CFR 1910.119.

a. If a formal complaint or referral relating to the PSM standard is received regarding any workplace classified in one of the SIC codes listed at Appendix C of this instruction, the complaint or referral item(s) shall be investigated and:

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

- (1) All programs required by the PSM standard shall be screened for obvious violations; and
 - (2) A CSHO referral for a PQV inspection shall be considered if major deficiencies are indicated. This determination shall be documented in the case file.
- b. Investigations of formal, PSM-related complaints and referrals in establishments in all other SIC codes shall normally be limited to the complaint item(s) only, unless violations related to the complaint or referral items are found.
- 4. Responses to Accidents and Catastrophes. Responses to accidents and catastrophes involving PSM shall follow the guidelines contained in Chapter VIII of the FOM and--where appropriate--in OSHA Instruction CPL 2.94, "OSHA Response to Significant Events of Potentially Catastrophic Consequence," in addition to the guidelines of this instruction. If the workplace is classified in one of the SIC codes listed at Appendix C of this instruction, a PQV inspection shall be considered; the reasons for the determination shall be documented in the case file.
- 5. All Other Inspections. Normally, there shall be no PSM-related activity on any inspection other than those described at H.1. through H.4., above.
- I. Inspection Resources. Appropriate levels of staff training and preparation are essential for compliance activities relating to the PSM standard. In particular, it is anticipated that PQV inspections will be highly resource-intensive; they will therefore require careful planning and coordination. The recommendations included as Appendix G of this instruction may be used as a guide for such planning.
 - 1. PQV Team Leaders ("Level One"). Only trained compliance safety and health officers (CSHOs) with experience in the chemical industry shall be assigned to lead a PQV inspection under this standard.
 - a. As a minimum, this training must include the OSHA Training Institute's Course 330, "Safety and Health in the Chemical Processing Industries," and Course 340, "Hazard Analysis in the Chemical Processing Industries," or equivalent training

OSHA Instruction CPL 2-2.45A
Directorate of Compliance Programs

such as that offered by the National Institute of Standards and Technology.

NOTE: Due to a significant change in course content, completion of Course 330 prior to Fiscal Year 1991 does not meet this requirement for PQV team leaders.

- b. Team leaders must have prior experience in the chemical industry. This experience should include experience obtained from accident/explosion investigations in chemical or petrochemical plants, through previous chemical inspections involving process safety management evaluation, or through previous chemical industry employment.
2. PQV Team Members ("Level Two"). CSHOs may be assigned as PQV team members, or to conduct unprogrammed inspections in workplaces in the targeted SIC codes listed in Appendix C of this instruction, if they have 2 years of OSHA inspection experience or the equivalent and have completed Course 330, "Safety and Health in the Chemical Processing Industries" (including offerings of this course prior to Fiscal Year 1991) and Course 340, "Hazard Analysis in the Chemical Processing Industries."
 3. CSHOs With Less Training. Complaint and other unprogrammed inspections pertaining to some sections of the standard may be conducted by CSHOs who do not have the training and experience described at I.1. or I.2., above, but who are experienced in evaluating other programmatic standards such as hazard communication and lockout/tagout and in evaluating respirator programs.
 - a. The following sections of 29 CFR 1910.119 may be appropriately evaluated by such CSHOs:
 - (c) Employee participation.
 - (g) Training.
 - (h) Contractors.
 - (k) Hot work permits.
 - (m) Incident investigation.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

- (n) Emergency planning and response.
- b. Such CSHOs shall make full utilization of Technical Support resources at the Regional Office and National Office levels in arriving at decisions regarding compliance or noncompliance.
- c. Nevertheless, to the extent possible, Area Directors shall attempt to utilize CSHOs with experience and training in the chemical industry to perform such unprogrammed inspections.
- 4. State Plan States. Each State shall have one or more CSHOs trained to meet the requirements for PQV team leaders and an appropriate number of qualified team members. OSHA will provide technical assistance, as needed, through the Regional Office, Health Response Team, and the Office of Construction and Engineering.
- J. PQV Inspection Scheduling. Due to the resource-intensive nature of inspections for compliance with the PSM standard, the Agency will be able to perform only a limited number of PQV inspections (as described at K. and L. of this instruction) each year. A special targeting and scheduling system is therefore necessary to maximize the effective use of inspection resources.
 - 1. Targeting. OSHA wishes to make the most effective use of its limited resources, and therefore will use the factors listed below in determining the SIC codes to be inspected. OSHA will select the SICs that have experienced the greatest number of accidents/incidents as determined from these three sources:
 - a. Published insurance industry reports of major accidents/incidents.
 - b. IMIS data, including the OSHA-170 Investigation Summary File.
 - c. EPA Accident Release Information Program (ARIP) data.
 - 2. Current Targeted SICs. A list of targeted SIC codes based on current data, as described at J.1., is included as Appendix C of this instruction. This Appendix may be updated periodically.

OSHA Instruction CPL 2-2.45A

JUL 28 1994
Directorate of Compliance Programs

3. Scheduling. PQV inspections shall be scheduled as follows:
- a. Using the list of SICs determined as described at J.1. above, the Office of Statistics shall annually create an initial list including all known establishments within each of the identified SICs for each Region. This list shall be organized by establishment, by establishment size, by corporate identity (as determined through a commercially available source), and by State.
 - b. The Directorate of Compliance Programs shall forward the initial lists to the appropriate Regions.
 - c. Within 30 days of receipt of the initial list, each Region shall select five candidates for a PQV inspection and shall forward the resulting list, together with documentation supporting the selections, to the Directorate of Compliance Programs. The Regions shall base their selection on such factors as:
 - (1) Number of employees at the facility.
 - (2) Age of the facility.
 - (3) Known toxicity of chemicals used in the facility's processes.
 - (4) Frequency of media reports of releases or other incidents at the facility.
 - (5) Local EPA information.
 - (6) Past OSHA history of the facility, including complaints received and/or followup inspections due.
 - (7) Information from local/municipal fire departments.

NOTE: The Regions need not make a determination on each of these factors for each establishment on their initial list; however, their selections for

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

candidates shall be thoroughly documented.

- d. Beginning with Fiscal Year 1994, Regional Administrators shall provide to each State designee a copy of the establishment list within their State. Each State shall nominate one establishment for a PQV inspection or provide an explanation of why a PQV inspection should not be scheduled in their State. Regional Administrators shall include these candidates with their regional submission (i.e., in addition to the five candidates submitted by each Region) to the Directorate of Compliance Programs, together with their assessment and recommendation as to whether the State's candidate should be included in the national selection and as to the State's degree of readiness to conduct the inspection independently.
- e. Within 60 days of the receipt of the candidate lists from the Regions, the Directorate of Compliance Programs shall notify each Region of the final list of establishments from which PQV inspections are to be scheduled.
 - (1) The selections for the Regional lists shall be made by the Directorate of Compliance Programs in coordination with the Office of Field Programs. The selections shall be based on:
 - (a) Emphasis on a corporate approach, to give inspection priority to the maximum number of different corporations, rather than targeting multiple inspections in the same corporation; and
 - (b) Regional resources and inspection goals; and
 - (c) Overall Agency resources.
 - (3) Inspection goals (actual numbers) are to be set in the annual Field Operations Program Plan between Regions and the Office of Field Programs.

OSHA Instruction CPL 2-2.45A

APR 2, 1982

Directorate of Compliance Programs

- (4) The number of establishments selected may vary from Region to Region, because OSHA plans to focus more PQV inspections in Regions with higher concentrations of high-hazard industries affected by the standard.
 - (5) The selections from the States' list shall be coordinated with the Office of State Programs. Regional Administrators shall include full discussion and coordination with the affected States.
4. Deletion Criteria. An establishment shall be deleted from the list if it:
- a. Has received a substantially complete systems safety inspection or PQV inspection within the current or the preceding 5 calendar years; or
 - b. Is included in a corporate settlement agreement requiring appropriate management systems for process safety; or
 - c. Is a VPP participant; or
 - d. Is a corporate office/headquarters and is not engaged in actual production or physical research operations; or
 - e. Is not covered because of exclusions in the PSM standard; or
 - f. Has been the subject of a PSM-related inspection (complaint or referral) in the preceding year during which PSM programs were screened and a referral for a PQV inspection was not made.

NOTE: Determination for deletion shall be made initially, to the extent possible, at the National Office level when the list is prepared; and/or subsequently, as necessary, at the Regional Office level based on local knowledge (e.g., recent inspections, Area Office screening, State Manufacturers' Guide).

5. Local Emphasis Programs. Some Regions may have relatively few establishments in the targeted SIC codes

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

listed in Appendix C. Regional Administrators therefore may propose a Local Emphasis Program to direct Regional PSM inspections resources to industry types that may not be covered by the targeted SIC codes. Such Local Emphasis Programs shall be submitted to the Directorate of Compliance Programs for approval in accordance with the FOM, Chapter II.

- K. Scope of PQV Inspection. Comprehensive inspections under the PSM standard shall evaluate the procedures used by the employer and the process-related contract employers to manage the hazards associated with processes using highly hazardous chemicals. Normally, these inspections will embody a three-fold approach, which for reference is termed **Program-Quality-Verification (PQV)**.
1. First, the employer's and the contract employers' **Program** for complying with each of the listed elements of the PSM standard shall be evaluated in accordance with the PSM Audit Guidelines contained in Appendix A of this instruction. (See also M. of this instruction.)
 2. Second, the **Quality** of the employer's and the contract employers' procedures shall be compared to acceptable industry practices as described in the standard to determine compliance.
 3. Third, **Verification** of the employer's and the contract employers' effective implementation of the program can be made through review of written programs and records of activity, interviews with employees at different levels, and observation of site conditions. The team leader shall select one or more processes as described at L.7. of this instruction to perform the verification portion of the inspection.
- L. PQV Inspection Procedures. The procedures given in the FOM, Chapter III, shall be followed except as modified in the following sections:
1. Opening Conference. Where appropriate, the facility safety and health director, Process Safety Manager, or other person capable of explaining the company's Process Safety Management Program shall be included in the opening conference.

OSHA Instruction CPL 2-2.45A

SEP 24 1981
Directorate of Compliance Programs

- a. During the opening conference, CSHOs shall familiarize themselves with the establishment's emergency response procedures and emergency alarms.
 - b. CSHOs shall also request that the management representative(s) provide them with a reasonably detailed overview of the chemical process at the facility, including block diagrams indicating chemicals and processes involved.
2. PSM Overview. Prior to beginning the walkaround inspection, the CSHOs shall request an explanation of the company's Process Safety Management Program including, at a minimum:
 - a. How the elements of the standard are implemented;
 - b. Personnel designated as responsible for implementation of the various elements of the standard; and
 - c. A description of company records used to verify compliance with the standard. (See also Appendix E of this instruction.)
3. Initial Walkaround. After this familiarization, the inspection may begin with a brief walkaround inspection of those portions of the facility within the scope of the standard. Additional walkaround activity may be necessary after selection of the process unit(s). The purpose of the initial walkaround is to:
 - a. Give CSHOs a basic overview of the facility operations;
 - b. Allow CSHOs to observe potential hazards such as pipework in risk of impact, corroded or leaking equipment, unit or control room siting, and location of relief devices; and
 - c. Solicit input from the employee representative concerning potential PSM program deficiencies.
4. Personal Protective Equipment. In addition to normal inspection protective equipment, CSHOs conducting these inspections shall be provided with flame retardant coveralls for protection from flash fires and with

OSHA Instruction CPL 2-2.45A

177 10 1982
 Directorate of Compliance Programs

NIOSH-approved emergency escape respirators for use during any emergency conditions.

- a. CSHOs shall wear flame-retardant coveralls in all areas of the plant where there is potential for flash fires and as may be required by company policy.

NOTE: Clothing made of hazardous synthetic fabrics should not be worn underneath flame-retardant coveralls.

- b. CSHOs shall carry emergency escape respirators, when necessary, during the walkaround portion(s) of the inspection. CSHOs conducting these inspections shall have received proper training in the use of emergency escape respirators.
- c. CSHOs shall be provided with appropriate alert monitors (e.g., HCN, Cl₂) where such devices are necessary.
- d. CSHOs shall ensure that any still cameras and/or video cameras are intrinsically safe for use in the process areas being inspected.

- 5. Documentation to be Requested--General and Process-Related. At the conclusion of the opening conference, the CSHO shall request access to or copies of the documents listed at L.5.a. through L.5.m. below. Initially, to expedite the inspection process, only access to documents should be requested. During the inspection, as potential violations of the standard are observed, copies of the written documentation described below shall be requested to substantiate citations.

- a. OSHA 200 Logs for the past 3 years for both the employer and all process-related contractor employer(s).
- b. Employer's written plan of action regarding the implementation of employee participation.
- c. Written process safety information for the unit(s) selected (see L.7.), if available, such as flow diagrams, piping and instrumentation diagrams (P&ID's), and process narrative descriptions.

OSHA Instruction CPL 2-2.45A

SFC 28 1382
Directorate of Compliance Programs

NOTE: The employer is required to compile process safety information on a schedule consistent with the employer's schedule for conducting the process hazard analyses (PHA).

- d. Documented priority order and rationale for conducting process hazard analyses; copies of any process hazard analyses performed after May 25, 1987; team members; actions to promptly address findings; written schedules for actions to be completed; documentation of resolution of findings; documentation verifying communication to appropriate personnel; and 5-year revalidation of original PHA required by standard.
- e. Written operating procedures for safely conducting activities in each selected unit; annual certification that operating procedures are current and accurate; written procedures describing safe work practices for potentially hazardous operations, including (but not limited to) lockout/tagout, confined space entry, lifting equipment over process lines, capping over ended valves, opening process equipment or piping, excavation, and control over entrance into a facility of maintenance, laboratory, or other support personnel.
- f. Training records for initial and refresher training for all employees in the selected unit(s) whose duties involve operating a process; methods for determining the content of the training; methods for determining frequency of refresher training; certification of required knowledge, skills, and abilities to safely perform job for employees already involved in operating a process on May 26, 1992, who have not received initial training; and training material.
- g. 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; documentation of employee training.
- h. Written procedures and schedules to maintain the ongoing integrity of process equipment; the

OSHA Instruction CPL 2-2.45A

1002
Directorate of Compliance Programs

relevant portions of applicable manufacturers' instructions, codes, and standards; and inspection and tests performed on process equipment in the unit(s) selected.

- i. Hot work permit program and active permits issued for the unit(s) selected.
 - j. Written procedures to manage change to process chemicals, technology, equipment and procedures; and changes to facilities that affect a covered process.
 - k. Incident investigation reports for the unit(s) selected, resolutions and corrective actions.
 - l. Written emergency action plan including procedures for handling small releases and evidence of compliance with 1910.120(a), (p), and (q), where applicable.
 - m. The two most recent compliance audit reports, appropriate responses to each of the findings, and verifications that deficiencies have been corrected.
5. Documentation to be Requested--Contractor-Related. The following information relating to contractor compliance shall be requested:
- a. Documentation from Employer:
 - (1) Information relating to contract employers' safety performance and programs;
 - (2) Methods of informing contract employers of known potential hazards related to contractor's work and the process and applicable provisions of the emergency action plan;
 - (3) Safe work practices to control the entrance, presence and exit of contract employers and contract employees in covered process areas;
 - (4) Evaluation of contractor employer performance in fulfilling responsibilities required by the standard;

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

- (5) Contract employee injury and illness logs related to work in process areas; and
- (6) A list of unique hazards presented by contractors' work or hazards found in the workplace that have been reported to the employer.

b. Documentation from Contract Employer:

- (1) Records showing employees receive training in and understand safe work practices related to the process on or near which they will be working to perform their jobs safely;
- (2) Known potential fire, explosion or toxic release hazards related to job, and applicable provisions of emergency action plan; and
- (3) A list of unique hazards presented by contractors' work or hazards found in the workplace that have been reported to the employer.

NOTE: The documentation described at L.5. and L.6.a. may also be required of the contract employer, depending on the scope of the contract employer's activities.

7. Selection of Process(es). The team leader shall select one or more processes within which to evaluate compliance with the standard. This selection shall be based on the factors listed below, and shall be documented in the case file:

- a. Factors observed during the walkthrough;
- b. Incident reports and other history;
- c. Company priorities for or completed process hazard analyses (PHA);
- d. Age of the process unit;
- e. Nature and quantity of chemicals involved;
- f. Employee representative input;

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

g. Current hot work, equipment replacement, or other maintenance activities; and

h. Number of employees present.

M. Compliance Guidelines for Specific Provisions of 29 CFR 1910.119. Guidelines for assessing compliance with the provisions of the PSM standard are provided in Appendix A of this instruction.

1. CSHOs shall use the guidance contained in Appendix A during all enforcement activities related to the PSM standard.
2. Clarifications and interpretations are provided in Appendix B of this instruction.. Appendix B (or a subsequent revision) shall normally be the first point of reference in interpreting 29 CFR 1910.119.

NOTE: Appendix B will be updated on an ongoing basis through page changes to this instruction, as more interpretations are developed. CSHOs must therefore take care to ensure that their reference copies are up-to-date.

N. Citations. Citations for violations of the PSM standard shall be issued in accordance with the FOM, Chapters IV and V, with the following additional directions:

1. Classification. The requirements of the PSM standard are intended to eliminate or mitigate the consequences of releases of highly hazardous chemicals. The provisions of the standard present closely inter-related requirements, emphasizing the application of management controls when addressing the risks associated with handling or working near hazardous chemicals.
 - a. Any violation of the PSM standard, therefore, is a condition which could result in death or serious physical harm to employees.
 - b. Accordingly, violations of the PSM standard shall normally not be classified as "other-than-serious."

OSHA Instruction CPL 2-2.45A

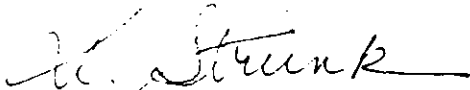
Directorate of Compliance Programs

2. Use of Appendix A. Appendix A, PSM Audit Guidelines, is constructed as a series of questions relating to each of the pertinent provisions of the standard.
 - a. The questions are designed to elicit a determination of "Yes" or "No" by the CSHO as to whether compliance with the provision has been met.
 - b. A determination of "No" for any provision indicates noncompliance; thus, any "No" shall normally result in a citation for a violation of that provision.
 - c. The CSHO shall thoroughly document each such determination in the case file.
- O. Non-Mandatory Appendices to this Instruction. This instruction contains two non-mandatory appendices that are designed to provide additional compliance assistance.
 1. Appendix E, Recommended Health Care Management Program Components for Process Safety Management, is still being developed and is designated as "Reserved."
 2. Appendix G, Recommended Guidelines for PQV Inspection Preparation, is intended as an aid to Regional and Area Offices in planning resources for PQV and other PSM-related inspections.
- P. Evaluation. Each Region shall develop a preliminary evaluation of the effectiveness of this program and submit it to the Directorate of Compliance Programs no later than September 30, 1993. The report shall include, at a minimum, the following items:
 1. The utility of the PSM audit guidelines used in Appendix A.
 2. An assessment of the accuracy of targeting information.
 3. An estimate of total resources (CSHO, supervisory, administrative and legal) that were required to conduct each inspection.

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

- Q. Recording in IMIS. Information about PSM-related inspections shall be recorded in IMIS following current instructions given in the IMIS manual. Refer to Appendix H of this instruction for additional guidance.



Dorothy L. Strunk
Acting Assistant Secretary

DISTRIBUTION: National, Regional, and Area Offices
All Compliance Officers
State Designees
NIOSH Regional Program Directors
7(c)(1) Consultation Project Managers
OSHA Training Institute

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

APPENDIX A

PSM AUDIT GUIDELINES

Purpose.

This appendix contains audit guidelines intended to assist the CSHO in investigating an employer's compliance with the PSM standard. It shall be used in conjunction with Appendix B, Clarifications and Interpretations of the PSM Standard, as the primary source of compliance guidance on 29 CFR 1910.119.

Structure.

The guidelines present a Program Summary, Quality Criteria References, and a Verification checklist for each of the PSM elements.

1. Guidelines for paragraphs **c**, **g**, **h**, **k**, **m**, and **n** are designed so that CSHOs who may not be specifically trained in chemical process plants or in the PSM standard can make a preliminary review of the required elements.
2. Guidelines for elements **d**, **e**, **f**, **i**, **j**, **l**, **o**, and **p** are oriented toward more detailed investigations.

Use of the Verification Checklist.

The verification of each program element is divided into three parts: *Records Review*, *On-Site Conditions* and *Interviews*.

1. The *Records Review* section describes the documentation of the programs as required by the PSM standard. During a preliminary inspection, the CSHO shall review the documentation for the entire PSM program to ascertain that all of the elements are developed.
2. Sections labeled *On-Site Conditions* and *Interviews* guide the CSHO in confirming that the programs are implemented. This confirmation involves *observing conditions and procedures*, and *interviewing the operators, maintenance personnel, engineering support staff, contractors and contractor employees*, as appropriate, to determine whether the implemented program matches the program outlined by the documentation.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

NOTE: Several questions in the "Interviews" sections refer to interviewing engineers. The PSM standard does not require an employer to employ engineers, and these questions should not be construed as imposing a new requirement that an employer do so. All questions in this appendix that refer to interviews of engineers shall be understood to mean "engineers, if any, or other qualified persons capable of providing the information requested."

3. The CSHO shall initially perform a representative number of observations and interviews for elements c, g, h, k, m, and n. A more detailed investigation will cover all 14 elements. During these detailed assessments, the CSHO shall review components from a representative number of processes, if multiple processes exist. To confirm implementation, the CSHO shall compare the conditions and the interview results with both the minimum requirements of the PSM standard and the program outlined by the employer's documents.

Audit Guideline Documentation.

As noted at P.2. of the body of this instruction, the Audit Guidelines are constructed as a series of questions relating to each of the pertinent provisions of the standard.

1. The questions are designed to elicit a determination of "Yes" or "No" by the CSHO as to whether compliance with the provision has been met. This shall be indicated in the column labeled Met Y/N. A "Y" or "Yes" in this column indicates the subsection meets requirements. An "N" or "No" indicates the employer does not meet the standard and an "NA" signifies that the subsection does not apply.
2. A determination of "No" for any provision indicates noncompliance; thus, any "No" shall normally result in a citation for a violation of that provision.
3. The CSHO shall thoroughly document each such determination in the case file.

The *Field Note Reference(s)* space is used to cross-reference the PSM subsection with the CSHO's field notes. Field notes need not be rewritten when using these guidelines. The CSHO may record field note page numbers, videotape frame identification, photograph identification, and other documentation that refers to the requirements of the standard's elements.

OSHA Instruction CPL 2-2.45A

OCC 100 1992

Directorate of Compliance Programs

Basic Audit Information.

In order to gather the information needed to audit the program, the CSHO shall answer the following questions for each element:

Who? What? When? Where? Why? and How?

1. *Who* are the officials responsible for developing and implementing each of the program elements?
2. *What* are the requirements and the contents of each program element?
3. *When* are the required actions for each element completed and when are they required to be completed?
4. *Where* have actions been implemented or changed?
5. *Why* have the implementation decisions and priorities been made as recorded in the PSM documentation?
6. *How* is the program implemented and how is the program's effectiveness evaluated and improved (monitoring performance, followup and closure of outstanding items, etc.)?

Interrelationship of Elements.

An essential part of verifying program implementation is to audit the flow of information and activities among the elements. When information in one element is changed or when action takes place in one element that affects other elements, the CSHO shall review a sample of the related elements to see if the appropriate changes and followup actions have taken place.

The following example demonstrates the interrelationship among the elements:

During a routine inspection of equipment (**Mechanical Integrity**), the maintenance worker discovers a valve that no longer meets the applicable code and must be changed. Because the type of valve is no longer made, a different type of valve must be selected and installed (**Management of Change**). The type of valve selected may mandate different steps for the operators (**Operating Procedures**) who will require training and verification in the new procedures (**Training**). The rationale for selecting the type of valve

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

must be made available for review by employees and their representatives (**Employee Participation**).

When the new valve is installed by the supplier (**Contractors**), it will involve shutting down part of the process (**Pre-startup Safety Review**) as well as brazing some of the lines (**Hot Work Permit**). The employer must review the response plan (**Emergency Planning**) to ensure that procedures are adequate for the installation hazards.

Although **Management of Change** provisions cover interim changes, after the new valve is in place the **Process Safety Information** will have to be updated before the **Process Hazard Analysis** is updated or revalidated, to account for potential hazards associated with the new equipment. Also, inspection and maintenance procedures and training will need to be updated (**Mechanical Integrity**).

In summary, 11 PSM elements can be affected by changing one valve. A CSHO would check a representative number of these 11 elements to confirm that the required followup activities have been implemented for the new valve.

Three key elements shall be routinely reviewed to verify that changes have been implemented. They are:

- Operating Procedures;
- Process Hazard Analysis; and
- Training.

These elements shall be crosschecked to see if they show that the changes have been followed through to completion.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (c): EMPLOYEE PARTICIPATION**I. PROGRAM SUMMARY**

The intent of this paragraph is to require employers to involve employees at an elemental level of the PSM program. Minimum requirements for an Employee Participation Program for PSM must include a written plan of action for implementing employee consultation on the development of process hazard analyses and other elements of process hazard management contained within 1910.119. The employer must also provide ready access to all the information required to be developed under the standard.

II. QUALITY CRITERIA REFERENCES

A. 1910.119(c): Employee Participation

III. VERIFICATION OF PROGRAM ELEMENTS

	Criteria Reference	Met Y/N
A. Records Review		
1. Does a written program exist regarding employee participation? FIELD NOTE REFERENCE(S):	.119(c) (1)	
2. Does the written program include consultation with employees and their representatives on the conduct and development of process hazard analyses and on the development of other elements in the PSM standard? FIELD NOTE REFERENCE(S):	.119(c) (2)	
3. Does the written program provide employees and their representatives access to process hazard analyses and all other information developed as required by the PSM standard? FIELD NOTE REFERENCE(S):	.119(c) (3)	
B. On-site Conditions		
Not applicable.		

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

C. Interviews 1. Based on interviews with a representative number of employees and their representatives, have they been consulted on the conduct and development of the process hazard analyses? FIELD NOTE REFERENCE(S):	.119(c) (2)	
2. Based on interviews with a representative number of employees and their representatives, have they been consulted on the development of other elements of the Process Safety Management program? FIELD NOTE REFERENCE(S):	.119(c) (2)	
3. Based on interviews with a representative number of employees and their representatives, have they been provided access to process hazard analyses and to all other information required to be developed by the PSM standard? (Ask about unreasonable delays in access to information and whether time is given during the working hours to access information required by the PSM standard.) FIELD NOTE REFERENCE(S):	.119(c) (3)	

OSHA Instruction CPL 2-2.45A

100 00 1992

Directorate of Compliance Programs

1910.119 (d): PROCESS SAFETY INFORMATION

I. PROGRAM SUMMARY

The intent of this paragraph is to provide complete and accurate information concerning the process which is essential for an effective process safety management program and for conducting process hazard analyses. Therefore in accordance with the schedule set forth in paragraph (e)(1) the employer is required to compile written process safety information on process chemicals, process technology, and process equipment before conducting any process hazard analysis.

II. QUALITY CRITERIA REFERENCES

- | | | |
|----|-----------------|----------------------------|
| A. | 1910.119(d): | Process Safety Information |
| B. | 1910.119(e)(1): | Process Hazard Analysis |
| B. | 1910.1200: | Hazard Communication |

III. VERIFICATION OF PROGRAM ELEMENTS

Criteria
ReferenceMet
Y/N

A. Records Review

1. Has written process safety information been compiled before conducting any process hazard analysis (PHA)?

.119(d)

FIELD NOTE REFERENCE(S):

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

2. Is information included pertaining to the hazards of the highly hazardous chemicals used or produced by the process, and does the information include at least: • toxicity information • PEL's • physical data • reactivity data • corrosivity data • thermal and chemical stability data • hazardous effects of inadvertent mixing of different materials that could foreseeable occur? NOTE: MSDS's meeting the requirements of 29CFR1910.1200(g) may be used to the extent they contain the information required. FIELD NOTE REFERENCE(S):	.119(d) (1) .1200 (g)	
3. Is information included concerning the technology of the process, and does it include at least: • a block flow diagram or simplified process flow diagram? • process chemistry? • maximum intended inventory? • safe upper and lower limits? • an evaluation of the consequences of deviations? (Where the original technical information no longer exists, it may be developed in conjunction with the PHA.) FIELD NOTE REFERENCE(S):	.119(d) (2)	
4. Is information included pertaining to equipment in the process, and does it include at least: • materials of construction? • piping and instrument diagrams (P&ID's)? • electrical classification? • relief system design and design basis? • ventilation system design? • design codes and standards employed? • material and energy balances for processes built after May 26, 1992? • safety systems (e.g. interlocks, detection or suppressions systems)? FIELD NOTE REFERENCE(S):	.119(d) (3)(i)	

OSHA Instruction CPL 2-2.45A

SEP 23 1992
 Directorate of Compliance Programs

5. Has the employer documented that equipment complies with recognized, generally accepted good engineering practices? (Review the documentation for evidence that compliance with the appropriate consensus standards has been researched.) FIELD NOTE REFERENCE(S):	.119(d) (3)(ii)	
6. Has the employer determined and documented that existing equipment designed and constructed in accordance with codes, standards, or practices no longer in general use are designed, maintained, inspected, tested, and operating in a safe manner? (Documentation may be through methods such as: documenting successful prior operation procedures; documenting that the equipment is consistent with the appropriate editions of codes and standards; or performing an engineering analysis to determine that the equipment is appropriate for its intended use.) FIELD NOTE REFERENCE(S):	.119(d) (3) (iii)	
B. On-site Conditions 1. Do observations of a representative sample of process chemicals and equipment indicate that the process information is complete? (Information that does not correspond to the actual conditions demonstrates incomplete information. Check critical equipment and components to see if they have been properly identified.) FIELD NOTE REFERENCE(S):	.119(d)	
2. Do observations of a representative sample of process components indicate that the process complies with recognized and generally accepted good engineering practice? (Review a representative number of safety devices such as pressure relief devices for proper sizing according to the maximum anticipated pressure.) FIELD NOTE REFERENCE(S):	.119(d) (3)(ii)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Do observations of a representative sample of the existing equipment designed and constructed according to codes, standards, or practices no longer in general use indicate that this equipment is inspected and is operated in a safe manner (as documented by the employer)? FIELD NOTE REFERENCE(S):	.119(d) (3) (iii)	
C. Interviews Process Hazard Analysis (PHA) Team: 1. Based on interviews with a representative number of PHA team members, was the process safety information complete before the process hazard analysis was conducted? FIELD NOTE REFERENCE(S):	.119(d)	
Operators: 2. Based on interviews with a representative number of operators, is MSDS information readily available to the operators who work with hazardous materials? FIELD NOTE REFERENCE(S):	.1200	
Engineers (if any; or other qualified persons capable of providing the information requested; see NOTE, p. A-2): 3. Based on interviews with a representative number of engineers, has the employer documented that the process equipment complies with recognized and generally accepted good engineering practice? (Ask about the technical bases for design and selection of equipment, the materials of construction, electrical classifications, relief devices sizing versus maximum anticipated pressures, installation procedures to assure equipment meets design specifications, etc.) FIELD NOTE REFERENCE(S):	.119(d) (3)(ii)	

For more information on Process Safety Information, see Appendix D, references 8. and 9.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (e): PROCESS HAZARD ANALYSIS**I. PROGRAM SUMMARY**

The intent of this paragraph is to require the employer to develop a thorough, orderly, systematic approach for identifying, evaluating and controlling processes involving highly hazardous chemicals. Minimum requirements include: (1) Setting a priority order and conducting analyses according to the required schedule; (2) Using an appropriate methodology to determine and evaluate the process hazards; (3) Addressing process hazards, previous incidents with catastrophic potential, engineering and administrative controls applicable to the hazards, consequences of failure of controls, facility siting, human factors, and a qualitative evaluation of possible safety and health effects of failure of controls on employees; (4) Performing PHA by a team with expertise in engineering and process operations, the process being evaluated, and the PHA methodology used; (5) Establishing a system to promptly address findings and recommendations, assure recommendations are resolved and documented, document action taken, develop a written schedule for completing actions, and communicate actions to operating, maintenance and other employees who work in the process or might be affected by actions; (6) Updating and revalidating PHA's at least every 5 years; and (7) Retaining PHA's and updates for the life of the process.

II. QUALITY CRITERIA REFERENCES

A. 1910.119(e): Process Hazard Analysis

III. VERIFICATION OF PROGRAM ELEMENTS

Criteria
Reference

Met
Y/N

A. Records Review

1. Has the employer determined and documented a priority order for conducting initial PHA's based on a rationale that includes at least these factors:

- the extent of process hazards
- number of potentially affected employees
- age of process
- operating history?

FIELD NOTE REFERENCE(S):

.119(e)
(1)

OSHA Instruction CPL 2-2.45A

17-03-1992

Directorate of Compliance Programs

2. Are the initial PHA's for processes covered by the PSM standard being performed as soon as possible? FIELD NOTE REFERENCE(S):	.119(e) (1)	
3. Does the priority schedule for PHA's assure that all initial PHA's will be performed by 5/26/97 and that: • No less than 25% of the PHA's shall be completed by 5/26/94? • No less than 50% of the PHA's shall be completed by 5/26/95? • No less than 75% of the PHA's shall be completed by 5/26/96? (PHA's completed after May 26, 1987 which meet the requirements of this paragraph are acceptable as initial PHA's; they must be updated and revalidated at least every 5 years.) FIELD NOTE REFERENCE(S):	.119(e) (1)	
4. Does the hazard evaluation use one or more of the following PHA methodologies: • What-if? • Checklist? • What-if/Checklist? • Hazard & Operability Study (HAZOP)? • Failure Mode and Effects Analysis (FMEA)? • Fault Tree Analysis (FTA)? • Other appropriate methodology? (See Appendix B for a discussion of appropriate methodologies). FIELD NOTE REFERENCE(S):	.119(e) (2)	

OSHA Instruction CPL 2-2.45A

SEP 25 1991
Directorate of Compliance Programs

5. Does the PHA address the following: • The hazards of the process? FIELD NOTE REFERENCE(S): • Previous incidents with likely potential for catastrophic consequences? FIELD NOTE REFERENCE(S): • Consequences of failure of engineering and administrative controls? (For example, potential injury, maximum release of hazardous materials, property damage, etc.) FIELD NOTE REFERENCE(S):	.119(e) (3)	
---	------------------------	--

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

5. (Continued) Does the PHA address the following: • Engineering and administrative controls applicable to the hazards and their interrelationships? (Such controls may include appropriate application of detection methodologies to provide early warning of releases; inventory reduction; substitution of less hazardous materials; protective systems such as deluges, monitors, foams; increased separation distances; modification of the process temperature or pressure; redundancy in instrumentation; etc.) FIELD NOTE REFERENCE(S): • Facility siting? (Review calculations, charts, and other documents that verify facility siting has been considered. For example, safe distances for locating control rooms may be based on studies of the individual characteristics of equipment involved such as: types of construction of the room, types and quantities of materials, types of reactions and processes, operating pressures and temperatures, presence of ignition sources, fire protection facilities, capabilities to respond to explosions, drainage facilities, location of fresh air intakes, etc.) FIELD NOTE REFERENCE(S): • Human factors? (Such factors may include a review of operator/process and operator/equipment interface, the number of tasks operators must perform and the frequency, the evaluation of extended or unusual work schedules, the clarity and simplicity of control displays, automatic instrumentation versus manual procedures, operator feedback, clarity of signs and codes, etc.) FIELD NOTE REFERENCE(S): • A qualitative evaluation of a range of possible safety and health effects of failure of controls on employees in the workplace? FIELD NOTE REFERENCE(S):	.119(e) (3)	
--	------------------------	--

OSHA Instruction CPL 2-2.45A

381 11/19/92
Directorate of Compliance Programs

6. Are the process hazard analyses performed by teams with expertise in engineering and process operations, including at least one employee with experience and knowledge specific to the process being evaluated and one member knowledgeable in the specific PHA methodology used? FIELD NOTE REFERENCE(S):	.119(e) (4)	
7. Has a system been established to promptly address the team's findings and recommendations? FIELD NOTE REFERENCE(S): Review a representative sample of the documentation. Has the system been able to: • Assure that the recommendations are resolved and documented in a timely manner? FIELD NOTE REFERENCE(S): • Document actions to be taken? FIELD NOTE REFERENCE(S): • Complete actions as soon as possible? FIELD NOTE REFERENCE(S): • Develop a written schedule of when actions are to be completed? FIELD NOTE REFERENCE(S): • 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? FIELD NOTE REFERENCE(S):	.119(e) (5)	
8. Are the PHA's updated and revalidated at least every five years by a qualified team meeting the requirements in paragraph (e)(4), to assure that the process hazard analysis is consistent with the current process? FIELD NOTE REFERENCE(S):	.119(e) (6)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

9. Are all initial PHA's, updates or revalidations, and documented resolutions of recommendations kept for the life of the process? FIELD NOTE REFERENCE(S):	.119(e) (7)	
B. On-site Conditions 1. Do observations of a representative sample of process-related equipment indicate that obvious hazards have been identified, evaluated, and controlled? (For example, hydrocarbon or toxic gas monitors and alarms are present; electrical classifications are consistent with flammability hazards; destruct systems such as flares are in place and operating; control room siting is adequate or provisions have been made for blast resistant construction, pressurization, alarms, etc.; pressure relief valves and rupture disks are properly designed and discharge to a safe area; pipework is protected from impact; etc.) FIELD NOTE REFERENCE(S):	.119(e) (1)	
2. Do observations of a representative sample of process-related equipment indicate that PHA recommendations have been promptly resolved? FIELD NOTE REFERENCE(S):	.119(e) (5)	
C. Interviews PHA Team Members: 1. Based on interviews with a representative number of the PHA team members, are the PHA methodologies used appropriate for the complexity of the process? FIELD NOTE REFERENCE(S):	.119(e) (1)	
2. Based on interviews with a representative number of the PHA team members, is the priority order for conducting PHA's based on the extent of the process, the number of potentially affected employees, the age of the process, and the operating history of the process? FIELD NOTE REFERENCE(S):	.119(e) (1)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Based on interviews with a representative number of the PHA team members, have the following been addressed: • The hazards of the process? • Previous incidents with likely potential for catastrophic consequences? • Engineering and administrative controls applicable to the hazards? • Consequences of control failures? • Facility siting? • Human factors? (Ask about shift rotations, extended schedules, and other possible sources of error.) • A qualitative evaluation of a range of possible safety and health effects of failure of controls on employees in the workplace? FIELD NOTE REFERENCE(S):	.119(e) (3)	
4. Based on interviews with a representative number of the PHA team members, do the members have the appropriate expertise in engineering, process operations, and the process methodology used? Does one member of the team have experience and knowledge in the specific process? FIELD NOTE REFERENCE(S):	.119(e) (4)	
5. Based on interviews with a representative number of the PHA team members, does the system established by the employer address the team's findings and recommendations promptly? FIELD NOTE REFERENCE(S):	.119(e) (5)	
Operators and maintenance: 6. Based on interviews with a representative number operator and maintenance employees, have the PHA's addressed the recognized hazards of the process and previous incidents which had a likely potential for catastrophic consequences? FIELD NOTE REFERENCE(S):	.119(e) (3)	
7. Based on interviews with operator, maintenance, and other employees who may be affected by PHA recommendations, have actions taken to resolve PHA findings been communicated to these employees? FIELD NOTE REFERENCE(S):	.119(e) (5)	

For more information on PHA, see Appendix D, references: 8.; 9.; 10.; 11.; 12.; 13.; 14.; 15.; 16.; 17.; 25.; 26.; 27; Part I, Section UG-125; 31.; 32.; and 33.

OSHA Instruction CPL 2-2.45A

1994 11 1992
 Directorate of Compliance Programs

1910.119 (f): OPERATING PROCEDURES								
I. PROGRAM SUMMARY The intent of this paragraph is to provide clear instruction for conducting activities involved in covered processes that are consistent with the process safety information. The operating procedures must address steps for each operating phase, operating limits, safety and health considerations, and safety systems and their functions.								
II. QUALITY CRITERIA REFERENCES <table> <tr> <td>A. 1910.119(f)</td> <td>D. 1910.1000</td> </tr> <tr> <td>B. 1910.120</td> <td>E. 1910.1200</td> </tr> <tr> <td>C. 1910.147</td> <td></td> </tr> </table>			A. 1910.119(f)	D. 1910.1000	B. 1910.120	E. 1910.1200	C. 1910.147	
A. 1910.119(f)	D. 1910.1000							
B. 1910.120	E. 1910.1200							
C. 1910.147								
III. VERIFICATION OF PROGRAM ELEMENTS	Criteria Reference	Met Y/N						
A. Records Review 1. Do written operating procedures exist for each covered process? Do the procedures provide clear instructions for conducting activities safely? FIELD NOTE REFERENCE(S):	.119(f) (1)							
2. Do the operating instructions address, as a minimum, steps for each operating phase, including: • Initial start-up? • Normal operations? • Temporary operations? • Emergency shutdowns? • Conditions requiring emergency shutdown? • Assignment of shutdown responsibility to qualified operators? • Emergency operations? • Normal shutdown? • Start-ups following a turnaround or emergency shutdown? FIELD NOTE REFERENCE(S):	.119(f) (1)(i)							

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Do the operating procedures include operating limits that outline consequences of process deviation and steps required to correct or avoid deviations? FIELD NOTE REFERENCE(S):	.119(f) (1)(ii)	
4. Have safety and health considerations been included in the operating procedures? Do they include at a minimum: • Properties of, and hazards presented by, chemicals used in the process? • Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment? • Control measures to be taken if physical contact or airborne exposure occurs? • Quality control for raw materials and control of hazardous chemical inventory levels? • Any special or unique hazards? FIELD NOTE REFERENCE(S):	.119(f) (1) (iii)	
5. Are safety systems and their functions included in the operating procedures? FIELD NOTE REFERENCE(S):	.119(f) (1)(iv)	
6. Are the operating instructions consistent with the process safety information? FIELD NOTE REFERENCE(S):	.119(f) (1)	
7. Are operating procedures readily accessible to employees who work in or maintain a process? FIELD NOTE REFERENCE(S):	.119(f) (2)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

8. Are operating procedures reviewed as often as necessary to assure that they reflect current operating practice? Are they certified annually by the employer that they are current and accurate? Do they reflect current operating practice that have resulted from changes in: • Process chemicals? • Technology? • Equipment? • Facilities? FIELD NOTE REFERENCE(S):	.119(f) (3)	
9. Have safe work practices been developed and implemented for employees and contractors to control hazards during operations such as: • Lockout/tagout? • Confined space entry? • Opening process equipment or piping? • Control over entrance into a facility by maintenance, contractor, laboratory or other support personnel? FIELD NOTE REFERENCE(S):	.119(f) (4)	
B. On-site Conditions 1. Does observation of a representative sample of processes indicate that the written operating procedures are being implemented? FIELD NOTE REFERENCE(S):	.119(f) (1)	
2. Does observation of a representative sample of processes indicate that the written operating procedures are readily accessible to employees who work or maintain a process? FIELD NOTE REFERENCE(S):	.119(f) (2)	
3. Does observation of a representative sample of processes indicate that operating procedures reflect current practice, including changes that result from process chemicals, technology, equipment, and facilities? (Observe to see if actual procedures match the written operating procedures.) FIELD NOTE REFERENCE(S):	.119(f) (3)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

4. Does observation of representative operations indicate that safe work practices have been implemented for company and contractor employees? Do such work practices include, where appropriate: • Lockout/tagout? • Confined space entry? • Opening process equipment or piping? • Control over entrance into a facility by maintenance, contractor, laboratory, and other support personnel? FIELD NOTE REFERENCE(S):	.119(f) (4)	
C. Interviews 1. Based on interviews with a representative number of operators, are the written operating procedures implemented for each covered process? FIELD NOTE REFERENCE(S):	.119(f) (1)	
2. Based on interviews with a representative number of operators, do operating procedures provide clear instructions for safely conducting activities? (Specifically ask for conditions requiring emergency shutdown, the operating limits of a particular process or item of equipment, what might occur if a deviation from those limits should take place, steps to avoid the deviation, and precautions necessary to prevent exposure to hazardous chemicals.) FIELD NOTE REFERENCE(S):	.119(f) (1)	
3. Based on interviews with a representative number of employees who work in or maintain a process, are the operating procedures readily accessible? FIELD NOTE REFERENCE(S):	.119(f) (2)	
4. Based on interviews with a representative number of operators and maintenance employees, do the operating procedures reflect current operating practice? FIELD NOTE REFERENCE(S):	.119(f) (3)	

OSHA Instruction CPL 2-2.45A

SEP 14 1992
Directorate of Compliance Programs**1910.119 (g): TRAINING****I. PROGRAM SUMMARY**

The intent of this paragraph helps employees understand the nature and causes of problems arising from process operations, and increases employee awareness with respect to the hazards particular to a process. An effective training program significantly reduces the number and severity of incidents arising from process operations, and can be instrumental in preventing small problems from leading to a catastrophic release. Minimum requirements for an effective training program include: Initial Training, Refresher Training, and Documentation.

II. QUALITY CRITERIA REFERENCES

- A. 1910.119(g): Training
- B. 1910.119(f)(1): Operating procedures

III. VERIFICATION OF PROGRAM ELEMENTS

Criteria Reference

Met
Y/N**A. Records Review**.119(g)
(1)(i)

1. For employees involved in operating a process do initial and refresher training records exist? Do the records contain the identity of the employee, the date of the training, and the means used to verify that the employee understood the training?

FIELD NOTE REFERENCE(S):

2. Has each employee been trained before being involved in a newly assigned process (except employees involved in operating a process prior to 5/26/92)?

.119(g)
(1)(i)

FIELD NOTE REFERENCE(S):

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. If initial training has not been given to employees involved in operating a process prior to 5/26/92, is there written certification that they have the required knowledge, skills and abilities to safely carry out the duties and responsibilities specified in the operating procedures? (Review the documents to make sure the certification has not be invalidated by a change in duties.) FIELD NOTE REFERENCE(S):	.119(g) (1)(ii)	
4. Has each employee involved in operating a process been trained in an overview of the process and the operating procedures including: • Steps for each operating phase? Initial startup, normal operations, temporary operations, emergency shutdown, emergency operations, normal shutdown, and startup following a turnaround or emergency shutdown • Operating limits? Consequences of deviations and steps required to avoid deviations • Safety and health considerations? Properties and hazards of chemicals used and precautions for preventing exposure. • Safety systems and their functions? FIELD NOTE REFERENCE(S):	.119(g) (1)(i)	
5. Has the employer consulted with employees involved in operating the process to determine the appropriate frequency for refresher training? Is the frequency at least once every 3 years? FIELD NOTE REFERENCE(S):	.119(g) (2)	
B. On-site Conditions Verification is not required.	.119(g) (1) or (2)	

OSHA Instruction CPL 2-2.45A

JUL 24 1992

Directorate of Compliance Programs

C. Interviews 1. Based on interviews with a representative number of employees, has their training emphasized specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to their tasks? FIELD NOTE REFERENCE(S):	.119(g) (1)(i)	
2. Based on interviews with employees named as having provided consultation, has the employer consulted with employees involved in operating the process to determine the appropriate frequency of refresher training? FIELD NOTE REFERENCE(S):	.119(g) (2)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (h) CONTRACTORS**I. PROGRAM SUMMARY**

The intent of this paragraph is to require employers who use contractors to perform work in and around processes that involve highly hazardous chemicals to establish a screening process so that they hire and use contractors who accomplish the desired job tasks without compromising the safety and health of employees at a facility. The contractor must assure that contract employees are trained on performing the job safely, of the hazards related to the job, and applicable provisions of the emergency action plan.

II. QUALITY CRITERIA REFERENCES

- A. 1910.119(h)
- B. 1910.119(f)(4)
- C. 1910.119(n)

III. VERIFICATION OF PROGRAM ELEMENTSCriteria
ReferenceMet
Y/N**A. Records Review - Employer's Program**.119(h)
(1)

1. Does the program include all contractors performing maintenance or repair, turnaround, major renovation or specialty work on or adjacent to covered processes?

(Contractors performing incidental services which do not influence process safety such as janitorial work, food and drink services, laundry, delivery, and other supply services need not be included.)

FIELD NOTE REFERENCE(S):

2. Is the information regarding the contractor's safety performance and programs obtained and evaluated for selection of contractors?

.119(h)
(2)(i)

FIELD NOTE REFERENCE(S):

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Are the contract employers informed of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the processes? FIELD NOTE REFERENCE(S):	.119(h) (2)(ii)	
4. Are contract employers informed of the applicable provisions of the emergency action plan required by .119(n)? FIELD NOTE REFERENCE(S):	.119(h) (2) (iii)	
5. Have safe work practices to control the entrance, presence and exit of contract employers and contract employees in covered process areas been developed and implemented? FIELD NOTE REFERENCE(S):	.119(h) (2)(iv) .119(f) (4)	
6. Are contract employers evaluated for their performance in fulfilling their obligations to: • Assure their employees are trained in safe work practices needed to perform the job? • Assure their employees are instructed in the known potential fire, explosion, or toxic release hazards related to the job and the applicable provisions of the emergency action plan? • Document the required training and the means to verify their employees have understood the training? • Assure their employees follow the facility safety rules and work practices? • Advise the employer of unique hazards presented by the contractor's work? FIELD NOTE REFERENCE(S):	.119(h) (2)(v)	
7. Does the employer maintain a contract employee injury and illness log related to the contractor's work in process areas? FIELD NOTE REFERENCE(S):	.119(h) (2)(vi)	
Records Review - Contractor's Programs 8. Are all contractor employees trained in the work practices necessary to perform their jobs safely? FIELD NOTE REFERENCE(S):	.119(h) (3)(i)	

OSHA Instruction CPL 2-2.45A

10/10/1992
 Directorate of Compliance Programs

9. Is each contract employee instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the processes and applicable provisions of the emergency action plan? FIELD NOTE REFERENCE(S):	.119(h) (3)(ii)	
10. Is there documentation that each contract employee has received and understands the required training? FIELD NOTE REFERENCE(S):	.119(h) (3) (iii)	
11. Do the contract employee training records contain the following: • The identity of the employee? • The date of the training? • The means used to verify that the training was understood? FIELD NOTE REFERENCE(S):	.119(h) (3) (iii)	
12. Are there means to assure that contract employee follow the safety rules of the facility, including safe work practices required in .119(f)(4)? (Review evidence of enforcement by the contractor.) FIELD NOTE REFERENCE(S):	.119(h) (3)(iv) .119(f) (4)	
13. Is the employer advised of any unique hazards presented by the contract employer's work or any hazards found by the contract employer's work? FIELD NOTE REFERENCE(S):	.119(h) (3)(v)	
B. On-site Conditions 1. Based on a representative sample of observations of contractor employees, has the employer's program to control their entrance, presence, and exit been implemented? FIELD NOTE REFERENCE(S):	.119(h) (2)(iv)	

OSHA Instruction CPL 2-2.45A

JAN 18 1992

Directorate of Compliance Programs

2. Based on a representative sample of observations of contractor employees, do they follow the safety rules of the facility? (These rules include the employer's safe work practices such as lockout/tagout, confined space entry, and opening process equipment or piping; they may also include other rules such as excavation procedures or use of PPE.) FIELD NOTE REFERENCE(S):	.119(h) (3)(iv)	
C. Interviews 1. Based on interviews with contractor employers, have they been informed of the known fire, explosion, or toxic release hazards related to their work and the processes in which they are involved? FIELD NOTE REFERENCE(S):	.119(h) (2)(ii)	
2. Based on interviews with contractor employers, have they been informed of the applicable provisions of the employer's emergency action plan? FIELD NOTE REFERENCE(S):	.119(h) (2) (iii)	
3. Based on interviews with contractor employers and employees, have work practices to control their entrance, presence, and exit of covered process areas been implemented? FIELD NOTE REFERENCE(S):	.119(h) (2)(iv)	
4. Based on interviews with the contractor employer, has the employer evaluated the contractor's performance in fulfilling the obligations required in .119(h)(3)? FIELD NOTE REFERENCE(S):	.119(h) (2)(v)	
5. Based on interviews with a representative number of contractor employees, are they being instructed in the known potential fire, explosion, or toxic release hazards related to their work and the processes in which they are involved? FIELD NOTE REFERENCE(S):	.119(h) (3)(ii)	

OSHA Instruction CPL 2-2.45A

777 28 1992
 Directorate of Compliance Programs

6. Based on interviews with a representative number of contractor employees, have they been instructed in the applicable provisions of the emergency action plan? (Ask them to explain the plan and evacuation procedures.) FIELD NOTE REFERENCE(S):	.119(h) (3)(ii)	
7. Based on interviews with a representative number of contractor employees, has the contract employer assured that they follow the safety rules of the facility? (Ask how safe work practices, entry restrictions for the facility, and use of required PPE are enforced.) FIELD NOTE REFERENCE(S):	.119(h) (3)(iv)	

For additional information on Contractors, see Appendix D, reference 16.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (i): PRE-STARTUP SAFETY REVIEW**I. PROGRAM SUMMARY**

The intent of this paragraph is to make sure that, for new facilities and for modified facilities when the modification necessitates a change to process safety information, certain important considerations are addressed before any highly hazardous chemicals are introduced into the process. Minimum requirements include that the pre-startup safety review confirm the following: construction and equipment is in accordance with design specifications; safety, operating, maintenance, and emergency procedures are in place and adequate; for new facilities, a PHA has been performed and recommendations resolved or implemented; modified facilities meet the requirements of paragraph (1), management of change; and training of each employee involved in the process has been completed.

II. QUALITY CRITERIA REFERENCES

- A. 1910.119(i): Pre-startup Safety Review
 B. 1910.119(l): Management of Change

III. VERIFICATION OF PROGRAM ELEMENTS**A. Records Review**

1. Has a pre-startup safety review been performed for all new facilities and for modified facilities when the modification is significant enough to require a change in process safety information?

FIELD NOTE REFERENCE(S):

.119(i)
(1)

2. Do pre-startup safety reviews confirm that prior to the introduction of highly hazardous chemicals to a process:

- Construction and equipment is in accordance with design specifications?

FIELD NOTE REFERENCE(S):

- Safety, operating, maintenance, and emergency procedures are in place and adequate?

FIELD NOTE REFERENCE(S):

.119(i)
(2)

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

2. (Continued) Do pre-startup safety reviews confirm that prior to the introduction of highly hazardous chemicals to a process: • For new facilities, a PHA has been performed and recommendations resolved or implemented before startup? FIELD NOTE REFERENCE(S): • Modified facilities meet requirements of paragraph (1)? FIELD NOTE REFERENCE(S): • Training of each employee involved in operating the process has been completed? FIELD NOTE REFERENCE(S):	.119(i) (2)	
On-site Conditions 1. Do observations of new or modified facilities indicate that prior to the introduction of highly hazardous chemicals: • Construction and equipment is in accordance with design specifications? • Safety, operating, maintenance, and emergency procedures are in place and adequate? FIELD NOTE REFERENCE(S):	.119(i) (2)	
C. Interviews [See NOTE, p. A-2.] 1. Based on interviews with a representative sample of operators, maintenance employees, and engineers, can it be confirmed that the construction and equipment are in accordance with design specifications prior to introducing highly hazardous chemicals to a process? FIELD NOTE REFERENCE(S):	.119(i) 2(i)	
2. Based on interviews with a representative sample of operators, maintenance employees, and engineers, are safety, operating, maintenance, and emergency procedures in place prior to introduction of highly hazardous chemicals into a process? Are these procedures adequate? FIELD NOTE REFERENCE(S):	.119(i) 2(ii)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Based on interviews with a representative sample of operators, maintenance employees, and engineers, is a PHA performed and are recommendations resolved prior to a startup that introduces highly hazardous chemicals into a new process? FIELD NOTE REFERENCE(S):	.119(i) 2(iii)	
4. Based on interviews with a representative sample of operators, maintenance employees, and engineers, do modified facilities meet requirements of paragraph (1), Management of Change prior to introducing a highly hazardous chemical? FIELD NOTE REFERENCE(S):	.119(i) 2(iii)	
5. Based on interviews with a representative sample of operators, is training completed for each employee involved in operating the process prior to the introduction of a highly hazardous chemical? FIELD NOTE REFERENCE(S):	.119(i) 2(iv)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (j): MECHANICAL INTEGRITY**I. PROGRAM SUMMARY**

The intent of this paragraph is to assure that equipment used to process, store, or handle highly hazardous chemical is designed, constructed, installed, and maintained to minimize the risk of releases of such chemicals. This requires that a mechanical integrity program be in place to assure the continued integrity of process equipment. The elements of a mechanical integrity program include the identification and categorization of equipment and instrumentation, development of written maintenance procedures, training for process maintenance activities, inspection and testing, correction of deficiencies in equipment that are outside acceptable limits defined by the process safety information, and development of a quality assurance program.

II. QUALITY CRITERIA REFERENCES

A. .119(j): Mechanical Integrity

III. VERIFICATION OF PROGRAM ELEMENTS

Criteria
Reference

Met
Y/N

A. Records Review

1. Does the written mechanical integrity program include?
 - Pressure vessels and storage tanks
 - Piping systems and components such as valves
 - Relief and vent systems and devices
 - Emergency shutdown systems
 - Controls (including monitoring devices and sensors, alarms and interlocks)
 - Pumps

.119(j)
(1)

FIELD NOTE REFERENCE(S):

2. Are there written procedures to maintain the on-going integrity of process equipment? Does the documentation indicate the procedures have been implemented?

.119(j)
(2)

FIELD NOTE REFERENCE(S):

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Has training been provided to each employee involved in maintaining the on-going integrity of process equipment in the following: • An overview of the process and its hazards? • Procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner? (Review certification documents for employees doing non-destructive tests, welding on pressure vessels, etc., where these certifications are required.) FIELD NOTE REFERENCE(S):	.119(j) (3)	
4. Are inspections and tests performed on each item of process equipment included in the program? FIELD NOTE REFERENCE(S):	.119(j) (4)(i)	
5. Do inspection and testing procedures follow good engineering practices? FIELD NOTE REFERENCE(S):	.119(j) (4)(ii)	
6. Are inspection and test frequencies consistent with the manufacturer's recommendation and good engineering practice? Are inspections and tests performed more frequently if determined necessary by operating experience? FIELD NOTE REFERENCE(S):	.119(j) (4) (iii)	
7. Is there documentation of each inspection and test that has been performed including all of the following: • Date of the inspection or test? • Name of person performing the procedure? • Serial number or other identifier of equipment on which procedure was performed? • Description of inspection or test performed? • Results of inspection or test? FIELD NOTE REFERENCE(S):	.119(j) (4)(iv)	

OSHA Instruction CPL 2-2.45A

350 24 1002

 Directorate of Compliance Programs

8. Are deficiencies in equipment that are outside limits (as defined in process safety information) corrected before further use or in a safe and timely manner when necessary means are taken to assure safe operation? FIELD NOTE REFERENCE(S):	.119(j) (5)	
9. In the construction of new plants and equipment, does the employer assure that equipment as it is fabricated is suitable for the process for which it will be used? FIELD NOTE REFERENCE(S):	.119(j) (6)(i)	
10. Have appropriate checks and inspections been made to assure equipment is installed properly and consistent with design specifications and manufacturer's instructions? (Include contractor supplied equipment.) FIELD NOTE REFERENCE(S):	.119(j) (6)(ii)	
11. Does the employer assure that maintenance materials, spare parts, and equipment are suitable for the process application for which they are used? (Include contractor supplied equipment.) FIELD NOTE REFERENCE(S):	.119(j) (6) (iii)	
B. On-site Conditions 1. Do observations of a representative sample of process equipment indicate deficiencies outside acceptable limits? (Compare process safety information criteria with the conditions of the equipment found in the process.) FIELD NOTE REFERENCE(S):	.119(j) (5)	
2. If new plants or equipment are being constructed, do observations indicate that the equipment as it is fabricated is suitable for the process application? FIELD NOTE REFERENCE(S):	.119(j) (6)(i)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Do observations of a representative sample of maintenance materials, spare parts, and equipment indicate that they are suitable for the process application for which they will be used? FIELD NOTE REFERENCE(S):	.119(j) (6) (iii)	
C. Interviews Engineers (if any; or other qualified persons capable of providing the information requested; see NOTE, p. A-2): 1. Based on interviews with a representative number of engineers, have procedures to maintain the on-going integrity of the process equipment been implemented for: • Pressure vessels and storage tanks? • Piping systems and components such as valves? • Relief and vent systems and devices? • Emergency shutdown systems? • Controls (including monitoring devices and sensors, alarms and interlocks)? • Pumps? (Ask about the possibility of safety critical equipment being inadvertently rendered inoperative. For example, a relief device might be isolated by closing an upstream valve.) FIELD NOTE REFERENCE(S):	.119(j) (2)	
2. Based on interviews with a representative number of engineers, do the inspection and testing procedures follow recognized and generally accepted good engineering practice? Has prior operating experience indicated a need for a more frequent test and inspection schedule than has been implemented? FIELD NOTE REFERENCE(S):	.119(j) (4)	
3. Based on interviews with a representative number of engineers, are equipment deficiencies corrected before use when they are outside the acceptable limits? If not, are the deficiencies corrected in a timely manner and are necessary means taken to assure safe operation? FIELD NOTE REFERENCE(S):	.119(j) (5)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

4. Based on interviews with a representative number of engineers, has the employer assured that, for new plants and equipment, the equipment as it is fabricated is suitable for the process application? Are appropriate checks and inspections made to assure equipment is installed properly and consistent with design specifications and manufacturer's instructions? Are maintenance materials, spare parts, and equipment suitable for the process application for which they will be used? (Ask about contractor supplied items.) FIELD NOTE REFERENCE(S):	.119(j) (6)	
Maintenance: 5. Based on interviews with a representative number of maintenance employees, have the written procedures for maintaining the on-going integrity of process equipment been implemented? FIELD NOTE REFERENCE(S):	.119(j) (2)	
6. Based on interviews with a representative number of employees involved in maintaining the on-going integrity of the process, have they been trained to assure they can perform their tasks in a safe manner? Did the training include an overview of the process, its hazards, and procedures applicable to the job? (Determine if certification, specialized training, or unique qualifications are required.) FIELD NOTE REFERENCE(S):	.119(j) (3)	
7. Based on interviews with a representative number of maintenance employees, do test and inspection procedures follow recognized and generally accepted good engineering practices? Is the frequency of inspections and tests consistent with applicable manufacturer's recommendations and good engineering practices? Are more frequent inspections and tests necessary due as indicated by prior operating experience? FIELD NOTE REFERENCE(S):	.119(j) (4)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

8. Based on interviews with a representative number of maintenance employees, are equipment deficiencies that are outside acceptable limits corrected before further use? If not, are corrections made in a timely manner and are necessary means taken to assure operation? FIELD NOTE REFERENCE(S):	.119(j) (5)	
9. Based on interviews with a representative number of maintenance employees, are maintenance materials, spare parts and equipment suitable for the process application for which they are intended? (Ask about availability and use of substitutes.) FIELD NOTE REFERENCE(S):	.119(j) (6)	

For additional information on Mechanical Integrity, see Appendix D, references: 9.; 18.; 19.; 20.; 21.; 22.; 23.; 27.; 28.; 29.; and 34.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (k): HOT WORK PERMIT**I. PROGRAM SUMMARY**

The intent of this paragraph is to require employers to control, in a consistent manner, nonroutine work conducted in process areas. Specifically, this subparagraph is concerned with the permitting of hot work operations associated with welding and cutting in process areas.

Minimum requirements include: that the employer issue a hot work permit for hot work operations conducted on or near a covered process and that hot work permits shall document compliance with the fire prevention and protection requirements of 29 CFR 1910.252(a).

II. QUALITY CRITERIA REFERENCES

- A. 1910.119(k): Hot Work Permit
 B. 1910.252(a): Fire Prevention and Protection

III. VERIFICATION OF PROGRAM ELEMENTS

	Criteria Reference	Met Y/N
A. Records Review 1. Have hot work permits been issued for all hot work operations conducted on or near a process covered by this standard? FIELD NOTE REFERENCE(S):	.119(k) (1)	
2. Do the hot work permits indicate the date(s) authorized for hot work performed? FIELD NOTE REFERENCE(S):	.119(k) (2)	
3. Do the hot work permits describe the object on which the hot work is to be performed? FIELD NOTE REFERENCE(S):	.119(k) (2)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

4. Have the hot work permits been kept on file until the hot work operations were complete? FIELD NOTE REFERENCE(S):	.119(k) (2)	
5. Have the hot work permits identified openings, cracks and holes where sparks may drop to combustible materials below? FIELD NOTE REFERENCE(S):	.252(a) (2)(i)	
6. Have the hot work permits described the fire extinguishers required to handle any emergencies? FIELD NOTE REFERENCE(S):	.252(a) (2)(ii)	
7. Have the hot work permits assigned fire watchers whenever welding is performed in locations where other than a minor fire might develop? FIELD NOTE REFERENCE(S):	.252(a) (2) (iii)	
8. Are the hot work permits being authorized, preferably in writing, by the "individual" responsible for all welding and cutting operations? Is authorization preceded by site inspection and designation of appropriate precautions? FIELD NOTE REFERENCE(S):	.252(a) (2)(iv) & .252(a) (2) (xiii) (A)	
9. Have the hot work permits described precautions associated with combustible materials on floors or floors, walls, partitions, ceilings or roofs of combustible construction? FIELD NOTE REFERENCE(S):	.252(a) (2)(v) & .252(a) (2)(ix)	
10. Has hot work permitting been successful in prohibiting welding in unauthorized areas, in sprinklered buildings while such protection is impaired, in the presence of explosive atmospheres, and in storage areas for large quantities of readily ignitable materials? FIELD NOTE REFERENCE(S):	.252(a) (2)(vi)	

OSHA Instruction CPL 2-2.45A

SEP 16 1992
 Directorate of Compliance Programs

11. Have the hot work permits required relocation of combustibles where practicable and covering with flameproofed covers where not practicable? FIELD NOTE REFERENCE(S):	.252(a) (2) (vii)	
12. Have hot work permits identified for shutdown any ducts or conveyors systems that may convey sparks to distant combustibles? FIELD NOTE REFERENCE(S):	.252(a) (2) (viii)	
13. Have hot work permits required precautions whenever welding on components (e.g., steel members, pipes, etc,) that could transmit heat by radiation or conduction to unobserved combustibles? FIELD NOTE REFERENCE(S):	.252(a) (2)(x) & .252(a) (2) (xii)	
14. Have hot work permits identified hazards associated with welding on walls, partitions, ceilings or roofs with combustible coverings or welding on walls or panels of sandwich-type construction? FIELD NOTE REFERENCE(S):	.252(a) (2)(xi)	
15. Has management established areas and procedures for safe welding and cutting based on fire potential? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii)	
16. Has management designated the "individual" responsible for authorizing cutting and welding operations in process areas? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii) (B)	
17. Has management ensured that welders, cutters and supervisors are trained in the safe operation of their equipment? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii) (C)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

18. Has management advised outside contractors working on their site about all hot work permitting programs? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii) (D)	
19. Has the Supervisor determined if combustibles are being protected from ignition prior to welding by moving them, shielding them, or scheduling welding around their production? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiv) (A)(B) & (C)	
20. Has the Supervisor, prior to welding, secured authorization from the responsible "individual" designated by management? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiv) (D)	
B. On-Site Conditions 1. Conduct checks of <u>current</u> welding and cutting operations to ensure compliance with the requirements of 1910.119(k) and 1910.252(a). The twenty items listed above in "Records Review" may serve as an audit checklist. A <u>management representative</u>, the "<u>individual</u>" <u>responsible</u> for welding operations and the <u>supervisor</u> should all be invited to participate in this on-site check. FIELD NOTE REFERENCE(S):	.119(k) & .252(a)	
C. Interviews - Employees and Contractors 1. Based on interviews with a representative number of maintenance and contractor employees, has the Supervisor visited welding work operations to verify that: • Welders have approval for safe go ahead prior to welding? • Fire protection and extinguishing equipment is properly located at the work site? • Fire watches are functional, where required? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiv) (E), (F) & (G)	

OSHA Instruction CPL 2-2.45A

SEP 28 1994
Directorate of Compliance Programs

2. Based on interviews with a representative number of maintenance and contractor employees, have hot work permits been issued for all hot work operations conducted on or near a process covered by this standard? FIELD NOTE REFERENCE(S):	.119(k) (1)	
3. Based on interviews with a representative number of maintenance and contractor employees, have the hot work permits been kept on file until the hot work operations were complete? FIELD NOTE REFERENCE(S):	.119(k) (2)	
4. Based on interviews with a representative number of maintenance and contractor employees, have the hot work permits identified openings, cracks and holes where sparks may drop to combustible materials below? FIELD NOTE REFERENCE(S):	.252(a) (2)(i)	
5. Based on interviews with a representative number of maintenance and contractor employees, have the hot work permits assigned fire watchers whenever welding is performed in locations where other than a minor fire might develop? FIELD NOTE REFERENCE(S):	.252(a) (2) (iii)	
6. Based on interviews with a representative number of maintenance and contractor employees, are the hot work permits being authorized, preferably in writing, by the "individual" responsible for all welding and cutting operations? Is authorization preceded by site inspection and designation of appropriate precautions? FIELD NOTE REFERENCE(S):	.252(a) (2)(iv) & .252(a) (2) (xiii) (A)	
7. Based on interviews with a representative number of maintenance and contractor employees, have the hot work permits described precautions associated with combustible materials on floors or floors, walls, partitions, ceilings or roofs of combustible construction? FIELD NOTE REFERENCE(S):	.252(a) (2)(v) & .252(a) (2)(ix)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

8. Based on interviews with a representative number of maintenance and contractor employees, has hot work permitting been successful in prohibiting welding in: • Unauthorized areas? • Sprinklered buildings while such protection is impaired? • The presence of explosive atmospheres? • Storage areas for large quantities of readily ignitable materials? FIELD NOTE REFERENCE(S):	.252(a) (2)(vi)	
9. Based on interviews with a representative number of maintenance and contractor employees, have the hot work permits required relocation of combustibles where practicable and covering with flameproofed covers where not practicable? FIELD NOTE REFERENCE(S):	.252(a) (2) (vii)	
10. Based on interviews with a representative number of maintenance and contractor employees, have hot work permits identified for shutdown any ducts or conveyors systems that may convey sparks to distant combustibles? FIELD NOTE REFERENCE(S):	.252(a) (2) (viii)	
11. Based on interviews with a representative number of maintenance and contractor employees, have hot work permits required precautions whenever welding on components (e.g., steel members, pipes, etc.) that could transmit heat by radiation or conduction to unobserved combustibles? FIELD NOTE REFERENCE(S):	.252(a) (2)(x) & .252(a) (2) (xii)	
12. Based on interviews with a representative number of maintenance and contractor employees, have hot work permits identified hazards associated with welding on walls, partitions, ceilings or roofs with combustible coverings or welding on walls or panels of sandwich-type construction? FIELD NOTE REFERENCE(S):	.252(a) (2)(xi)	

OSHA Instruction CPL 2-2.45A

SEP 08 1992

Directorate of Compliance Programs

13. Based on interviews with a representative number of maintenance and contractor employees, has management established areas and procedures for safe welding and cutting based on fire potential? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii)	
14. Based on interviews with a representative number of maintenance and contractor employees, has management designated the "individual" responsible for authorizing cutting and welding operations in process areas? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii) (B)	
15. Based on interviews with a representative number of maintenance and contractor employees, has management ensured that welders, cutters and supervisors are trained in the safe operation of their equipment? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii) (C)	
16. Based on interviews with contractors and contractor employees, has management advised outside contractors working on the site about all hot work permitting programs? FIELD NOTE REFERENCE(S):	.252(a) (2) (xiii) (D)	
17. Based on interviews with a representative number of maintenance and contractor employees, has the Supervisor determined if combustibles are being protected from ignition prior to welding by moving them, shielding them, or scheduling welding around their production. FIELD NOTE REFERENCE(S):	.252(a) (2) (xiv) (A)(B) & (C)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (I): MANAGEMENT OF CHANGE

I. PROGRAM SUMMARY

The intent of this paragraph is to require management of all modifications to equipment, procedures, raw materials and processing conditions other than "replacement in kind" by identifying and reviewing them prior to implementation of the change. Minimum requirements for management of change include: establishing written procedures to manage change; addressing the technical basis, impact on safety and health, modification to operating procedures, necessary time period, and authorizations required; informing and training employees affected; and updating process safety information and operating procedures or practices.

II. QUALITY CRITERIA REFERENCES

A. 1910.119 (1): Management of Change

III. VERIFICATION OF PROGRAM ELEMENTS

	Criteria Reference	Met Y/N
A. Records Review 1. Are there written procedures for managing changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures and changes to facilities that affect a covered process? (Review procedures that address responsibilities, steps for assessing risks and approving changes, requirements for reviewing designs for temporary and permanent changes, steps needed to verify that modifications have been made as designed, variance procedures, time limit authorizations for temporary changes, and steps required to return the process to status quo after temporary changes.) FIELD NOTE REFERENCE(S):	.119(1) (1)	
2. Do the procedures assure that the technical basis for the proposed change is addressed prior to any change? FIELD NOTE REFERENCE(S):	.119(1) (2)(i)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Do the procedures assure that the impact of the change on safety and health is addressed prior to any change? FIELD NOTE REFERENCE(S):	.119(1) (2)(ii)	
4. Do the procedures assure that modifications to operating procedures is addressed prior to any change? FIELD NOTE REFERENCE(S):	.119(1) (2) (iii)	
5. Do the procedures assure that the necessary time period for the change is addressed prior to any change? FIELD NOTE REFERENCE(S):	.119(1) (2)(iv)	
6. Do the procedures assure that the authorization requirements for the proposed change are addressed prior to any change? FIELD NOTE REFERENCE(S):	.119(1) (2)(v)	
7. Are employees involved in operating a process, and maintenance and contract employees whose job tasks will be affected by change informed of, and trained in, the change prior to start-up of process or affected part of process? FIELD NOTE REFERENCE(S):	.119(1) (3)	
8. Is the process safety information required by paragraph (d) updated if changed? FIELD NOTE REFERENCE(S):	.119(1) (4)	
9. Are the operating procedures or practices required by paragraph (f) updated if changed? FIELD NOTE REFERENCE(S):	.119(1) (5)	

OSHA Instruction CPL 2-2.45A

1000-1382
 Directorate of Compliance Programs

B. On-site Conditions 1. Do observations of new or recently modified process chemicals, technology, equipment, or procedures (except "replacement in kind") indicate that the Management of Change procedures have been implemented? (Determine if records are available to support the procedures for new or revised processes found in the facility.) FIELD NOTE REFERENCE(S):	.119(1) (1)	
C. Interviews Operators, Maintenance, and Contractor Employees: 1. Based on interviews with operators, maintenance employees and contractor employees, are procedures implemented to manage changes to existing process chemicals, technology, equipment, facilities, and procedures? FIELD NOTE REFERENCE(S):	.119(1) (1)	
2. Based on interviews with operators, maintenance employees and contractor employees, is training in process changes provided to employees whose job tasks will be affected by the changes prior to start-up? FIELD NOTE REFERENCE(S):	.119(1) (3)	

For additional information on Management of Change, see Appendix D, reference 9., Chapter 7.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (m): INCIDENT INVESTIGATIONS**I. PROGRAM SUMMARY**

The employer is required to investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace. An investigation shall be initiated no later than 48 hours following the incident. An investigation team shall be established and a report prepared which includes: 1) Date of incident 2) Date investigation began 3) Description of incident 4) Factors that contributed to the incident 5) Recommendations from the investigation. The employer is required to establish a system to promptly address the incident report findings and recommendations, documenting all resolutions and corrective actions. Incident reports shall be reviewed with all affected personnel whose job tasks are relevant to the investigation and retained for five years.

II. QUALITY CRITERIA REFERENCES

A. 1910.119(m): Incident Investigations

III. VERIFICATION OF PROGRAM ELEMENTS

Criteria Reference

Met
Y/N**A. Records Review**

1. Has each incident been investigated which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemicals in the workplace?

FIELD NOTE REFERENCE(S):

.119(m)
(1)

2. Have incident investigations been initiated as promptly as possible, but not later than 48 hours following the incident?

FIELD NOTE REFERENCE(S):

.119(m)
(2)

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Have incident investigation teams been established? Do the teams contain at least one person knowledgeable in the process involved in the incident, and other members with appropriate knowledge and experience to thoroughly investigate and analyze the incident? Has a contractor employee been included in the team if the incident involved work of the contractor? FIELD NOTE REFERENCE(S):	.119(m) (3)	
4. Have incident investigation reports been prepared at the conclusion of the investigation which include at minimum: • Date of the incident? • Date the inspection began? • A description of the incident? • The factors that contributed to the incident? • Any recommendations resulting from the investigation? FIELD NOTE REFERENCE(S):	.119(m) (4)	
5. Has a system been established to promptly address and resolve the incident investigation report findings and recommendations? FIELD NOTE REFERENCE(S):	.119(m) (5)	
6. Have resolutions and corrective actions from the incident investigation reports been documented? FIELD NOTE REFERENCE(S):	.119(m) (5)	
7. Have incident investigation reports been reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees, where applicable? FIELD NOTE REFERENCE(S):	.119(m) (6)	
8. Are incident investigation reports retained for five years? FIELD NOTE REFERENCE(S):	.119(m) (7)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

B. On-site Conditions 1. Do observations of a representative sample of process components involved in incident investigations indicate that recommendations have been resolved? (Compare the corrective actions outlined in the investigation documentation with the actual equipment, procedures, material use, etc.) FIELD NOTE REFERENCE(S):	.119(m) (5)	
C. Interviews 1. Based on interviews with a representative number of operators, maintenance employees and contractor employees, have all incidents that resulted in or could reasonably have resulted in a catastrophic release of highly hazardous chemicals in the workplace, been investigated? FIELD NOTE REFERENCE(S):	.119(m) (1)	
2. Based on interviews with a representative number of the members of past investigation teams, do the teams contain at least one person knowledgeable in the process involved in the incident, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident? Was a contractor employee included in the team if the incident involved work of the contractor? FIELD NOTE REFERENCE(S):	.119(m) (3)	
3. Based on interviews with a representative number of employees whose job tasks are relevant to the past incident investigation findings, have the investigation reports been reviewed with the affected personnel? FIELD NOTE REFERENCE(S):	.119(m) (6)	

For additional information on Incident Investigations, see Appendix D, references 9. and 24.

OSHA Instruction CPL 2-2.45A

SEP 14 1981
 Directorate of Compliance Programs

1910.119 (n): EMERGENCY PLANNING AND RESPONSE

I. PROGRAM SUMMARY

The intent of this paragraph is to require the employer to address what actions employees are to take when there is an unwanted release of highly hazardous chemicals. The employer must establish and implement an emergency action plan in accordance with the provisions of 29 CFR 1910.38(a) and include procedures for handling small releases. Certain provisions of the hazardous waste and emergency response standard, 29 CFR 1910.120(a), (p), and (q), may also apply.

[NOTE: 1910.120(a) addresses scope, application, and definitions for the entire standard. 1910.120(p) addresses treatment, storage, and disposal (TSD) facilities under the Resource Conservation and Recovery Act (RCRA). 1910.120(q) addresses requirements for facilities that are not RCRA TSD's, where there is the potential for an emergency incident involving hazardous substances. Cleanup operations--including corrective actions and post-emergency response cleanup--are covered by 1910.120(b) through (o). For further guidance, refer to the forthcoming directive on 29 CFR 1910.120.]

II. QUALITY CRITERIA REFERENCES

- | | | | |
|----|-----------------------|----|------------|
| A. | 1910.119(n) | D. | 1910.165 |
| B. | 1910.38(a) | E. | 1910.1200 |
| C. | 1910.120(a), (p), (q) | F. | 1910.36(b) |

III. VERIFICATION OF PROGRAM ELEMENTS

Criteria Reference	Met Y/N

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

A. Records Review 1. Has an emergency action plan been established and implemented for the entire plant in accordance with the requirements of 1910.38? Does the plan address the following: • Escape procedures and routes? • Procedures for post-evacuation employee accounting? • Preferred means to report emergencies? • Duties and procedures of employees who: • Remain to operate critical equipment? • Perform rescue and medical duties? • The names for persons or locations to contact for more action plan information? • Employee alarm systems? FIELD NOTE REFERENCE(S):	.119(n) or .38(a) (2)	
2. Is the plan written if the facility has more than ten employees? FIELD NOTE REFERENCE(S):	.38(a) (1)	
3. Is there sufficient number of persons designated and trained to assist in the safe and orderly emergency evacuation of employees? FIELD NOTE REFERENCE(S):	.38(a) (5)(i)	
4. Is the plan reviewed with each employee covered by the plan: initially when the plan is developed; and whenever the employees' responsibilities or designated action under the plan change; and whenever the plan is changed? FIELD NOTE REFERENCE(S):	.38(a) (5)(ii)	
5. Does the emergency action plan cover procedures for handling small releases? FIELD NOTE REFERENCE(S):	.119(n)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

6. Is an alarm system established and implemented which complies with 1910.165? Are the alarms: • Distinctive for each purpose of the alarm? • Capable of being perceived above ambient noise and light levels by all employees in the affected portions of the workplace? • Distinctive and recognizable as a signal to evacuate the work area or perform actions designated under the plan? • Maintained in operating condition? • Tested appropriately and restored to normal operating condition as soon as possible after test? • Non-supervised systems tested not less than every two months? • Supervised systems tested at least annually? • Serviced, maintained, and tested by appropriately trained persons? • Unobstructed, conspicuous and readily accessible, if they are manual alarm systems? FIELD NOTE REFERENCE(S):	.165 (b-e)	
7. Does the written emergency response plan meet the requirements of 1910.120 (a), (p), and (q), if appropriate? (See the NOTE at I., Program Summary. Clean-up operations required by a governmental body are addressed in .120(a); treatment, storage, and disposal (TSD) facilities under the Resource Conservation and Recovery Act are addressed in .120(p); and .120(q) addresses requirements for emergency response no matter where they occur, except that it does not cover employees engaged in operations at TSD facilities or hazardous waste sites.) FIELD NOTE REFERENCE(S):	.120(a) .120(p) .120(q)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

8. If employees are engaged in emergency response (except clean-up operations), does the plan address the following: • Coordination with outside parties? • Personnel roles, lines of authority, training, and communication? • Emergency recognition and prevention? • Safe distances and places of refuge? • Site security and control? • Evacuation routes and procedures? • Decontamination? • Emergency medical treatment and first aid? • Emergency alerting and response procedures? • Critique of response and followup? • PPE and emergency equipment? FIELD NOTE REFERENCE(S):	.120(q)	
B. On-site Conditions 1. Do observations of a representative sample of alarm systems indicate that they comply with the requirements in .165(b-e)? Are the alarms: • Distinctive for each purpose of the alarm? • Capable of being perceived above ambient noise and light levels by all employees in the affected portions of the workplace? • Distinctive and recognizable as a signal to evacuate the work area or perform actions designated under the plan? • Maintained in operating condition? • Tested appropriately and restored to normal operating condition as soon as possible after test? (Be present for an alarm test if possible or review video if available.) • Tested no greater than every two months? • Serviced, maintained, and tested by appropriately trained persons? • Unobstructed, conspicuous and readily accessible, if they are manual alarm systems? FIELD NOTE REFERENCE(S):	.165 (b-e)	
2. Do observations of the evacuation routes indicate that they are not blocked, locked, or barricaded? FIELD NOTE REFERENCE(S):	.36(b) (4)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Do observations of the evacuation routes indicate that there are readily visible signs for evacuation routes leading to safe locations? FIELD NOTE REFERENCE(S):	.36(b) (5)	
4. Do observations of a representative sample of the evacuation route signs during dark conditions indicate that they are adequately illuminated? FIELD NOTE REFERENCE(S):	.36(b) (6)	
C. Interviews 1. Based on interviews with employees who have been identified as likely to discover releases or assigned other emergency response duties, are they provided training? Is the training based on the duties they are expected to perform? FIELD NOTE REFERENCE(S):	.120(q) (6)	
2. Based on interviews with employees who are likely to discover hazardous substance releases, can they demonstrate competency in the provisions listed in the first responder awareness level: • Understanding what hazardous substances are, and the risks associated with them in an incident? • Understanding potential outcomes associated with an emergency when hazardous substances are present? • Ability to recognize the presence of hazardous substances in an emergency? • Ability to identify the hazardous substances, if possible? • Understanding the role of the first responder awareness individual in the employer's emergency response plan, including site security and control and the U.S. Dept. of Transportation's Emergency Response Guidebook? • Ability to realize the need for additional resources, and make appropriate notifications to the communication center? FIELD NOTE REFERENCE(S):	.120(q) (6)(i)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Based on interviews with employees who will take defensive action in containing and controlling a release as part of the response, can they demonstrate the competencies for a first responder operations level: • Knowledge of the basic hazard and risk assessment techniques? • Knowledge of how to select and use proper PPE provided to them? • Understanding of basic hazardous materials terms? • Knowledge of how to perform basic containment, confinement, and control operations within the capability of their unit? • Knowledge of how to implement basic decontamination procedures? • Knowledge of relevant standard operating procedures and termination procedures for a response? FIELD NOTE REFERENCE(S):	.120(q) (6)(ii)	
4. Based on interviews with employees who will take offensive action in containing and controlling a release as part of the response, can they demonstrate the competencies for a hazardous materials (HAZMAT) technician: • Knowledge of how to implement the employer's emergency response plan? • Knowledge of the classification, identification, and verification of known and unknown materials using field survey instruments and equipment? • Ability to function within an assigned role in the Incident Command System? • Knowledge of how to select and use proper specialized chemical PPE provided to them? • Understanding of hazard and risk assessment techniques? • Ability to perform advanced control, containment, and/or confinement operations within the capability of their unit? • Understanding of how to implement decontamination procedures? • Understanding of termination procedures? • Understanding of basic chemical and toxicological terminology and behavior? FIELD NOTE REFERENCE(S):	.120(q) (6) (iii)	
5. Based on interviews with a representative number of operator and maintenance employees, do they know the emergency action plan to protect themselves in an emergency? FIELD NOTE REFERENCE(S):	.38(a)	

OSHA Instruction CPL 2-2.45A

1992
Directorate of Compliance Programs**1910.119 (o): COMPLIANCE AUDITS****I. PROGRAM SUMMARY**

The intent of this paragraph is to require employers to self-evaluate the effectiveness of their PSM program by identifying deficiencies and assuring corrective actions. Minimum requirements include: audits at least every three years; maintenance of audit reports for at least the last two audits; audits conducted by at least one person knowledgeable in the process; documentation of an appropriate response to each finding; documentation that the deficiencies found have been corrected.

II. QUALITY CRITERIA REFERENCES

- A. 1910.119(o): Compliance Audits
- B. 1910.119(c): Employee Participation

III. VERIFICATION OF PROGRAM ELEMENTS

	Criteria Reference	Met Y/N
A. Records Review 1. Has the employer certified in writing that there has been an audit of compliance with PSM at least every three years? FIELD NOTE REFERENCE(S):	.119(o) (1)	
2. Do the audit reports include an evaluation of all the required paragraphs of the PSM standard? FIELD NOTE REFERENCE(S):	.119(o) (1)	
3. Was the compliance audit conducted by at least one person who was knowledgeable in the process? FIELD NOTE REFERENCE(S):	.119(o) (2)	
4. Has a report of the findings been developed for each audit? FIELD NOTE REFERENCE(S):	.119(o) (3)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

5. Has the employer promptly determined and documented an appropriate response to each of the findings? FIELD NOTE REFERENCE(S):	.119(o) (4)	
6. Does the employer document that deficiencies have been corrected? FIELD NOTE REFERENCE(S):	.119(o) (4)	
7. Has the employer retained the two most recent compliance audit reports? FIELD NOTE REFERENCE(S):	.119(o) (5)	
B. On-site Conditions No observations are required; on-site conditions will be cited under other paragraphs.	.119(o) (4)	
C. Interviews 1. Based on interviews with auditors, are they knowledgeable in processes? FIELD NOTE REFERENCE(S):	.119(o) (2)	
2. Based on interviews with a representative number of employees and their designated representatives, do they have access to compliance audit information? FIELD NOTE REFERENCE(S):	.119(c) (3)	

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

1910.119 (p): TRADE SECRETS

I. PROGRAM SUMMARY

The intent of this paragraph is to require employers to provide all information necessary to comply with the standard to personnel developing paragraphs (d), (e), (f), (n) and (o) without regard to possible trade secrets. In addition, employees and their designated representatives shall have access to trade secret information contained within documents required to be developed by the standard.

II. QUALITY CRITERIA REFERENCES

- A. 1910.119(p): Trade Secrets
 B. 1910.1200: Hazard Communication

III. VERIFICATION OF PROGRAM ELEMENTS

A. Records Review

1. Has all information necessary been provided to those persons responsible for compiling the process safety information (paragraph d), those assisting in development of the PHA (paragraph e), those responsible for developing the operating procedures (paragraph f), and those involved in incident investigations (paragraph m) and emergency planning and response (paragraph n), and compliance audits (paragraph o) been without regard to possible trade secret status of such information?

FIELD NOTE REFERENCE(S):

.119(p)
(1)

2. Do employees and their designated representatives have access to trade secret information contained in the PHA and to other documents required to be developed by the standard, subject to the provisions set forth in 1910.1200(i)(1) through (i)(12)?

FIELD NOTE REFERENCE(S):

.119(p)
(3)

B. On-site Conditions

Not applicable.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

C. Interviews Employees involved in specific duties: 1. Based on interviews with a representative number of employees involved in compiling the process safety information, developing PHA's, developing operating procedures, investigating incidents, planning and responding to emergencies, and auditing compliance, has all information necessary been provided to them without regard to possible trade secret status of such information? FIELD NOTE REFERENCE(S):	.119(p) (1)	
Employees and Representatives: 2. Based on interviews with a representative number of employees and their designated representatives, do they have access to trade secret information contained within the PHA and other documents required to be developed by the standard? (Note that this access is subject to the provisions set forth in 1910.1200(i)(1).) FIELD NOTE REFERENCE(S):	.119(p) (3)	

OSHA Instruction CPL 2-2.45A
SEP 28 1992
Directorate of Compliance Programs

Appendix B

Clarifications and Interpretations of the PSM Standard

The guidance contained in this appendix is provided for compliance assistance. It shall be followed in interpreting the PSM standard for compliance purposes. Unless otherwise noted, all paragraph citations refer to 29 CFR 1910.119.

Where possible, clarifications and interpretations have been presented in a question-and-answer format.

NOTE: OSHA plans to include additional clarifications and interpretations in this appendix through future page changes to this instruction.

(a) Application

(a) Registration

Do covered establishments have to register with OSHA?

No. There is no requirement that establishments covered by the standard register with or otherwise notify OSHA.

(a) Explosives--fireworks manufacture

How does the PSM standard apply to pyrotechnics (fireworks) and explosives?

The PSM standard amended the scope of 29 CFR 1910.109, Explosives and blasting agents, by revising paragraph (k), which requires that the manufacturer of explosives and pyrotechnics comply with 29 CFR 1910.119. As defined at 1910.109(a)(10), pyrotechnics are commonly referred to as fireworks. Employers who manufacture explosives and fireworks must comply with both 29 CFR 1910.109 and 1910.119.

The applicability of 29 CFR 1910.109 to employers who manufacture fireworks is delineated in OSHA Instruction

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

CPL 2.73, Fireworks Manufacturers: Compliance Policy. In accordance with that directive, a fireworks plant employer can be cited for violation of 29 CFR 1910.109 with reference to certain National Fire Protection Association (NFPA) standards in NFPA 1124, Code for the Manufacture, Transportation and Storage of Fireworks.

What is the role of the Bureau of Alcohol, Tobacco and Firearms (BATF) vis-a-vis the PSM standard and fireworks manufacture?

By 27 CFR 55 Subpart K, BATF regulates the storage, including minimum distances, of explosive materials including fireworks in the workplace. As such, BATF limits the amount of special fireworks, pyrotechnic composition, and explosive materials used to assemble fireworks in processing building to no more than 500 pounds. Also, the maximum quantity of flash powder permitted by BATF in any fireworks process building is 10 pounds. These BATF limitations should not be confused with the applicability of the PSM standard to any amount of fireworks being manufactured.

(a) Laboratories

Does the PSM standard apply to laboratory and research operations?

A laboratory or research operation involving at least the threshold quantity of one or more highly hazardous chemicals is subject to the PSM standard.

(a) Flammable liquids

Are processes involving flammable liquids (e.g., ethyl alcohol) covered by the standard?

Processes involving flammable liquids (e.g., in a distillation process) in quantities at or above 10,000 lbs. are covered. Quantities of flammable liquids in storage are considered a part of the process if the storage tanks are interconnected with the process, or if they are sufficiently near the process that an explosion, fire, or release could reasonably involve the storage area combined with the process in quantities sufficient to meet the threshold amount of 10,000 lbs.

OSHA Instruction CPL 2-2.45A

55-25192
Directorate of Compliance Programs

Flammable liquids that are stored on a tank farm (e.g., a wholesale gasoline regional tank farm) where only transferring and storage are done are not covered by the PSM standard. They are, however, covered under 1910.106.

(a)(1)(ii)(A) Tote tanks

350-gallon tote tanks containing flammable liquids are used at a facility to refuel vehicles. Are they covered by the standard?

No. 1910.119(a)(1)(ii)(a) exempts hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., gasoline for vehicle refueling) if such fuels are not part of a process containing another highly hazardous chemical covered by the standard. They are, however, covered under 1910.106.

(a)(2)(i) Retail facilities

What is the definition of "retail facilities" that are exempted from coverage by the PSM standard?

With respect to enforcement of the PSM standard, a retail facility means an establishment that would otherwise be subject to the PSM standard at which more than half of the income is obtained from direct sales to end users.

(a)(2)(iii) Meaning of "facility"

Can a facility contain more than one process?

A facility can include multiple processes. If multiple processes are interconnected, they may be considered a single process for purposes of the standard.

OSHA Instruction CPL 2-2.45A

452 35 392
Directorate of Compliance Programs

(b) Definitions

(b) "Process"

What are "aggregate threshold quantities"?

In accordance with the second sentence of the definition of "process," quantities of a particular hazardous chemical contained in vessels that are interconnected--and in unconnected vessels that may be adversely affected due to an incident at a nearby process--may be combined to determine whether the threshold level of a hazardous chemical has been reached. If the threshold level is exceeded by the combination of the amount in separate tanks and interconnected vessels, then all of these may be considered one process.

(b) "Hot work"

"**Spark-producing operations**" include operations which use flame- or spark-producing equipment--such as grinders, welding, burning, or brazing--that are capable of igniting flammable vapors or gases.

(c) Employee participation

(c)(2) Consultation

What does consult mean? Can the employer simply inform the employees?

The intent of consult is to exchange information, solicit input and participation from the employees and their representatives. It requires more than simply informing employees.

The employer needs to consult with employees and employee representatives and develop information concerning knowledge and expertise of individual employees in various processes and aspects of the facility in order to ensure substantive input by employees and their representatives in developing

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

the written action plan, process hazard analyses, and access to information required under the standard.

The standard requires employers to consult with "employees and their representatives." Is the term broad enough to include a representative of the international union? A consultant designated by the union local or international?

The standard requires consultation with "employees and their representatives". The term "employee representative" is intended to mean **union representative** where a union exists, or an employee-designated representative in the absence of a union. The term is to be construed broadly, and may include the local union, the international union, or an individual designated by these parties, such as the safety and health committee representative at the site or a non-employee consultant. In the absence of a union, employees have a right under the standard to designate a representative to participate in the consultation process.

(c) (3) Access

What does "access" mean? Does this mean simply make it available at a central location? Does the employer have to make copies for employees if requested?

The intent of **access** under this standard is for the information to be made available for employees and their representatives in a reasonable manner. Reasonable access may require providing copies or loaning documents. The trade secret provision of the standard permits the employer to require confidentiality agreements before providing the information.

(d) Process safety information

(d) Retention of information

How long must the employer maintain process safety information?

In order to demonstrate compliance with this paragraph, and to meet the purpose of the standard, the process safety information is to be kept for the lifetime of the process, and updated whenever changes other than "replacement in kind" are made.

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

(e) Process hazard analysis

(e)(1) PHA priority

What rationale must employers use to determine the priority for conducting the process hazard analyses? May the rationale include age, history, extent of employee exposure, etc.?

The appropriate priority for conducting PHA's is to be determined by using all of the criteria identified in this paragraph, e.g., extent of the process hazards (catastrophic potential), age of the process, number of potentially exposed employees, and operating history. Other appropriate factors may also be considered in establishing the priority. The documentation required by this paragraph shall demonstrate the underlying rationale for the prioritization.

(e)(5) Timeliness

Employers must "promptly" address the problems identified in the PHA in a "timely manner," and complete actions "as soon as possible." What time frame did OSHA intend here?

The standard's intent is for the employer to take corrective action as soon as possible. As soon as possible means that the employer shall proceed with all due speed, considering the complexity of the recommendation and the difficulty of implementation. OSHA expects employers to develop a schedule for completion of corrective actions and to document the basis for the amount of time needed.

(e)(7) Retention

How long must the process hazard analyses, updates, and revalidations be retained?

For the life of the process.

OSHA Instruction CPL 2-2.45A
SEP 2 1992
Directorate of Compliance Programs

(f) Operating procedures

(f)(1)(iii)(c) "Control measures to be taken if physical contact or airborne exposure occurs"

Does this mean first aid, or industrial hygiene services?

It primarily means first aid procedures or emergency medical attention, which should be consistent with the information on the material safety data sheet.

(g) Training

(g)(3) Training documentation

This paragraph requires the employer to make sure that operators "understand" the training provided to them under this section. Is some method of testing required?

There must be some positive means taken by the employer to determine if employees have understood their training and are capable of adhering to the current operating procedures of the process. This could include the administration of a written test, although the standard does not require that a formal written test be used. Other means of ascertaining comprehension of the training, such as on-the-job demonstrations, etc., are acceptable, as long as they are adequately documented.

(j) Mechanical integrity

(j)(2) Written procedures

Do these written procedures need to be specific to each vessel, each type of vessel, or each group of equipment types listed?

The procedures need to be specific to the type of vessel or equipment. Identical or very similar vessels and items of equipment in similar service need not have individualized maintenance procedures. Each procedure must clearly identify the equipment to which it applies.

OSHA Instruction CPL 2-2.45A

~~SEP 26 1996~~
Directorate of Compliance Programs

(j)(6)(ii) Quality assurance

If an installation is being done by contractors, does this require the employer to implement a quality assurance program to monitor the activities of these contractors?

The employer is responsible for ensuring that equipment is installed consistent with design specifications and manufacturer's instructions. This may require the employer to be involved in the review, inspection, certification, and quality assurance of work performed by contractors.

OSHA Instruction CPL 2-2.45A

SEP 28 1987
Directorate of Compliance Programs**Appendix C****Standard Industrial Classification (SIC) Codes
Targeted for PQV Inspections**

The following SIC codes are designated as targeted for possible PQV inspections, in accordance with the criteria at J.1. of this instruction:

- 2812 Alkalies and Chlorine
- 2819 Industrial Inorganic Chemicals, Not Elsewhere Classified
- 2821 Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers
- 2865 Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments
- 2869 Industrial Organic Chemicals, Not Elsewhere Classified
- 2873 Nitrogenous Fertilizers
- 2892 Explosives [chemical plants making explosives]
- 2911 Petroleum Refining

OSHA Instruction CPL 2-2.45A

SEP 11 1991

Directorate of Compliance Programs

Appendix D**References for Compliance with the PSM Standard**

1. OSHA Instruction CPL 2.45B, June 15, 1989, the Revised Field Operations Manual (FOM).
2. OSHA Instruction STP 2.22A, CH-2, January 29, 1990, State Plan Policies and Procedures Manual.
3. OSHA Instruction ADM 1-1.12B, Dec. 29, 1989, Integrated Management Information System (IMIS) Forms Manual, Chapter V.
4. OSHA Instruction CPL 2-2.45, Sep. 6, 1988, Systems Safety Evaluation of Operations with Catastrophic Potential.
5. "Safety and Health Program Management Guidelines," 1989; U.S. Department of Labor, Occupational Safety and Health Administration.
6. "Safety and Health Guide for the Chemical Industry," 1986, (OSHA 3091); US.DOL, OSHA.
7. "Review of Emergency Systems," June 1988; U.S.E.P.A., Office of Solid Waste and Emergency Response, Washington, DC 20480.
8. "Guidelines for Hazard Evaluation Procedures," Center for Chemical Process Safety of the American Institute of Chemical Engineers; 345 East 47th Street, New York, NY 10017.
9. "Plant Guidelines for Technical Management of Chemical Process Safety," Center for Chemical Process Safety (CCPS) of The American Institute of Chemical Engineers (AIChE).
10. "Guidelines for Safe Storage and Handling of High Toxic Hazard Materials," AIChE, CCPS.
11. "Guidelines for Vapor Release Mitigation," AIChE, CCPS.
12. "Process Safety Management (Control of Acute Hazards)," Chemical Manufacturers Association (CMA).
13. "Evaluating Process Safety in the Chemical Industry," Chemical Manufacturers Association; 2501 M Street NW, Washington, DC 20037.

OSHA Instruction CPL 2-2.45A

1992
Directorate of Compliance Programs

14. "Safe Warehousing of Chemicals," Chemical Manufacturers Association.
15. "A Managers Guide to Reducing Human Errors Improving Human Performance in the Chemical Industry," Chemical Manufacturers Association.
16. "Improving Owner and Contractor Safety Performance," API Recommended Practice 2220.
17. "Management of Process Hazards," American Petroleum Institute (API) Recommended Practice 750, First Edition, January 1990; 1220 L Street NW, Washington, DC 20005.
18. "Sizing, Selection, and Installation of Pressure Relieving Devices," Part 1, July 1990, API RP 520.
19. "Guide for Pressure relieving and Depressuring Systems," Nov. 1990, API RP 521.
20. "Avoiding Environmental Cracking in Amine Units," Aug. 1990, API RP 945.
21. "Pressure Vessel Inspection Code: Inspection, Rating, Repair, and Alteration," June 1989, API STD 510.
22. "Inspection of Piping, Tubing, Valves, and Fittings," API RP 574.
23. "Prevention of Brittle Fracture of Pressure Vessels," API RP 920.
24. "Accident Investigation * * * A New Approach," 1983, National Safety Council; 444 North Michigan Avenue, Chicago, IL 60611-3991.
25. "Fire & Explosion Index Hazard Classification Guide," 6th Edition, May 1987, Dow Chemical Company; Midland, Michigan 48674.
26. "Chemical Exposure Index," May 1988, Dow Chemical Co.
27. "Pressure Vessels, Section VIII," The American Society of Mechanical Engineers (ASME).
28. "Chemical Plant and Petroleum Refinery Piping," ASME B31.3.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

29. "Personnel Qualification and Certification in Nondestructive Testing," American Society of Nondestructive Testing, Recommended Practice No. SNT-TC-1A.
30. "Prevention of Furnace Explosions/Implosions in Multiple Burner Boiler Furnaces," National Fire Protection Association, NFPA 85C.
31. "Purged and Pressurized Enclosures for Electrical Equipment," NFPA 496.
32. "Spacing of Facilities in Outdoor Chemical Plants," Factory Mutual Loss Prevention Data Sheet, 7-44.
33. "Chemical Process Control and Control Rooms," Factory Mutual Loss Prevention Data Sheet, 7-45.
34. "National Board Inspection Code, A Manual for Boiler and Pressure Vessel Inspectors," The National Board of Boiler and Pressure Vessel Inspectors, 1992.
35. Gideon, James A., and Thomas W. Carmody, "Process Safety Management: Resources from the American Institute of Chemical Engineers for Use by Industrial Hygienists," American Industrial Hygiene Association Journal (53), June 1992.

OSHA Instruction CPL 2-2.45A

SEP 20 2014

Directorate of Compliance Programs

Appendix E

**Recommended Health Care Management Program Components
For Process Safety Management
(Nonmandatory Guidance)**

[RESERVED]

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

[PAGE INTENTIONALLY LEFT BLANK]

OSHA Instruction CPL 2-2.45A

SEP 28 1992

Directorate of Compliance Programs

Appendix F**SAMPLE LETTER TO BE PROVIDED TO EMPLOYER
FOLLOWING SCREENING FOR PSM COVERAGE**

Dear Employer:

The Occupational Safety and Health Administration's (OSHA) evaluation of your workplace and the information you have provided indicate that your establishment is covered by OSHA's standard for Process Safety Management of Highly Hazardous Chemicals, 29 CFR 1910.119.

As you may know, the requirements of this standard are intended to protect employees by preventing or minimizing the consequences of accidents involving highly hazardous chemicals. OSHA believes that compliance with the standard is important for ensuring worker protection.

Accompanying this letter are copies of the following publications:

(1) "Process Safety Management," OSHA 3132, which provides information on the standard and its requirements, and

(2) "Process Safety Management--Guidelines for Compliance," OSHA 3133.

These guidelines are not a substitute for the standard itself, which is reprinted in the "Process Safety Management" booklet.

Your workplace will be included in an overall listing of all establishments known to be covered by the standard. OSHA may schedule an inspection of your establishment in the future to evaluate your compliance with the standard.

This standard is relatively new, and OSHA realizes that affected employers may have many questions. After reading the materials provided, please feel free to direct any questions to [Area Office; telephone number].

Sincerely,

Area Director

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

Appendix G

Recommended Guidelines for PQV Inspection Preparation (Nonmandatory)

The following guidelines are suggested as background and preparation for a PQV inspection.

AREA OFFICE COORDINATION

Coordination within the Area Office is absolutely essential in the orderly conduct of a PQV inspection. The Area Director and all those involved in a PQV inspection must commit the resources with the understanding that the project is long-term, possibly several weeks or months. It is imperative that team members complete all outstanding assignments prior to the PQV inspection. Equally important, team participants should not be directed or "asked" to do assignments while they are engaged in the PQV inspection. An obvious exception would be court hearings, over which the Area Office has little control.

The Area Director should designate a contact person in the Area Office to coordinate and oversee all aspects of the inspection. The contact person should be a supervisor, safety or industrial hygiene (IH), who is familiar with the PQV concept. In addition to providing Area Office coordination, the contact person would review the entire case file/report. The team leader would communicate at least weekly with the contact supervisor, who would then brief the Area Director as appropriate. The contact supervisor would advise the supervisor(s) of team members about the conduct and performance of the individuals concerned. This is especially important so that the team members get a fair appraisal from their supervisors who would not or could not rate them on their PQV performance because they had no knowledge as to what was going on for weeks or months.

INSPECTION TEAM COMPOSITION

By design, a PQV inspection is a large and complex undertaking, to be accomplished by a select, well-trained team. All members of the team must be experienced journey or senior level compliance officers who are familiar with the chemical industry and have taken the appropriate OSHA training. Newer compliance officers can be utilized in the inspections, but not as a substitute for regular team members.

The team should consist of two safety compliance officers/engineers, two industrial hygiene compliance officers, an administrative support person and a construction specialist. The team leader could be from either discipline in the team, but preferably a safety specialist, due to the fact that most of the critical PSM and construction related hazards reside in the area of safety.

The team leader should be a GS-12 Senior Compliance Officer with experience in large team inspections. He or she should have excellent organizational and communication skills, both oral and written. It would also be of benefit that the team leader be knowledgeable in word processing and data base management computer operations. Since the team leader will be the focal point during the conduct of the inspection, that person should also have demonstrated leadership abilities. The entire team, the company, employees/unions and other OSHA personnel will look to the team leader for direction and answers to the many questions that will arise during the course of the inspection.

OSHA Instruction CPL 2-2.45A

300 80 1000
Directorate of Compliance Programs

The team leader is responsible for the overall conduct of the inspection including planning, onsite activities and report preparation. The leader would assign the various inspection areas to team members in accordance with their expertise and abilities, and determine what, if any, special expertise is needed. Additional responsibilities include:

1. Keeping the Area Office contact apprised of activities;
2. Providing and tracking requests for documents;
3. Resolving problems with the company;
4. Ensuring that the report addresses all questions in the directive.

An administrative support person would greatly increase the overall efficiency of the inspection. This position would be ideal for an accommodated compliance officer with some computer skills and organizational abilities. The support person would answer directly to the team leader and would be responsible for organizing, labeling and filing the many documents that will become part of the case file. An accommodated CSHO could also review the documents and document requests to assure the request was properly fulfilled. In addition, an accommodated CSHO could assist the inspecting team members with the many interviews that will be conducted. The support person would also be responsible for the inspection supplies and equipment.

Safety and IH team members are responsible for carrying out the PQV inspection activities under the direction of the team leader. They must keep the team leader apprised of their activities and potential problems when they arise. The construction specialist would work for the most part independently of the rest of the team, under the general direction of the team leader. Some crossover of inspection areas is to be expected, as many of the contractors and company responsibilities overlap.

PRE-INSPECTION PREPARATION

Effective planning and preparation is essential to the efficient implementation and successful completion of any large inspection, especially a PQV. Exhibit 1 provides an outline that can be used as a guide to plan and prepare for a PQV inspection. Establishment histories can be obtained and reviewed well in advance of the target date for the inspection. The inspection strategy and scheduling should be done after the team has been selected. A pre-inspection meeting with all members and the Area Office contact person should be held prior to entry.

The case file begins in the planning and preparation stage. Any documents received, such as micro to host reports, citations and PSM-related findings (including PetroSEP) in other regions must be logged and identified to allow for easy retrieval. An activity log/diary should be started to record all pertinent actions taken. A computer data base management program is recommended to keep track of the document requests and to provide a ready index of the documents that have been obtained. With this type of system it would be easy to search for pertinent documents by using the OSHA identification number, topic of document, company identification number, date of request, etc., and to ensure that various members of the team do not duplicate requests for documents.

The team should develop a weekly schedule of activities, taking into account travel days, holidays, start time, stop time, company briefings and internal briefings. Time should be allotted during the inspection week to complete necessary paperwork and documentation and tie up loose ends.

OSHA Instruction CPL 2-2.45A
SEP 23 1992
Directorate of Compliance Programs

DOCUMENTS

PQV inspections will require compliance officers to review numerous company documents. Many of these documents will become part of the case file as documentation for potential citations or for documentation of the required PSM elements. It is imperative that these documents be organized and identified so that they may be readily referenced and reviewed. It is highly recommended that all requests for copies of company documents be in writing. A standard document request format should be established and should contain at least the following information:

1. Who is the requester
2. To whom the request is made
3. Identity of the document (in company terms if possible)
4. Company document number
5. Date of request
6. Priority for response
7. Internal I.D. number or docket number (for filing)
8. Date request fulfilled
9. Comment section (did the response fulfill request).

It should be noted that there is no universal language used to identify documents. Different companies have different names for the same type of document. It is therefore essential to clearly communicate what information is needed and desired prior to writing the request. The document requests should be in duplicate: one copy for the company and the other to be retained in the case file. To avoid long discussions and legal department involvement, all documents obtained should be considered proprietary information.

Prior to the documents actually being received, a filing system should be developed. The system should be secure, accessible to all team members and ensure that individual documents are easily retrievable. The administrative support person could manage the filing system to ensure its continued effectiveness. NOTE: Only appropriate documents should be maintained in the filing system; field notes, document "clips", and document review/evaluation notes should remain with the corresponding 1B's.

Exhibit 2 contains a list of those documents most commonly requested. It is divided into two sections: Pre-Unit Selection and Unit-Specific Documents.

INSPECTION FACILITIES

The PQV team needs a suitable work area/command center from which the inspection can be conducted and coordinated. Except in the most unusual of circumstances, the company will provide the requisite onsite space. Almost any room will suffice, providing it meets some basic requirements. The work area must be secure 24 hours a day with access limited to the inspection team and those company officials who would respond in an emergency. This is important so as to preclude taking boxes of documents and equipment in and out each day. The room should have sufficient desks and/or tables for reviewing documents and writing the report. Provisions should be made for communications--one phone line as a minimum. Outgoing calls should be charged on the Area Office calling card. Where phone service is not provided, the team should have a portable cellular phone.

OSHA Instruction CPL 2-2.45A

100-2-1002
Directorate of Compliance Programs

Sufficient power outlets should be available for charging pumps, batteries and other inspection equipment.

The inspection team will need copies of a number of documents. It is hoped that the company would provide copying services or the use of a copy machine. The administrative support person could make the copies should the company not provide these services.

The team leader must determine as soon as possible, what--if any--of the necessary facilities the company will provide. If the company does not provide all of the necessary facilities voluntarily, or puts disruptive restrictions on their use, the ARA for Technical Support should be contacted as soon as possible so that alternate facilities can be arranged. This may result in the use of a rented copier(s) and office space.

INSPECTION EQUIPMENT

Upon entry to the site, the inspection team should be fully prepared with all necessary inspection equipment and personal protective equipment. Exhibit 3 contains a list of equipment that may be useful to prepare for the inspection. In addition, an inspection "kit" is outlined which can be used to set up the command center. Some of the items in the "kit" may appear to be trivial; however, all of these items will be needed at some time during the inspection. It may not be practical to go back and forth to the office or a store to get these items, particularly if the inspection site is in a remote location. The administrative support person would be responsible for maintaining adequate supplies throughout the inspection.

CRITICAL INSPECTION AREAS

It is essential that team members have specific subjects and areas to investigate. The team leader, with input from the team members, should assign the inspection areas prior to entry. This will help to avoid confusion and duplication of effort. In addition, the team members will be able to be better prepared for their individual tasks.

As inspection subjects are completed, the information should be reviewed with the team leader before going on to the next assignment. The state of compliance or noncompliance within any given area may require the team leader to modify the assignment list so as to make the most of the resources available.

CONTRACTORS

Contractors are an integral part of any PSM inspection. There may be only a few contractors or dozens, with several hundred contract employees, depending on whether the facility is undergoing a shutdown or turnaround.

It is imperative that, upon entry, the scope of the contractor activity be determined. The construction specialist on the team will have to formulate an inspection plan and set appropriate priorities. It is not the intent of the PQV inspection to inspect all outside contractors that are on-site, rather to inspect only those contractors who may be exposed to, or could cause or be affected by a catastrophic incident. Food service workers, certain janitorial employees and similar activities would

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

not normally be inspected. Remote construction projects not associated with catastrophic potential would not necessarily be inspected.

The term "contractor" is not limited to construction type activities. Many chemical facilities use contract maintenance workers, vessel and piping inspectors, vessel heat treating, cleaning, engineering and similar non-construction contractors who remain at the facility year round or are called in at regular intervals. They are used to supplement existing plant personnel for regular duties and for special projects.

A shared responsibility for both contractors and company is quality assurance. It is essential that all materials and workmanship meet engineering standards. There should be sufficient checks to ensure that materials, such as the proper alloy or carbon steel pipe is used, and that the studs and/or bolts are of the proper size and grade. This is especially important in contractor supplied materials.

CRITICAL EXPERTISE

Situations may arise in a PQV inspection that are beyond the technical expertise of the team members. A list should be developed identifying OSHA personnel and/or private sector experts and how they may be contacted. Areas where this expertise may be needed are:

1. Pressure equipment
2. Fire protection (fire brigades)
3. Facility siting
4. Emergency medical services
5. Hazardous waste operations
6. Dispersion modeling & incident command centers
7. Process hazard analysis/HAZOPS
8. Process chemistry
9. Industry practice

By no means is this list all-inclusive. It should be modified as needed to reflect current technology and hazards.

DOCUMENTATION

In order to withstand the probable legal challenges, all items must be thoroughly documented. Since the team will be made up of journey- and senior-level CSHOs, good documentation is to be expected. All OSHA-1B forms must be complete and legible. Shortcuts for employer knowledge such as "should have known" or "reasonable diligence" are not acceptable. Appropriate company documents, logs, procedures, permits, etc., should be referenced on the 1B for the particular violation.

Photographic documentation, either still camera or videotape, should be reviewed as soon as practicable to ensure that the condition or violation is appropriately depicted. Retake any photos or videos that are not good quality.

CASE FILE AND REPORT PREPARATION

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

A PQV inspection will take weeks or months of onsite activity and will generate a large amount of paper, both in field notes and documents. It is essential that the paper flow be organized and well maintained. This will result not only in a more efficient onsite survey, but will greatly reduce the write-up time.

A daily log, either manual or computer generated, should be maintained indicating the team members onsite, daily activities, meetings, problems, or other details, as necessary. All OSHA-1B forms should be completed as the violation is observed, documenting the employees exposed, the date, time, location and management representative who accompanied the CSHO. Each instance of a violation should have a separate 1B. Where multiple violations are noted on a form, the form should be photocopied and highlighted showing the appropriate instance and corresponding documentation. Alleged violation descriptions should be written as soon as practicable, while the hazard is fresh in the mind of the CSHO. Multi-employer policy citations must be coordinated with respect to exposing, controlling, correcting and creating employers' files.

Case file structure and organization must begin prior to entry into the facility. All documents must be logged and an index (computer preferred) generated, indicating the subject matter, document identification number, file number and the location of the document (box number). This is essential, as these documents may have to be referenced or retrieved many times during the course of the inspection and the review process. A data base management program for the PC's would be extremely beneficial. Computer disks should be backed up daily, or more often as necessary. The photos and videotape taken during the inspection should be properly identified with photographer, date, roll or tape number and subject. They should be kept in a separate file.

OSHA Instruction CPL 2-2.45A

SEP 23 1992
Directorate of Compliance Programs**EXHIBIT 1****PRE-INSPECTION PREPARATION**

- A. Previous OSHA history - nationwide search
1. all citations and/or reports
 2. litigation results
 3. outstanding issues, items in contest
 4. health response team reports
 5. NIOSH evaluations if any
- B. EPA history
1. reportable releases
 2. reports of any kind
 3. complaints and pending actions
- C. Other Agency histories - local/State/Federal
1. Dept. of Transportation
 2. Coast Guard
 3. ESDA/FEMA
 4. State Fire Marshal
 5. State Boiler and Pressure Vessel
- D. Previous PetroSEP/PSM inspection results
1. citations
 2. team members & expertise
 3. settlement agreements or litigation results
- E. Identify contact people -- other jurisdictions
- EPA, DOT, Coast Guard, etc.
- F. Acquire necessary codes or standards
- ASME, API, ANSI, NFPA, etc.

INSPECTION STRATEGY

- A. Identify critical needs and expertise
- B. Select team members
- C. Identify expertise within the team

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

- D. Identify critical inspection areas
- E. Assign areas according to expertise
- F. Identify areas lacking expertise
 - 1. provide training
 - 2. bring in additional resources
- G. Develop a tracking system for documents
- H. Develop a daily log of on-site activities
- I. Identify known scheduling conflicts
 - Team members and/or employer
- J. Develop weekly schedule of activities
 - 1. travel, write up, start/stop times
 - 2. employer/employee and Area Office updates

PLANNING AND SCHEDULING

- A. Create a Projected Time Line
 - 1. Projected records and program review time
 - 2. Projected walkaround time
 - 3. Projected write-up time
- B. Resource Scheduling
 - 1. Team leader and construction specialist enter first for program and records review; present document request list.
 - 2. Full team enters following acquisition of requested documents for program/record review & walkaround
 - 3. Expert assistance enters as needed
- C. Equipment Acquisition
 - 1. Required PPE
 - 2. Technical equipment

OSHA Instruction CPL 2-2.45A

OSHA
Directorate of Compliance Programs**EXHIBIT 2****DOCUMENT REQUEST LIST****I. PRE-UNIT-SELECTION**

- A. OSHA 200 logs for past 3 years
 - 1. Employer
 - 2. Contractors
- B. Incident reports
 - 1. Near miss
 - 2. Fires
 - 3. All releases (cross check with EPA documents)
- C. Site plan/Facility overview
- D. Simplified flow diagrams
- E. All permit procedures
 - 1. Confined space
 - 2. Hot work
 - 3. Others
- F. Hazard communication
- G. Overall emergency response plan (emergency action plan, evacuation plan)
- H. Lockout/Tagout
- I. PPE plan/Requirements
- J. Audits
 - 1. Internal
 - 2. Corporate
 - 3. Contracted
 - 4. Insurance/Consultant
- K. Fire brigade records
 - 1. Organizational statement
 - 2. Training records
 - 3. Callouts/Responses
 - 4. Roster

OSHA Instruction CPL 2-2.45A

SEP 18 1991
Directorate of Compliance Programs

- 5. Equipment inspection
 - L. Respirator program and inspections (emergency use)
 - M. Infection/Exposure control program (bloodborne)
 - N. Safety and health outline
 - 1. Minutes of safety and health committee meetings and walkaround reports
 - 2. Committee roster
 - O. Disaster preparedness program
 - P. Facility description
 - 1. Size, capacity, age (units)
 - 2. History
 - Q. Turnaround/Shutdown schedule (not turnaround plan)
 - R. Safety and health complaints
 - S. Accident investigation logs
 - T. Industry hazard alerts (fire and explosion information from other facilities) ("Lessons Learned" by API)
 - U. Process hazard analysis scheduling procedure

II. UNIT-SPECIFIC DOCUMENTS

- A. Written operating procedures
 - 1. All current procedures
 - a. Normal
 - b. Abnormal
 - c. Emergency
 - 2. Startup procedures
 - a. Partial (swoop down procedures)
 - b. Full (cold)
 - 3. Shutdown procedures
 - a. Normal
 - b. Emergency
 - 4. Upset conditions (beyond normal operating parameters)

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

- B. Process safety information
 - 1. Process chemistry
 - 2. Capacity (volume)
 - 3. Operating temperatures and pressures
 - Alarm settings (high, high-high, low, low-low, etc.)
 - 4. Operating parameters
 - 5. Consequences of deviations
 - 6. Flow rates
- C. Operating logs (past 6 months)
 - 1. Foreman
 - 2. Operator
 - 3. Manual and Computer
- D. Piping and instrumentation diagrams (P&IDS)
 - 1. Working (unit level) **NOTE: Must be current.**
 - 2. Archival
 - 3. Simplified (detailed, at a later date)
 - 4. Product
 - 5. Utility
 - 6. Fire protection
- E. Training records
 - 1. Operator and supervisory
 - 2. Training records (summary) for all safety and health programs
 - a. Hazard communication
 - b. Emergency response
 - c. Bloodborne
 - d. Respirators and PPE

OSHA Instruction CPL 2-2.45A

SEP 27 1994

Directorate of Compliance Programs

- e. SCBA
 - f. Fire
 - g. Others
- F. Permits for the units
 - Hot work, confined space, etc.
- G. Pressure vessel records
 - 1. For at least 20 different vessels, selection based on age, pressure, temperature, toxic chemical involved (corrosive nature, i.e. sulfuric acid), repair history, environmental stress cracking, etc.
 - 2. Inspection records
 - a. All previous records
 - b. Analysis of defects
 - c. Nondestructive testing records
 - d. Inspection schedule and frequency
 - e. Internal
 - f. External
 - g. On-stream
 - h. Special
 - i. U-1 and U-2 records
 - 3. Inspector qualifications
 - a. ASNT or equivalent levels (1, 2, or 3)
 - b. Roster of inspectors
 - c. Training history and documentation
 - 4. Pressure relief valve (PRV) inspection records
 - 5. Selection criteria for PRV's, vessels, etc.
- H. Unit plot plan - detailed
- I. Instrumentation calibration records
- J. Unit emergency response / Action plan
- K. Control room blueprint and schematic
- L. Work orders
 - 1. Outstanding

OSHA Instruction CPL 2-2.45A

SEP 11 1995

Directorate of Compliance Programs

2. Obtain a sample of completed work order
 3. Written work order procedure
 4. All safety work orders
- M. Environmental sampling records
1. Noise
 2. Air contaminants/Toxins
 3. Asbestos
- N. Product sampling procedures
- O. Calibration records for IH sampling equipment
- P. Pre-startup review
- Q. Rotating equipment inspection records
1. Schedule
 2. Repair records
- R. Operator certification
- S. Flare system diagram (P&ID)
- T. Process hazard analysis (Haz-Op, What-If, etc.)
- U. Piping inspection program
1. Records/Results
 2. Schedule
 3. Inspector qualifications

OSHA Instruction CPL 2-2.45A

SEP 14 2011

Directorate of Compliance Programs

EXHIBIT 3

INSPECTION EQUIPMENT

I. PERSONAL PROTECTIVE EQUIPMENT

A. Standard PPE per directive

1. Safety shoes
2. Safety glasses with side shields
3. Hard hat

B. Site specific PPE

1. *Hearing protection*
2. Respirators with proper filters/cartridges

C. Flame retardant clothing/coveralls

D. Emergency escape packs, where necessary

E. Supplied-air respirators (only trained CSHOs)

F. Oxygen and combustible meters

II. SAMPLING EQUIPMENT

A. Hydrogen sulfide dataloggers/dosimeters

B. Noise dosimeters

C. Benzene equipment/media

D. Sulfuric acid/hydrogen fluoride equipment/media

E. Asbestos media

F. Other air contaminants

G. Charging facilities (area and equipment)

H. TSD sites - specific requirements

III. TECHNICAL EQUIPMENT

A. Cameras and video cameras

1. *Company policy regarding use*

OSHA Instruction CPL 2-2.45A

SEP 28 1992
Directorate of Compliance Programs

2. Each CSHO/inspection team equipped with a camera
3. Careful log of each frame (who, when, where, what)

B. FILM

1. Each roll should be identified with CSHO, date, and time prior to developing
2. Each picture identified with CSHO, date, and time
3. Film must be developed as soon as possible, and identified (who, what, where, when)
4. Film log must be maintained with roll number, CSHO, date in for developing, date returned
5. Photos should be mounted on worksheets and identified sequentially for each team member
6. Negatives must be identified and secured (preferably stored separately from developed photographs)

C. Videotapes

1. Identified with CSHO, date, and subject
2. Original tapes must be maintained
3. Videotape log maintained with CSHO, camera number (serial number), and date

D. Audiotapes

1. Primarily for interviews and/or field notes
2. Company policy
3. Permit requirements
4. Original tapes must be retained in file
5. Transcription (as needed)
6. Tapes must be identified with date, team member, and subject matter
7. Tapes must be logged

INSPECTION KIT**I. Office Supplies**

- A. Folders (file folders and expandable)
- B. Paper clips
- C. Hole punch
- D. Stapler and staples
- E. Staple puller
- F. White out/correction tape
- G. Colored pencils/markers
- H. Scissors
- I. Post-its
- J. Tape
- K. Labels

OSHA Instruction CPL 2-2.45A

3-2-82

Directorate of Compliance Programs

- L. Pens/pencils
- M. Calculator
- N. Ruler/graph paper
- O. Filing Boxes
- P. Envelopes

II. Inspection Supplies

- A. OSHA forms (1b, photo mounting, 5(a)(1) letters, willful and 5(a)(1) worksheets)
- B. Film, audio and video tapes
- C. Batteries and battery packs for camcorders
- D. Film processing envelopes
- E. Sampling media
 - 1. smoke tubes
 - 2. scintillation vials
 - 3. filters/charcoal tubes
- F. OSHA 31's & travel vouchers

III. Command Center Equipment

- A. Computers (two or more)
 - 1. database management program
 - 2. word processor
 - 3. spreadsheet
 - 4. floppy disks
- B. Printer with paper and spare ribbon
- C. Disk storage boxes
- D. Fax with extra paper
- E. Cellular phone and pagers if needed
- F. Chargers for all equipment
- G. Answering machine
- H. Telephone directory (OSHA contacts)

OSHA Instruction CPL 2-2.45A

388 2-1-03

Directorate of Compliance Programs

IV. Library/Reference Material

- A. API 510, 750, and others
- B. PUB 8-1.5, CPL2 PETROSEP (March 9, 1992)
- C. 1910.119 Process Safety Management
- D. OTI-PSM (Courses 330/340) manuals
- E. 2 sets General Industry and Construction Standards
- F. SAVEs manual
- G. Field Operations Manual
- H. Other references as needed; e.g., NFPA, ANSI, ASNT

OSHA Instruction CPL 2-2.45A
 SEP 28 1992
 Directorate of Compliance Programs

Appendix H

Recording PSM-Related Inspection in IMIS

Information about PSM-related inspection activity, as described at H. of this instruction, shall be recorded in IMIS following current instructions in the IMIS manual. These guidelines shall apply:

1. PQV Inspections. The identifier code "PSMPQV" shall be used for these inspections.
 - a. PQV inspections, as described at J., K., and L. of this instruction, shall be identified by recording "PSMPQV" in item 25.d of the OSHA-1 Form.
 - b. Any inspections of onsite contractors shall also be identified by recording "PSMPQV" in item 25.d of the OSHA-1 Form.
 - c. Linkage of all of the employers inspected on-site shall be performed in accordance with the instructions for entering Multi-Employer Inspections currently specified in Chapter V, item E.(5.), of the IMIS Forms Manual.
 - d. PQV inspections may be programmed or unprogrammed; all PQV inspections shall be identified as comprehensive.
2. Unprogrammed PSM-related Inspections. All unprogrammed inspection activity relating to the PSM standard--as described at H.3. of this instruction--shall be coded as follows in Item 42, Optional Information of the OSHA-1 form:

<u>Type</u>	<u>ID</u>	<u>Value</u>
N	06	PSMP

This shall apply to all unprogrammed inspections in which compliance with the PSM standard is investigated; i.e., inspections in which the establishment:

- a. Is not in one of the SIC codes listed in Appendix C of this instruction; or
- b. Is not an establishment selected for a PQV inspection, although it is in one of the SIC codes listed in Appendix C of this instruction.

OSHA Instruction CPL 2-2.45A

Directorate of Compliance Programs

3. Other Programmed Inspections: Screening for PSM Coverage. In all programmed safety and health inspections in general industry, a determination shall be made as to whether the establishment is covered by the PSM standard. The establishments shall be coded as follows in Item 42, Optional Information of the OSHA-1 form:

- a. Establishments determined to be covered by the PSM standard:

<u>Type</u>	<u>ID</u>	<u>Value</u>
N	06	PSMY

- b. Establishments determined to be **not** covered by the PSM standard:

<u>Type</u>	<u>ID</u>	<u>Value</u>
N	06	PSMN

Federal Register

Monday
February 24, 1992

Part II

Department of Labor

**Occupational Safety and Health
Administration**

29 CFR Part 1910

**Process Safety Management of Highly
Hazardous Chemicals; Explosives and
Blasting Agents; Final Rule**

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

RIN 1218-AB20

Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents

Editorial Note: This reprint incorporates a correction document published in the Federal Register of March 4, 1992.

AGENCY: Occupational Safety and Health Administration (OSHA), Labor.

ACTION: Final rule.

SUMMARY: This final rule contains requirements for the management of hazards associated with processes using highly hazardous chemicals. It establishes procedures for process safety management that will protect employees by preventing or minimizing the consequences of chemical accidents involving highly hazardous chemicals. Employees have been and continue to be exposed to the hazards of toxicity, fires, and explosions from catastrophic releases of highly hazardous chemicals in their workplaces. The requirements in this standard are intended to eliminate or mitigate the consequences of such releases. This rule is being referenced in OSHA's Explosives and Blasting Agents standard, 29 CFR 1910.109.

DATES: This final rule will become effective on May 26, 1992.

ADDRESSES: In compliance with 28 U.S.C. 2112(a), the Agency designates for receipt of petitions for review of the standard, the Associate Solicitor for Occupational Safety and Health, Office of the Solicitor, room S4004, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, U.S. Department of Labor, Occupational Safety and Health Administration, Office of Information, room N3647, 200 Constitution Avenue, NW., Washington, DC 20210, (202) 523-8151.

SUPPLEMENTARY INFORMATION: In this preamble, OSHA identifies sources of information submitted to the record by an exhibit number (Ex. 3). When applicable, comment numbers follow the exhibit in which they are contained (Ex. 3: 1). If more than one comment within an exhibit is cited, the comment numbers are separated by commas (Ex. 3: 1, 2, 3). For quoted material, page numbers are cited if other than page one (p.2). The transcript of the hearing is cited by the page number (Tr. 321). Transcript pages are separated by

commas. Exhibits and transcripts are separated by semicolons (Ex. 1; Tr. 50).

I. Background

Releases of toxic, reactive or flammable liquids and gases in processes involving highly hazardous chemicals have been reported for many years. Incidents continue to occur in a variety of industries which use a variety of highly hazardous chemicals which may be toxic, reactive, flammable, or explosive or exhibit a combination of these attributes. (See for example, Ex. 2: 2, 4, 12, 13; Ex. 11: 2, 5, 6, 22, 28, 30, 31, 33, 41, 50, 63, 84, 94, 99, 120-136, 163; Ex. 15B, C; Ex. 53A; Ex. 114; Ex. 118; Tr. 2070, 2230, 2441-42, 2451, 2502.)

Regardless of the industry that uses these highly hazardous chemicals, there exists a potential for an accidental release if a highly hazardous chemical is not properly controlled. This in turn presents the potential for a devastating incident. Recent major incidents include the 1984 Bhopal incident resulting in more than 2,000 deaths; the October 1989 Phillips 66 Chemical Plant incident resulting in 24 deaths and 132 injuries; the July 1990 Arco Chemical incident resulting in 17 deaths; the July 1990 BASF incident resulting in 2 deaths and 41 injuries; and the May 1991 IMC incident resulting in 8 deaths and 128 injuries. While these major incidents involving highly hazardous chemicals have drawn national attention to the potential for major catastrophes, the record is replete with information concerning many other releases of highly hazardous chemicals (as referenced above). These releases continue to pose a significant threat to employees. The continuing occurrence of incidents has provided impetus, internationally and nationally, for authorities to develop or consider the development of legislation and regulations directed toward eliminating or minimizing the potential for such events.

International efforts include the development of the Seveso Directive by the European Economic Community after several large scale incidents occurred in the 1970's, including Flixborough and Seveso. The Directive addresses the major accident hazards of certain industrial activities, lists the hazardous materials of concern and is directed toward controlling those activities that could give rise to major accidents in an effort to protect the environment and the safety and health of persons (Ex. 11-53).

Subsequent international efforts include the development of guidelines for identifying, analyzing and controlling major hazard installations in developing countries and a hazards assessment

manual which provides measures to control major hazard accidents developed by the World Bank (Ex. 2: 2); the development of the Code of Practice on the Prevention of Major Accident Hazards by the International Labour Organization (Ex. 11: 154); and the special conferences held by the Organization of Economic and Cooperative Development (Ex. 11: 153) to consider the catastrophic potential of accidents involving hazardous substances and the means to prevent their occurrence and mitigate their impact.

In the United States, Congress, Federal agencies, State governments, industry, unions and other interested groups have become actively concerned and involved with protecting employees, the public and the environment from major chemical accidents involving highly hazardous chemicals.

In 1985, the Environmental Protection Agency (EPA) in response to the potential for catastrophic releases initiated a program to encourage community planning and preparation relative to serious hazardous materials releases (Ex. 2: 5). In 1986, Congress passed the framework for emergency planning efforts through Title III of the Superfund Amendments and Reauthorization Act (SARA), also known as the Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001 *et seq.*). SARA encourages and supports states and local communities in efforts to address the problems of chemical releases. Under section 302 of SARA, 42 U.S.C. 11002, EPA was required to publish a list of extremely hazardous substances with threshold planning quantities which would trigger planning in states and local communities (52 FR 13378).

After the 1984 Bhopal, India incident involving an accidental release of methyl isocyanate which resulted in more than 2000 deaths, OSHA determined that it was necessary to immediately investigate U.S. producers and users of methyl isocyanate. This investigation indicated that while the chemical industry is subject to OSHA's general industry standards, these standards do not presently contain specific coverage for chemical industry process hazards, nor do they specifically address employee protection from large releases of hazardous chemicals.

OSHA standards do exist for employee exposure to certain specific toxic substances (see subpart Z of part 1910), and hazardous chemicals are covered generally by other OSHA standards such as the Hazard Communication Standard, § 1910.1200. While these standards do address

hazardous chemicals, they focus on routine or daily exposures and while in many cases they also address emergencies such as spills, OSHA believes that they do not address the precautions necessary to prevent large accidental releases that could result in catastrophes.

Additionally, OSHA has certain standards contained in subpart H of 29 CFR part 1910, Hazardous Materials, concerning flammable liquids, compressed and liquified petroleum gases, explosives and fireworks. The flammable liquids and compressed and liquified petroleum gas standards emphasize equipment specification and the flammability of materials and do not thoroughly address other hazards of materials such as toxicity, and the standard concerning explosives and fireworks does not address the hazards involved during their manufacture. Beyond these standards, OSHA must depend on section 5(a)(1) of the Occupational Safety and Health Act, the general duty clause, to protect employees from other hazardous situations arising from the use of highly hazardous chemicals in certain industrial processes and must use national consensus standards and industry standards to support these general duty clause citations.

The need to focus on safety and health in the chemical industry was reinforced in August 1985. A serious release of highly hazardous chemicals (aldicarb oxime and methyl chloride) occurred at a plant in Institute, West Virginia. While no deaths occurred, 135 persons were injured (Ex. 2: 7). The experience of investigating this release indicated to OSHA that there was a need to look beyond existing standards and led OSHA to develop a demonstration program of special inspections in a small segment of the chemical industry (Ex. 2: 7). The purpose of the program was to examine industry practices for the prevention of disastrous releases and the mitigation of the effects of releases that do occur, and to consider ways in which OSHA could best protect employees in the industry from these hazards. Based on the results of the program, OSHA determined that chemical plant inspections need a comprehensive inspection approach which includes plant physical conditions and management systems.

Since this program was initiated, OSHA has issued a series of inspection directives, updated by growing experience and knowledge, that address system safety evaluations of operations with catastrophic potential. One important change in the successive

directives was the expansion of the scope of facilities to be inspected. Inspections were to be conducted in industries beyond chemical manufacturing because potentially hazardous chemical releases are not limited to chemical manufacturing and similar precautions should be implemented in operations in which hazardous chemicals are used, mixed, stored or otherwise handled (Ex. 2: 8).

Several states have developed legislation intended to prevent catastrophic events in their communities by requiring employers to take steps to control the highly hazardous chemicals in the workplace (e.g., Delaware, California, New Jersey (Ex. 2: 9)).

Industry has also taken measures aimed at improving the protection of public health and safety by improving chemical process safety to prevent releases. The Chemical Manufacturers Association (CMA) developed the Chemical Awareness and Emergency Response Program to foster cooperation, knowledge and response within communities (Ex. 11: 23, 24; Ex. 3: 48). Additionally CMA produced a report on process safety management, "Process Safety Management, (Control of Acute Hazards)," in order to increase knowledge among CMA members about systematic approaches to process safety analysis (Ex. 11: 25).

In 1985 a professional organization involved with process safety and loss control, the American Institute of Chemical Engineers, formed a separate branch, the Center for Chemical Process Safety (the Center). The Center's charter is to develop and disseminate technical information to be used in the prevention of major chemical accidents (Ex. 11: 16, 17, 18). The Center has become well known for its process safety management guidance publications (see appendix D).

Also an industry consulting group, the Organization Resources Counselors (ORC), and an industry trade association, the American Petroleum Institute (API), have developed recommended practices to address the protection of employees and the public through the prevention or mitigation of the effects of dangerous chemical releases. The ORC recommended practices (Ex. 2: 10) are discussed later in this notice. In 1990 API published its Recommended Practice 750, Management of Process Hazards (Ex. 2: 11), "to provide a more structured and formal approach to existing practices and to ensure a comprehensive approach to process safety" (Ex. 3: 106).

Unions representing employees immediately exposed to danger from

processes using highly hazardous chemicals have demonstrated a great deal of interest and activity in controlling major chemical accidents. For example, the International Confederation of Free Trade Unions and the International Federation of Chemical, Energy and General Workers' Unions issued a special report on the Bhopal, India accident (Ex. 2: 12). Additionally the United Steelworkers of America investigated and issued a special report on the 1988 PEPCON plant oxidizer accident in Henderson, Nevada (ammonium perchlorate explosion, two deaths and 350 injuries (Ex. 2: 13)). Further, unions including the United Steelworkers of America, the International Chemical Workers, and the Oil, Chemical and Atomic Workers, have undertaken large-scale efforts to train and educate their members who work in the petrochemical industry (e.g., Ex. 11: 2, Tr. 2262-03, 2265).

OSHA believed that available evidence supported the need for a standard and that adequate data and information existed upon which a standard could be based. Accordingly, on July 17, 1990, OSHA published in the *Federal Register* (55 FR 29150) a proposed standard containing requirements for the management of hazards associated with processes using highly hazardous chemicals in order to help assure that workers have a safe and healthful workplace.

OSHA's proposed rule emphasized the management of hazards associated with highly hazardous chemicals. The application of management controls to processes involving highly hazardous chemicals was recommended to OSHA by the Organization Resources Counselors (ORC). ORC (Ex. 2: 14) observed:

[W]hen OSHA issued its final report on the Special Emphasis Program for the Chemical Industry (Chem SEP), among its findings were that "specification standards * * * will not * * * ensure safety in the chemical industry * * * [because such standards] tend to freeze technology and may minimize rather than maximize employers safety efforts." The Chem SEP report recommended a new approach to the identification and prevention of potentially catastrophic situations. This approach would involve "performance-oriented standards * * * to address the overall management of chemical production and handling systems."

Further regarding the recommended standard, ORC noted (p.1-2) that:

The recommendations it contains are a systematic approach to chemical process hazards management which, when implemented, will ensure that the means for preventing catastrophic release, fire and explosion are understood, and that the

necessary preventive measures and lines of defense are installed and maintained.

The application of management controls to processes involving highly hazardous chemicals was also supported by other interested groups (Ex. 2: 11; Ex. 11: 23, 24).

The OSHA proposed standard established a comprehensive management program; a holistic approach that integrated technologies, procedures, and management practices. The proposal contains provisions addressing process safety information, process hazard analysis, operating procedures, training, contractors, pre-startup safety reviews, mechanical integrity, hot work permits, management of change, incident investigations, emergency planning and response, and compliance safety audits (Ex. 1).

The notice of proposed rulemaking invited comment on any aspect of the proposed standard for process safety management of highly hazardous chemicals. Additionally comment was invited on a series of issues concerning the requirements and appendices contained in the proposed standard which OSHA believed needed special emphasis. Specific questions were raised on the application of the standard; process hazard analyses; phase-in periods; team composition; training; contractors; critical equipment; drills; and notification. Finally, the notice announced the scheduling of a hearing to begin on November 27, 1990, in Washington, DC.

The Oil, Chemical and Atomic Workers Union requested that OSHA hold a regional hearing in Houston, Texas (Ex. 3: 13). OSHA agreed that the second hearing would be useful and on November 1, 1990, OSHA published a **Federal Register** notice (55 FR 46074) scheduling a second hearing to begin on February 26, 1991, in Houston, Texas; enumerating additional issues; and extending the written comment period until January 22, 1991. The additional issues in the hearing notice concerned a broader permit system; aggregation of threshold quantities of covered chemicals; workplace fuel consumption; and flammable liquid storage.

The hearings on the proposed standard for process safety management were held in Washington, DC, from November 27 through December 4, 1990, and in Houston, Texas from February 26 through March 7, 1991. The Administrative Law Judge presiding at the hearings allowed participants to submit post-hearing comments by May 6, 1991, and post-hearing briefs by June 5, 1991.

Approximately four months after the publication of OSHA's proposed standard for process safety management of highly hazardous chemicals, the Clean Air Act Amendments (CAAA) were enacted into law (November 15, 1990). The CAAA requires in section 304 that the Secretary of Labor, in coordination with the Administrator of the Environmental Protection Agency, promulgate, pursuant to the Occupational Safety and Health Act of 1970, a chemical process safety standard to prevent accidental releases of chemicals which could pose a threat to employees. The CAAA require that the standard include the development of a list of highly hazardous chemicals which include toxic, flammable, highly reactive and explosive substances. The CAAA specified the minimum elements which must be covered by the standard. The OSHA standard must require employers to:

(1) Develop and maintain written safety information identifying workplace chemical and process hazards, equipment used in the processes, and technology used in the processes;

(2) Perform a workplace hazard assessment, including, as appropriate, identification of potential sources of accidental releases, an identification of any previous release within the facility which had a likely potential for catastrophic consequences in the workplace, estimation of workplace effects of a range of releases, estimation of the health and safety effects of such range on employees;

(3) Consult with employees and their representatives on the development and conduct of hazard assessments and the development of chemical accident prevention plans and provide access to these and other records required under the standard;

(4) Establish a system to respond to the workplace hazard assessment findings, which shall address prevention, mitigation, and emergency responses;

(5) Periodically review the workplace hazard assessment and response system;

(6) Develop and implement written operating procedures for the chemical process including procedures for each operating phase, operating limitations, and safety and health considerations;

(7) Provide written safety and operating information to employees and train employees in operating procedures, emphasizing hazards and safe practices;

(8) Ensure contractors and contract employees are provided appropriate information and training;

(9) Train and educate employees and contractors in emergency response in a manner as comprehensive and effective as that required by the regulation promulgated pursuant to section 126(d) of the Superfund Amendments and Reauthorization Act;

(10) Establish a quality assurance program to ensure that initial process related equipment, maintenance materials, and spare

parts are fabricated and installed consistent with design specifications;

(11) Establish maintenance systems for critical process related equipment including written procedures, employee training, appropriate inspections, and testing of such equipment to ensure ongoing mechanical integrity;

(12) Conduct pre-start-up safety reviews of all newly installed or modified equipment;

(13) Establish and implement written procedures to manage change to process chemicals, technology, equipment and facilities; and

(14) Investigate every incident which results in or could have resulted in a major accident in the workplace, with any findings to be reviewed by operating personnel and modifications made if appropriate.

Also under the CAAA, the Environmental Protection Agency has specified duties relative to the prevention of accidental releases (see section 301(r)). Generally EPA is required to develop a list of chemicals and a Risk Management Plan.

OSHA received more than 175 comments in response to the notice of proposed rulemaking. In addition to these comments, the hearings resulted in almost 4000 pages of testimony and almost 60 post-hearing comments and briefs.

Shortly after the catastrophic Phillips 66 Company's Houston Chemical Complex incident, OSHA asked the John Gray Institute of Lamar University to conduct a study of safety and health issues as they relate to contract work in the petrochemical industry. The issue of the role of contractors in the petrochemical industry surfaced since a contractor had been working in the vicinity of the Phillips' release. Additionally, OSHA's experience indicated that a significant number of companies were using contractors to perform work at their plants. The Agency determined additional information was needed on contractors since it wanted to assure that safety issues surrounding contractor employees who are exposed or may expose site employees to potentially catastrophic events are thoroughly addressed in the process safety management standard. Upon the completion of the report, OSHA decided to give interested persons an opportunity to comment on the report and, therefore, reopened the record to receive public comment on the report and to reexamine the provisions concerning contractors. On September 24, 1991, OSHA published a notice in the **Federal Register** announcing the availability of the John Gray report and requesting public comment (56 FR 48133). OSHA received more than 300

requests for the John Gray Institute report. The comment period ended on October 24, 1991, and OSHA received 37 comments in response to the notice. The Administrative Law Judge certified the public record for the proposed rule to the Assistant Secretary of Labor for Occupational Safety and Health on November 29, 1991.

The record for this rulemaking is extensive and OSHA appreciates the time and effort expended by interested parties to ensure that as much information as possible was available to the Agency for purposes of making decisions on the final standard. In analyzing the record and preparing this final document, OSHA has carefully reviewed all of the information received, and has considered the concerns expressed by the parties participating in this rulemaking and has carefully examined the requirements of the Clean Air Act Amendments in order to assure that the final standard reflects its intent.

II. Agency Action

OSHA believes that processes involving highly hazardous chemicals present the potential for accidents, such as spills or other uncontrolled releases that could have catastrophic results. Information available to OSHA indicates that accidents have occurred in workplaces with processes involving highly hazardous chemicals for many years and that they continue to occur. Reports of incidents clearly show that there is a significant risk to employees in industries covered by this rule and that mandatory standards are reasonably necessary and appropriate and will reduce deaths and injuries due to accidental releases of highly hazardous chemicals which expose employees to the hazards of toxicity, fires and explosions. OSHA believes that this final rule will significantly reduce deaths and injuries associated with accidental releases of highly hazardous chemicals.

In conclusion, OSHA has determined that employees in industries with processes involving highly hazardous chemicals have been for many years exposed to the hazards of releases of highly hazardous chemicals which may be toxic, reactive, flammable, or explosive; that employees continue to be exposed to the hazards of releases of toxic, reactive, flammable, or explosive chemicals; that incident information and other relevant data demonstrate that these hazards pose a significant risk to employees; that this standard is reasonably necessary and appropriate; and that feasible control measures are available that will reduce the risk of employees in these industries being

injured or killed. The final standard reflects OSHA's determination that a standard is reasonably necessary and appropriate to provide safe and healthful employment and places of employment for employees in industries which have processes involving highly hazardous chemicals. Additionally, OSHA is convinced that compliance with the final standard provisions will mitigate many of the hazards present in processes involving highly hazardous chemicals. As a result, OSHA believes the risk of death or injury to employees exposed will be significantly reduced.

Finally, the Clean Air Act Amendments of 1990 clearly require OSHA to develop a chemical process safety standard containing certain minimum requirements to prevent accidental releases of chemicals which could pose a threat to employees (section 304(a)). The standard must contain clearly defined minimum requirements. Thus, in addition to being convinced that a process safety management standard is necessary and appropriate, OSHA is fulfilling its obligation under the Clean Air Act Amendments to develop this final standard. This final rule is consistent with the mandate of the CAAA.

III. Summary and Explanation of the Final Rule

This section contains an analysis of the record evidence and policy decisions pertaining to the various provisions of the standard.

The Occupational Safety and Health Act (OSH Act) defines an occupational safety and health standard as a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.

Under section 6(b) of the OSH Act, the Secretary (of Labor) may by rule promulgate, modify or revoke any occupational safety and health standard in a prescribed manner. The Act directs the Secretary of Labor to consider in promulgating standards, national consensus standards. In this instance, there is no existing consensus standard that addresses process safety management of highly hazardous chemicals.

The proposed process safety management standard contained the following paragraphs:

Purpose: Paragraph (a)
Application: Paragraph (b)
Definitions: Paragraph (c)
Process safety information: Paragraph (d)

Process hazard analysis: Paragraph (e)
Operating procedures: Paragraph (f)
Training: Paragraph (g)
Contractors: Paragraph (h)
Pre-startup safety review: Paragraph (i)
Mechanical integrity: Paragraph (j)
Hot work permits: Paragraph (k)
Management of change: Paragraph (l)
Incident investigations: Paragraph (m)
Emergency planning: Paragraph (n)
Compliance safety audits: Paragraph (o)

In the final standard, OSHA has added two additional paragraphs: employee participation and trade secrets. OSHA determined that the logical placement of the paragraph regarding employee participation should be at the beginning of the rule since the provisions require that employers consult with employees and their representatives on the general development of a process safety management program, as well as on the process hazards analyses. In order to accommodate the placement of the provisions concerning employee participation in the beginning of the final standard but also to minimize any unnecessary redesignation of paragraphs, OSHA has decided to remove the letter designation "(a)" from the "purpose" paragraph. This results in the following changes:

Purpose

Application: Paragraph (a)
Definitions: Paragraph (b)
Employee participation: Paragraph (c)
The paragraph on trade secrets has been added to the end of the standard and becomes new paragraph (p). Therefore, the paragraphs in the final rule are designated in the following manner:

Purpose

Application: Paragraph (a)
Definitions: Paragraph (b)
Employee participation: Paragraph (c)
Process safety information: Paragraph (d)
Process hazards analysis: Paragraph (e)

Operating procedures: Paragraph (f)
Training: Paragraph (g)
Contractors: Paragraph (h)
Pre-startup safety review: Paragraph (i)
Mechanical integrity: Paragraph (j)
Hot work permit: Paragraph (k)
Management of change: Paragraph (l)
Incident investigation: Paragraph (m)
Emergency planning and response: Paragraph (n)
Compliance safety audit: Paragraph (o)
Trade secrets: Paragraph (p)

A significant number of commenters and hearing participants supported the proposed standard and its purpose (e.g., Ex. 3: 10, 17, 18, 22, 25, 26, 28, 29-32, 38, 39, 40, 42, 45, 46, 53, 59, 69, 70, 71, 72, 76, 77, 79, 80, 82, 83, 86, 87, 91, 95, 96, 97, 101,

103, 104, 106, 107, 108, 113, 117, 120, 121, 127, 129, 134, 143, 146, 152, 153, 156, 162, 164, 168, 171; Ex. 89; Ex. 91; Ex. 112; Ex. 138; Tr. 730, 779, 1204, 1594, 1614, 1802, 1998-99, 2155, 2172, 2245, 2506, 2570, 2652, 2768, 3115, 3157, 3236, 3345, 3404, 3442, 3461, 3604, 3753). A participant from The Upjohn Company (Ex. 3: 22) stated:

We are pleased at this proposed rule (1910.119) which will require all employers to implement programs to ensure the safety and health of those employees working with and around processes which involve highly hazardous chemicals. In addition, we are encouraged that the effort to establish this standard included cooperation from business and government to propose a standard that is both beneficial and workable.

The Food and Allied Services Trades, of the AFL-CIO, (Ex. 3: 25, p. 3) remarked:

The proposed rule is well-intended and there is little question that such regulation is needed. Recent events * * * underscore this need. These events include not only the catastrophic explosions that occurred at Phillips Petroleum and Arco Chemical in the Houston area, but hundreds of smaller explosions and disasters that were not as widely reported by the press.

BP Oil Company (Tr. 1802) stated:

We are here today to comment on a proposed regulation which we regard as of major importance to our industry. We strongly support the Occupational Safety and Health Administration's approach to protecting workers and the public from industrial operation hazards.

Finally, the United Steelworkers of America (Tr. 2231) observed:

But the real problem is that OSHA has no standard requiring process hazard analysis, written operating procedures, adequate training in process safety, periodic safety reviews, quality assurance for critical equipment or the investigation of near-miss accidents.

Had such a standard been in place at Neville Chemical, Jim Thompson would be alive today. So might all the other chemical workers killed by accidental releases of hazardous chemicals in the past several years including the 40 in Pasadena and Channelview. Clearly, it is time to give OSHA inspectors the tools they need to prevent catastrophic accidents.

It is also time to give workers the tools they need to protect themselves and their communities.

Participants in the rulemaking also supported OSHA's development of a performance-oriented standard (e.g., Ex. 3: 27, 33, 39, 45, 46, 48, 69, 76, 134, 146, 161, 162, 171; Ex. 91; Ex. 133; Ex. 138; Tr. 1009, 1999, 2284, 3726). The Chemical Manufacturers Association (Ex. 3: 48) remarked:

Initially CMA would like to commend OSHA on its efforts to craft a comprehensive performance based standard addressing

process safety management of highly hazardous chemicals. As CMA has commented in past rulemakings, performance language capitalizes on industry's ingenuity and capability to effectively reduce hazards as they may be uniquely applied to a particular safety concern.

Ashland Petroleum Company (Ex. 3: 80) stated:

Ashland * * * is generally supportive of the efforts of the Secretary and of the Occupational Safety and Health Administration with respect to this proposed regulation. While our internal commentators had divided between a desire for specificity and the obvious value of the non-detailed performance approach, ultimately we believe the "performance standard" approach is the best way to regulate a wide variety of situations for which a common end is desired.

The American Society of Safety Engineers (Ex. 3: 146, p. 2) noted:

The Society commends OSHA's use of a performance standard rather than a specification rule, believing this is the better means to help ensure each affected facility address its individual situation.

Many participants in the rulemaking acknowledged their belief that a process safety management standard is the most effective approach available in the prevention of catastrophic releases and others acknowledged their belief that the standard will improve the safety and health of employees (e.g., Ex. 3: 71, 72, 91, 94, 95, 96, 101, 106, 113, 120, 121, 127, 129, 158; Ex. 131; Tr. 1998, 3719). For example, Amoco (Ex. 3: 95) found that:

In general, we are very favorably impressed with the regulation as written. This standard is comprehensive, and when properly applied, should be effective in reducing loss of life, serious injury, and damage to property.

The American Petroleum Institute (API) (Ex. 3: 106) indicated:

API member companies support OSHA's effort to develop an effective process safety management rule. API believes process safety management is the most effective approach available in the prevention of catastrophic releases, a goal which we share with OSHA completely.

Finally, Oryx Energy Company (Tr. 3719) testified:

I think the proposed rule and 750 [API RP 750]—you know, they are similar—they will both accomplish the mission of making a safer workplace. I think—I know of no other system that is better than the system that is proposed by OSHA.

Before discussing the provisions of the final standard, OSHA would like to address several issues that were brought up during the rulemaking. First, many participants asserted that OSHA should permit required information to be stored electronically or on computers.

Electronic storage or computerized storage of records and information required by this standard is permissible, as long as it is readily accessible and easily understood.

Second, in Issue 10 of the proposal (55 FR 29159) OSHA asked whether provisions should be delayed or phased-in (timeframes for conducting process hazard analyses were discussed in a separate issue, Issue 3 at 29158). Participants suggested a variety of schedules (e.g., Ex. 3: 41, 45, 48, 53, 69, 81, 96, 101, 106, 113, 127, 134; Ex. 138; Tr. 735, 1616, 3241). However, OSHA has decided that, with the exception of allowing a phase-in period for paragraph (d), process safety information, and paragraph (e), process hazards analysis, no other phase-in period is necessary or warranted. OSHA realizes, as it does with any other newly promulgated standard, that employers will be working toward implementation of the provisions contained in the standard as quickly as possible. The standard will become effective in 90 days, thereby giving employers a brief period to familiarize themselves with the provisions of the standard and begin its implementation. OSHA believes this schedule is practical and feasible.

Third, also in Issue 10, OSHA asked whether it is necessary for all of the covered industries to meet all of the proposed provisions. OSHA was concerned about the potential impact on small businesses. Most of the participants who addressed this issue believed that small facilities should not be exempted if they have the threshold quantity of chemicals in their processes since the potential for a catastrophe is based on the amount of chemical present rather than on the size of facility (e.g., Ex. 3: 9, 20, 38, 47, 59, 69, 95, 103, 138; Tr. 2010-1, 2176, 3421). Several of these participants suggested that OSHA provide special assistance to small employers. OSHA agrees with participants that plants should be covered based on whether they have the threshold quantity of a covered highly hazardous chemical. OSHA also agrees with the recommendation suggesting that OSHA provide special assistance to small businesses and is considering this issue at this time. As an immediate step, OSHA has developed nonmandatory appendices which will assist in providing small businesses with guidance on complying with the process safety management standard and sources of further information and assistance (appendix C and appendix D respectively). Additionally, the Agency is developing a compliance assistance

"outreach" program to assist small businesses.

Finally, in Issue 11 (55 FR 29159) of the proposal, OSHA asked whether employers, when they have a threshold quantity of a highly hazardous chemical as specified by the standard, should be required to notify the OSHA Area Office of their location. Other entities which regulate potentially catastrophic workplaces require notification of the regulating authority.

Numerous participants addressed this issue. Some participants believed that notification should be required (e.g., Ex. 3: 20, 25, 71, 86, 99, 115; Ex. 101, Tr. 2253). Other participants indicated that while they did not see a benefit to notification, they would not object if a notification requirement was kept simple (e.g., Ex. 3: 26, 28, 26, 28, 69, 113, 120; Tr. 3279, 3376). Still others objected to notification as an unnecessary burden, and in some cases observed that EPA already requires notification or that perhaps OSHA should access the information already required to be submitted to EPA (e.g., Ex. 3: 30, 36, 64, 60, 109, 113, 120, 122, 127, 134, 141, 146; Ex. 103, Tr. 1025). For example, Organization Resources Counselors (Ex. 131, p.11) indicated that:

Before OSHA inserts such a requirement into the standard, it should determine what use it will make of such notification and whether or not the information is already available from other resources.

OSHA has decided not to require notification in the final standard. OSHA believes requiring such information would be redundant with requirements that already exist under SARA and under the Clean Air Act Amendments which require reporting. Since similar information is already required to be reported, OSHA will work with EPA to obtain needed plant location information, instead of placing a redundant burden on employers.

On September 19, 1990, the Office of Management and Budget (OMB) filed comments on the process safety management proposal (Ex. 3: 14). OMB raised several concerns about the proposal. OMB observed that:

(1) OSHA failed to consider alternative regulatory options;

(2) The effectiveness of OSHA's approach is uncertain;

(3) The costs of the standard may be higher than estimated and may adversely affect profitability;

(4) The standard may have high costs and few benefits for small employers and, therefore, could be anticompetitive; and

(5) OSHA should consider a sunset provision in the final rule that would cause the rule to expire after five years

if it does not have the intended effect of providing significant reductions in the number of workplace accidents associated with hazardous chemicals.

OSHA has carefully evaluated the OMB comment and believes that the modifications to the proposed rule and the issues discussed below are responsive to the OMB concerns. The major concerns are addressed below.

(1) OMB stated that OSHA had failed to consider alternative regulatory options that might protect workers equally well at lower cost (Ex. 3: 14, p.1-3). OSHA believes that its latitude to consider regulatory options such as those contemplated by OMB is somewhat limited by the Clean Air Act Amendments (CAAA). For example, in section 304 of the CAAA, OSHA was directed to enact a chemical process safety standard containing certain minimum elements within one year. The Clean Air Act Amendments specified 14 elements which OSHA must include in the process safety standard. OSHA has included these elements in its final process safety management standard. OMB suggested that OSHA consider an alternative regulatory approach that allows firms to use the results of the hazard analysis to determine which of the other safety requirements are appropriate. The Congressional mandate does not allow OSHA this flexibility. In addition, participants addressed this issue (Ex. 131; Tr. 307, 818) and the consensus was that the provisions of the standard were inextricably intertwined and they could not be considered separately without adversely affecting the contemplated effectiveness of the rule. For example, the Organization Resources Counselors (ORC) stated that its member companies "indicate that most, if not all, process related incidents involve a breakdown of one or more of OSHA's Process Safety Management elements" (Ex. 131, p.9). American Cyanamid Company (Ex. 3: 127) observed:

We concur with the concept of a comprehensive management system which addresses technology, equipment, procedures, training and management oversight. Deficiencies in any one of these areas can lead to a breakdown in process safety and increase the potential for a serious accident.

In addition, OMB suggested that OSHA should look more closely at the potential for accidents from various types of hazardous chemicals (Ex. 3: 14, p.2). In establishing the list of substances to be regulated under the process safety management rule, OSHA carefully considered the potential for catastrophic events posed by a large number of chemicals. In order to select

chemicals with catastrophic potential, OSHA consulted the lists developed by the Environmental Protection Agency and Department of Transportation and various states with regulatory experience in this area; namely Delaware and New Jersey. In developing the list of covered substances, OSHA also reviewed materials on this subject developed by the World Bank, the European Economic Community (the Seveso Directive), the National Fire Protection Association and ORC. While it is true that all chemicals on the list do not have equal catastrophic potential, OSHA addressed this issue in two ways. It developed appropriate thresholds for each of these chemicals by consulting with the sources above and relying on its own expertise, and it developed the flexible performance-oriented approach of the standard by mandating a process hazard analysis which will itself indicate the necessary safety precautions to take according to the incidence of use in a particular industrial setting.

(2) OMB claimed that the effectiveness of OSHA's approach is uncertain (Ex. 3: 14, p.3-4). In its preliminary regulatory impact analysis (PRIA, Ex. 4), OSHA claimed that after the standard had been in effect for 5 years, injuries and illnesses resulting from potentially catastrophic incidents would be reduced by at least 80% (Chapter V-14). This effectiveness rate is consistent with that used in other OSHA Regulatory Impact Analyses such as Electrical Safety-Related Work Practices (Final Rule, 55 FR at 32011, August 8, 1990, Regulatory Impact Assessment); Control of Hazardous Energy Source (Lockout/Tagout) (85 percent, Final Rule, 54 FR at 36665, September 1, 1990, Regulatory Impact Analysis); Permit Required Confined Spaces; Notice of Proposed Rulemaking (54 FR at 24097, June 5, 1989, Benefits); and Hearing Conservation (Final Regulatory Analysis of the Hearing Conservation Amendment, U.S. Department of Labor, January 1991, Chapter III-27; benefits of 85% at equilibrium from the hearing conservation amendment).

Participants also acknowledged their belief that the process safety management standard will be substantially effective in improving safety. For example, Arco Chemical (Ex. 3: 71) stated:

ARCO Chemical Company strongly endorses OSHA's proposed rulemaking * * * ACC's President and Chief Executive Officer, stated that ACC shares " * * * the Congress' desire to further improve process safety management in the chemical industry," and

that ACC believes that OSHA's proposed rules "—as minimum standards—will substantially improve safety across the entire U.S. process industry."

American Cyanamid Company (Ex. 3: 127) remarked:

American Cyanamid believes that the proposed standard, if implemented, will substantially reduce the risk of accidental releases, fires and explosions from processes involving highly hazardous substances.

Additionally, the Organization Resources Counselors (Ex. 131, p.9-10) stated:

Given effective implementation and compliance with the provisions of the proposed standard, we agree with OSHA's estimate of at least 80% reduction in serious process incidents.

Quantitative evidence from Air Products and Chemicals, Inc., suggests that instituting a comprehensive process safety program which includes a hazard analysis could result in an even more significant reduction in accident and injury rates (97.5%; RIA, Chapter V-11-12). Moreover, empirical data from a senior safety consultant showed that in dealing with 500 companies of all sizes (over a 15 year period) "those committed to the development of a long-term program" similar to that described in the process safety management standard, achieve median improvement in their safety programs after the third year of implementation of nearly 75% (RIA, Chapter V-13).

Although one of the studies cited by OMB (the St. John's River Power Plant project) only accomplished a 56% decrease in accidents, it is important to note that the potential hazards faced by the plant studied were significantly lower than those posed by the use and handling of the threshold amounts of chemicals covered by the process safety management rule; and the program studied was not as comprehensive as that contemplated in the PSM standard. It is not unreasonable to assume that where, as here, highly hazardous chemicals are being used in potentially catastrophic amounts and there is a comprehensive standard in effect that has the force and effect of law, that an additional 25% effectiveness could be accomplished. While one cannot predict benefits absolutely it would seem that the 80% estimate assumed by the RIA is reasonable and supported by substantial evidence in the record as a whole.

(3) OMB also indicated that the costs may be higher than estimated and may adversely affect profitability (Ex. 3: 14, p. 4-6). The PRIA predicted that compliance with the proposed standard would cost \$638 million in direct annualized gross costs (estimated per

year for a ten year period). These estimates were based in large part on the Kearney/Centaur Report, "Proposed OSHA Rule for the Process Hazards Management of Highly Hazardous Chemicals: An Industry Profile, Cost Assessment and Benefits Analysis" (Ex. 5). A number of commenters believed that the PRIA had underestimated the costs of complying with the proposed standard (e.g., 3: 45, 69, 95, 106, 109, 150, 153). In response to comments in the record, OSHA updated and refined the Kearney/Centaur industry profile, its estimates of current industry compliance with the proposed process safety management standard, and the estimate of the number of processes per establishment that would be covered by the standard (RIA, Chapter V). This resulted in the calculation of increased costs of compliance with the process safety management standard. The final RIA predicts gross costs of \$863.5 million/year during the first 5 years that the standard is in effect (as opposed to the \$638 million estimated by the PRIA) (RIA, Chapter IV-11) and \$390.1 million/year during the next 5 years. In order to better understand the true costs associated with the process safety management rule, the gross cost of compliance must then be adjusted downward to account for the many benefits of the standard, such as increased productivity, decreased property damage, and decreased fatalities and injuries. When these offsets are taken into account, OSHA predicts that the standard will cost approximately \$143.5 million per year for the first 5 years. Cost savings are expected to exceed direct costs for most industry groups in years 6 through 10.

OSHA also looked at the effect of the costs of compliance on the profitability of the affected industries and found that, assuming that the affected companies would not pass on any of the costs of compliance to customers (a worst case assumption), in the first five years compliance with the process safety management rule might decrease profits anywhere from .09 percent to 15.7 percent depending on the industry group. Worst-case profit impacts would average 1.1 percent for large establishments and 3.2 percent for small establishments. Therefore the final figures show that the standard is not only economically feasible, but it will not unreasonably affect the profitability of the affected industries and is well within the mandates of the CAAA, the Occupational Safety and Health Act and Executive Order 12291.

(4) OMB also believed that the process safety management rule might have high costs and few benefits for

small employers and, therefore, could be anticompetitive (Ex. 3: 14, p. 6-7). As stated above, the final RIA indicates the gross costs of complying with the process safety management standard will be \$863.5 million/year during the first 5 years that the standard is in effect and \$390.1 million/year during the next 5 years for all industry. Of this total gross cost of compliance, small business will bear approximately \$88.9 million/year during the first 5 years that the standard is in effect and \$33.0 million/year during the next 5 years. While accounting for approximately 10 percent of costs, small firms will realize considerable benefits from compliance: 21 percent of fatalities avoided and 9 percent of lost-workday injuries avoided will occur in small establishments.

OSHA's estimates for small-firm costs declined in the final impact analysis after incorporating the ideas of inventory reduction and a learning-curve effect during compliance. A small business might reduce the potential hazard by purposely controlling its on-site inventory of highly hazardous chemicals by ordering more frequent, smaller shipments so that they do not exceed the threshold for coverage set forth in the rule. Also, they may segregate their inventory by dispersing the storage around the worksite so that the release of a highly hazardous chemical from one storage area would not cause the release of the other inventory stored on site. This remote storage approach would also be a feasible alternative. Moreover, small employers who use batch processes may be able to use a generic approach to the required process hazards analysis which would help to further reduce the estimated cost of compliance. For example, a generic process hazard analysis of a representative batch might be used where there are only small changes in the process chemistry and this is documented for the range of batch processes (see appendix C).

Also, as a general rule, small employers have greater flexibility within their workplaces than do large employers. Employees may be trained to do more than one job and have a greater understanding of the interrelationship of the different factors that can adversely affect the process and produce a potentially catastrophic incident.

Some participants believe that there will be long-term benefits to full implementation of process safety management (e.g., Ex. 11: 87; Ex. 99; Ex. 131; Tr. 1050-52, 3052). For example, evidence in the record from a manager of a small plant which had recently undergone the experience of

implementing process safety management practices and techniques indicates that the benefits of the standard can be substantial and realizable (Ex. 131, Attachment III, p. 5-6). For example, he wrote:

The benefits of a comprehensive process safety program are substantial, but are often difficult to quantify. This is particularly true if one tries to develop a traditional "return on investment."

Perhaps the biggest benefit is in the alteration of thinking that is inherent to the system. It became apparent that there was a subtle shifting of approach to problems by plant staff . . . Our small organization was quietly infused with a rebirth of innovative thinking. Process technology that was more than 35 years old was routinely being questioned and inspected for safer ways to do the task at hand. This quickly led to the same questioning being applied to process improvement . . .

The net result has been not only that safety performance has been enhanced, and the process operational risks materially reduced, but the resultant attitude and approach to daily tasks have resulted in material gains in directly accountable issues such as process yields. Ultimately, I believe that this thoroughness and rigorous training approach will result in cost savings to a small plant site on the order of 4 to 7 percent of an operating budget . . .

(5) OMB also felt that OSHA should consider a sunset provision in the final rule that would cause the rule to expire after five years if it does not have the intended effect of providing significant reductions in the number of workplace accidents associated with hazardous chemicals (Ex. 3: 14, p. 3). In its proposal, OSHA did not propose a specific timeframe for compliance. The final OSHA rule, because of feasibility considerations, does not become fully effective for five years and if the comment is read literally, the rule might "set" before it was fully implemented. Therefore, the 5-year "sunset" timeframe would not be compatible with the process safety management regulatory framework. The process safety management standard is based on the Occupational Safety and Health Act and the Clean Air Act Amendments of 1990 (CAAA). The CAAA does not contemplate a "sunset" provision and this is probably because we know that the chemicals which this standard regulates are intrinsically hazardous and the hazard will not go away as long as these chemicals are being used in industrial processes. Even if the OMB comment were read to mean that OSHA should consider a sunset provision 5 years after the rule becomes effective, there is nothing in the present record that would support the inclusion of a sunset provision in the final rule. The Agency believes that this final rule will

be highly effective and will significantly reduce workplace accidents and injuries. This view is supported by substantial evidence in the record as a whole. Therefore it would be arbitrary and contrary to the record evidence for the Agency to include a sunset provision in the final rule. Moreover, it is questionable whether this approach (i.e., a sunset provision) is consistent with the procedural framework of the Occupational Safety and Health Act, which directs the Secretary to use specified procedures to amend or revoke a standard adopted under the Act. These procedures include public notice and an opportunity for the public to file comments and objections and to request a public hearing on the proposed amendments or revocation (29 U.S.C. 655).

It is, of course, possible that after the process safety management rule has been in effect for a while, however, facts may emerge to indicate that there is a need to change the regulation (e.g., safety prevention provisions, highly hazardous chemical lists, etc.). If such facts emerge, either based on safety experience under the rule or on an OSHA retrospective study of the costs and benefits of the rule, the Agency might then consider amending the regulation to make it more effective. This would, of course, be done under section 6 of the Occupational Safety and Health Act, perhaps with the assistance of other potentially relevant statutes such as the Alternative Dispute Resolution Act (Pub. L. 101-552) and the Negotiated Rulemaking Act (Pub. L. 101-646). Under any of these vehicles, however, interested persons would be given a chance to comment and present evidence on all relevant issues, a safeguard that might be missing if a sunset provision were used.

Purpose

It was pointed out to OSHA by several commenters (e.g., 3: 12, 48, 53) that in the proposed paragraph concerning the purpose of the standard (proposal paragraph (a)), OSHA did not correctly state the types of chemicals covered by the proposal since in addition to "toxic, flammable or explosive chemicals," OSHA was also covering reactive chemicals. This intent was stated in other locations in the proposal including the description of the highly hazardous chemicals covered by appendix A of the proposal. In response, OSHA has added "reactive" to the purpose paragraph and it now states that the section contains requirements for preventing or minimizing the consequences of "toxic, reactive, flammable, or explosive chemicals."

Additionally, OSHA has added that the standard is intended to address the hazards to employees from toxicity, fire or explosion.

Application: Paragraph (a)

The application section in proposed paragraph (b) specified those types of highly hazardous chemicals covered by the proposal. The application section also included processes involving certain specified highly hazardous chemicals at or above a stated threshold which was listed in appendix A; processes involving flammable liquids or gases on site in one location in quantities of 10,000 pounds or greater (with two exceptions discussed later in this preamble); the manufacture of explosives and pyrotechnics; and processes involving chemicals developed after the promulgation of the final standard which meet certain criteria contained in proposed mandatory appendix B (Substance Hazard Index). Additionally, OSHA proposed to exclude retail facilities, oil and gas well drilling and servicing operations and normally unmanned remote facilities from the standard.

The application paragraph was addressed by the vast majority of rulemaking participants. OSHA received a great deal of support concerning its general approach to covering highly hazardous chemicals but also received numerous recommendations for clarifications; criticisms regarding the toxic and reactive list (appendix A); the inclusion of 10,000 pounds of flammable liquids rather than the use of a vaporizable amount (5 tons of vapor); and recommendations for additional exemptions for certain processes or industries. OSHA has carefully evaluated participants' comments and information concerning the appropriate scope and application of the standard in order to assure that the standard is clearly and properly focused to achieve its goal of eliminating the occurrence of releases or mitigating the consequences of releases that occur.

Before discussing the proposed application provisions in detail, OSHA would like to address and clarify OSHA's use of the plural word "processes" in the application paragraph of the proposal. This use resulted in commenters (e.g., Ex. 3: 104, 109, 112, 119, 125, 126) questioning whether the use of the word "processes" meant that the amount of highly hazardous chemical used at a plant must be aggregated to meet the threshold for coverage even though the amount of highly hazardous chemicals used at any one location might be less than the

threshold amount or the amount of highly hazardous chemical in use might be divided among remote processes. Also, participants asked whether the proposal required that the highly hazardous chemical threshold quantity be aggregated over a period of time or whether it must be present at one point in time to be covered by the proposal. OSHA addressed this concern in its November 1, 1990, **Federal Register** notice in Issue 2 (55 FR 46075).

OSHA's view at that time was that if a plant exceeded the threshold quantity of a listed chemical but the chemical was used in smaller quantities around the plant and was not concentrated in one process or in one area, then OSHA believed that a catastrophic release of the threshold quantity would be remote due to the reduced availability of a concentrated amount of the chemical in one location. However, OSHA requested comment on the point at which a chemical should be considered in its aggregate due to the proximity of the sites at which it was being used in a plant.

While a few participants indicated that the amounts of a highly hazardous chemical used at various sites around the plant should all be counted toward the threshold amount for coverage (e.g., Ex. 3; 12, 18, 41; Ex. 153), most participants who discussed this issue noted that the threshold quantity should not be aggregated (e.g., Ex. 163; Ex. 164; Tr. 2591, 3192). They agreed that highly hazardous chemicals in less than threshold quantities distributed in several processes would not present as great a risk of catastrophe as the threshold quantity in a single process.

OSHA continues to believe that the potential hazard of a catastrophic release exists when the highly hazardous chemical is concentrated in a process and therefore agrees with these commenters. OSHA has clarified the language contained in the application paragraph to reflect its intent that coverage is triggered by a specified threshold quantity of an appendix A substance being used in a single process. This revision also clarifies the fact that the presence of a threshold quantity of a highly hazardous chemical in a process is to be at one point in time; not aggregated over a period of time.

In the application section (paragraph (b)(1)(i)) of the proposal, a process would be covered if it involved a toxic or reactive highly hazardous chemical listed in appendix A, at or above a specified threshold quantity. Appendix A was a compilation of highly hazardous chemicals that could cause a serious chemical accident, by toxicity or

reactivity, and a consequent potential danger to employees in a workplace.

The appendix A list has been drawn from a variety of relevant sources which include: The New Jersey "Toxic Catastrophe Prevention Act," the State of Delaware's "Extremely Hazardous Substances Risk Management Act," the World Bank's "Manual of Industrial Hazard Assessment Techniques," the Environmental Protection Agency's "Extremely Hazardous Substance List," the European Communities Directive on major accident hazards of certain industrial activities (82/501/EEC, sometimes called the Seveso Directive), the United Kingdom's "A Guide to the Control of Industrial Major Accident Hazards Regulations 1984," the American Petroleum Institute's RP 750, "Management of Process Hazards," the National Fire Protection Association's NFPA 49, "Hazardous Chemicals Data," and the Organization Resources Counselors, Inc.'s "Recommendations for Process Hazards Management of Substances with Catastrophic Potential."

Every chemical listed in appendix A is on at least one list compiled by these agencies and organizations as warranting a high degree of management control due to its extremely hazardous nature. Most of the chemicals are on several lists. Not every list contains the same chemicals or quantities. Based on a review of these sources, OSHA has sought to include those toxic and reactive chemicals it believes are most significant in potentially becoming a catastrophic event. OSHA has also sought to develop a reasonable listing of threshold quantities which, when used in a process, would invoke coverage of the standard.

Those appendix A highly hazardous chemicals which are highly reactive or explosive-type chemicals have been drawn from chemicals listed in the National Fire Protection Association (NFPA) document, NFPA 49, "Hazardous Chemicals Data" and cross-referenced with other sources mentioned above. The Agency decided to include substances with the two highest or most dangerous reactivity ratings from NFPA 49 because these chemicals present the most severe exposure potential to workers. These substances, which are rated 3 or 4 by NFPA 49, are those which are capable of undergoing detonation or explosive decomposition. These are the substances which can generate the most severe blast or shock wave, and can cause fragmentation of piping, vessels and containers, as well as causing

serious damage to buildings and structures.

The minimum threshold quantities for the highly reactive chemicals covered by the standard have been determined by calculating the amount of material needed to propagate a blast wave that creates an overpressure of 2.3 psi (15.85 kPa) to a flat surface perpendicular to the direction of the blast wave at a distance of 100 meters from the point of origin. This approach is similar to that used by the State of Delaware.

The toxic chemicals contained in appendix A were drawn from the various resource documents discussed above. Most of the toxic chemicals listed in appendix A are on a majority of the lists produced by these resource documents.

In determining threshold quantities for toxic chemicals, OSHA used the Turner described Gaussian dispersion model. This approach, again, is similar to that used by the State of Delaware. Both OSHA and Delaware made the following assumptions: Average conditions of 4.3 m/sec. wind speed and D stability with urban dispersion coefficients; continuous steady-state release for one hour; no liquid pools; all released chemicals in vapor or gaseous state; chemical release is at ambient temperature and at ground level; chemical gas or vapor cloud is neutrally buoyant; and no design features prevent downwind dispersion. The calculated threshold quantities were rounded by OSHA to further simplify the standard.

The lowest threshold quantity that the Agency has used is 100 pounds (45.4 kg) for the most hazardous of the chemicals listed. The OSHA threshold quantities are the same or somewhat greater than the Delaware "sufficient quantity level" (threshold quantity) due to the rounding up by the Agency for the vast majority of the toxic chemicals listed. This has been done to simplify the application of this final rule and also in recognition that the Agency has other standards which address the hazards of lower quantities of toxic materials in the workplace.

OSHA specifically solicited comments on the sufficiency of the list and threshold quantities in appendix A (55 FR at 29158). Appendix A generated a significant amount of discussion during this rulemaking.

Some commenters (e.g., Ex. 3; 18, 35, 89, 152) asked why OSHA's resulting list was different than the Environmental Protection Agency's (EPA) Extremely Hazardous Substance (EHS) list and some suggested further expansion of the list. For example the Consumer Policy Institute (Ex. 3; 152, p.2) stated:

CPI recommends that the highly hazardous substance list be expanded to include all substances on the EPA SARA Title III list of extremely hazardous substances, all substances found to be involved in incidents at facilities and all substances listed by the European Economic Community under the Seveso directive.

The Shipbuilders Council of America (3: 18, p.4) indicated:

[I]t is recommended that the two agencies [OSHA and EPA] publish one consistent list of chemicals which both would consider "extremely" or "highly" hazardous. Employers would then be required to deal with one list of chemicals for reporting purposes under SARA regulations and for safely managing processes that use these chemicals under the OSHA regulations.

Under section 302 of the Superfund Amendments and Reauthorization Act (SARA) also known as the Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001 *et seq.*), EPA was required to publish a list of extremely hazardous substances with threshold planning quantities which would trigger planning in states and local communities (52 FR 13378). EPA's EHS list is quite extensive (more than 300 hazardous substances) and serves as an emergency response planning list directed toward addressing hazards to the public and the environment.

Section 304 of the Clean Air Act Amendments (CAAA), paragraph (b), List of Highly Hazardous Chemicals, mandates that:

The Secretary [of Labor] shall include as part of such standard [Chemical Process Safety Standard] a list of highly hazardous chemicals, which include toxic, flammable, highly reactive and explosive substances (Emphasis added).

The paragraph further indicates that the Secretary may include those chemicals listed by the Environmental Protection Agency under section 302 of the Emergency Planning and Community Right to Know Act of 1986.

Further the CAAA did not anticipate that even EPA would adopt the whole EHS list for the purpose of prevention of accidental chemical releases. Section 301(r) indicated that EPA's first list must contain no less than 100 substances which may be from the EHS list. EPA's 301(r) list is not a planning tool but rather a list that requires covered plants to develop comprehensive Risk Management Plans.

While OSHA considered this list, it does not consider all of the substances on the EHS list to present a potential catastrophic situation for employees in workplaces within its jurisdiction. Therefore, OSHA believes it has acted reasonably and appropriately in evaluating a variety of chemical lists

including the EHS list in order to identify those highly hazardous chemicals which present a potential catastrophic threat to employees. These events typically include toxic releases, fires and explosions as opposed to potential environmental threats such as spillage of a pesticide.

Several participants in the rulemaking (e.g., Ex. 3: 6, 45, 51, 150; Ex. 141) advised OSHA that certain chemicals which appeared in appendix A, including dimethyl sulfide, isopropyl formate, and methyl disulfide had been deleted from EPA's EHS list based on a reconsideration of the data and a determination that the data did not support the inclusion of the chemicals on the EHS list. OSHA agrees that it is appropriate to delete these chemicals from its list since a redetermination had been made that data and information available did not support their inclusion on the EPA list. OSHA has therefore removed these chemicals from its appendix. Other changes to OSHA's appendix A list include: (1) A change in the amount of anhydrous ammonia from 5,000 to 10,000 pounds to better reflect its hazards; (2) a change in the stated threshold quantity of ammonia solutions from 10,000 to 15,000 pounds to better reflect its dilution by water and its consequent decreased flammability and potential adverse health affects; (3) a change in the amount of 3-bromopropyne (also listed as propargyl bromide) from 7,500 pounds to 100 pounds to reflect its toxic characteristics rather than its reactive characteristics; (4) elimination of the erroneous description of formaldehyde, in "concentrations greater than 90%," since no such concentration exists, and the addition of formalin in the description to assure that no doubt exists that formalin is covered under the formaldehyde entry; (5) an editorial change to peracetic acid (also called peroxyacetic acid) which inadvertently did not include the description "concentration > 60%" which was correctly included in the subsequent entry of peroxyacetic acid; (6) the elimination of the word "liquid" from the description of sulfur dioxide since it may also be a gas and the health hazards are the same regardless of its state; (7) and changes based on a reevaluation of available information, in the threshold amounts of allylamine from 1500 pounds to 1000 pounds, peracetic acid (also called peroxyacetic acid, concentration > 60%) from 5000 pounds to 1000 pounds, and tetramethyl lead from 7500 pounds to 1000 pounds to better reflect their toxic hazards.

Some participants expressed their general support for the list contained in

appendix A (e.g., Ex. 3: 17, 45, 59, 62, 82, 88, 95, 127, 134; Tr. 1999-2000). Allied-Signal Inc. (Ex. 3: 17, p.15) observed:

Appendix A is a credible compilation of chemicals that are sufficiently toxic and volatile that their release could result in a catastrophic event. We applaud OSHA's use of list of toxic and reactive/unstable chemicals developed by other Federal and State agencies to develop appendix A.

The American Paper Institute (Ex. 3: 45, p.10) indicated:

The approach of tying process safety management requirements to the presence or absence of listed chemicals is an imperfect one. While the list-based approach may mean that the rule is both over and under inclusive, we have devised no approach that more closely tailors the process safety management requirements to real process safety hazards.

In general, appendix A appears to be a sufficient compilation of chemicals.

BP America Inc. (Ex. 3: 59A) noted:

BP America has reviewed the list of Appendix A chemicals and believes that the current compilation of chemicals is acceptable.

Amoco Corporation (Ex. 3: 95) stated:

We think that the list of highly hazardous chemicals in appendix A is sufficiently comprehensive in nature and reasonable with regard to threshold quantity to adequately cover the most toxic and hazardous chemicals in current use.

American Cyanamid Company (Ex. 3: 127, p.2) indicated:

Mandatory appendix A is a sufficient compilation of chemicals for the initial coverage of this proposed standard. We could find no major omissions from appendix A. Its completeness is undoubtedly attributable to careful research on OSHA's part and the experience factor derived from review of similar lists.

Lubrizol Petroleum Chemicals Company (Ex. 3: 134) stated:

The Houston plants agree with OSHA's belief that appendix A represents a reasonable and appropriate listing of chemicals and threshold quantities.

Finally, OSHA's expert witness, who worked for 37 years with Monsanto Company, the last 9 as corporate safety director (worldwide responsibilities) (Tr. 1999-2000) testified:

In my opinion, the list of chemicals with the stated threshold quantities in the appendix is reasonable and provides the focus for preventing catastrophic releases of hazardous materials in the processing industry.

OSHA based its list on information drawn from a variety of sources, including other federal and state agencies, national consensus standards and the United Kingdom Health and Safety Commission.

While any listing of hazardous chemicals is subject to revision, I support the listing of the chemicals in the appendix as appropriate.

It encompasses, in my experience, the vast majority of chemicals likely to cause catastrophic release and its consequences.

However, a number of participants felt OSHA should provide a technical basis for the appendix A list and its threshold quantities (e.g., Ex. 3: 26, 46, 48, 53, 97, 101, 129; Ex. 131; Tr. 66, 1015). Some participants noted that if no published technical basis existed then it would be difficult to add chemicals at a later time (e.g., Ex. 3: 46, 48; Ex. 131; Tr. 1015). OSHA believes that its review of available literature for the development of its list of highly hazardous chemicals and its technical approach (discussed previously) is an appropriate method to determine which toxic chemicals should be included on its list. OSHA also believes that it is reasonable to defer to groups that have already published their lists and which have withstood public scrutiny. OSHA is convinced that it has taken a correct and reasonable approach.

Additionally OSHA believes that additional consideration would be required to fully evaluate a "technical basis" other than that used by the Agency (e.g., a formula). The Organization Resources Counselors (ORC) recommended the use of a technical basis throughout the rulemaking. In its post-hearing comment (Ex. 131, Table A-1), ORC reassessed the OSHA appendix A list based on its suggested technical basis (a formula, similar to the Substance Hazard Index proposed by OSHA). The outcome resulted in significant differences in the threshold quantities for many chemicals. For example, OSHA lists the threshold quantity of acrylyl chloride at 250 pounds and arsine at 100 pounds; ORC lists the threshold quantity of acrylyl chloride at 200 pounds and arsine at 450 pounds. While the ORC approach is an interesting one, OSHA believes that its approach is also correct, and has decided to retain it in the final rule.

As noted, some participants indicated that without a technical basis for appendix A it would be difficult for OSHA to readily update its list in the future. OSHA believes that a means for adding highly hazardous chemicals to appendix A in the future can be considered at such time as the need arises. As discussed, OSHA has explained its technical basis for appendix A highly hazardous chemicals. OSHA does not believe that it should modify the approach it used in the development of the appendix A list especially in light of the many changes that would be necessitated through the

incorporation of other suggested approaches. In addition, with the exception of a few corrections and clarifications, there were no objections raised as to the appropriateness of the threshold quantities proposed, but as stated, general support for the list and threshold quantities.

As discussed, the application section (proposed paragraph (b)(1)(i)) triggering coverage of those processes using chemicals in quantities listed in appendix A, has been clarified to lessen confusion concerning the aggregation of chemicals by changing the term "processes" to "a process." No other changes have been made to the text of the paragraph but it has been redesignated as paragraph (a) and thus becomes paragraph (a)(1)(i).

The application section (paragraph (b)(1)(ii)) proposed to include processes involving flammable liquids or gases in quantities of 10,000 pounds or more. It has been suggested that OSHA cover flammable gases and liquids with a potential release of five tons of gas or vapor (Ex. 2: 10, 11).

The American Petroleum Institute's (API) Recommended Practice 750 (RP 750), Management of Process Hazards, uses the potential release of gas or vapor approach. The stated purpose of RP 750 is to help prevent the occurrence, or minimize the consequences of, catastrophic releases of toxic or explosive materials (Ex. 2: 11). Additionally in the application statement of RP 750 it is stated that the recommended practice is intended for facilities that use, produce, process, or store:

Flammable or explosive substances that are present in such quantity and condition that a sudden, catastrophic release of more than 5 tons of gas or vapor can occur over a matter of minutes, based on credible failure scenarios and the properties of the materials involved.

Appendices A and B to RP 750 provide information and guidance on the application of this paragraph.

However, OSHA believed that assessing the variables and assumptions inherent in determining whether five tons of gas or vapor could be released (temperature, pressure, rate of release, etc.) using undefined "credible release scenarios," would be an unnecessary burden on employers and compliance personnel. More importantly, depending on these variables, substances might sometimes be covered and sometimes not be covered, a potentially confusing situation. Therefore, OSHA decided to use a worst case approach and assume that the entire five ton quantity of a

highly hazardous chemical could be released into gas or vapor.

In Issue 1 in the notice of proposed rulemaking (55 FR at 29158) OSHA requested comments on other ways in which flammable liquids and gases might be covered. A variety of commenters supported the 10,000 pound threshold amount for coverage of flammable liquids and gases which OSHA proposed (e.g., Ex. 3: 45, 59, 81, 95, 99). BP America (Ex. 3: 59A) remarked:

BP America also believes that a five ton release of vapor as explained in the API Recommended Practice (RP) 750 is most appropriate. However, BP understands the administrative difficulties relating to enforcement of this provision and, therefore, supports the five ton flammable liquids and gases criterion as defined in the standard.

Goodyear Tire & Rubber Company (Ex. 3: 81) noted:

The threshold quantity of 10,000 pounds for flammable liquids and gases is appropriate for the standard.

Other participants (e.g., Ex. 3: 20, 26, 69, 71, 80, 91, 106, 108, 127, 129, 173; Tr. 1513, 2583, 3193) recommended that OSHA address only the amount of flammable liquid or gas that could result in the release of 5 tons of vapor using worst case release conditions in conjunction with appropriate flash calculations instead of credible release scenarios. For example, API (Ex. 3: 106A, p. 4) asserted:

As you know, API's Recommended Practice 750 applies to flammable liquids provided 10,000 pounds (5 tons) of gas or vapor can be released over a matter of minutes during credible release scenarios. We understand OSHA has rejected this approach . . . due to regulatory difficulties in defining credible release scenarios. Although API prefers the API RP 750 approach, we can accept the 10,000 pounds of inventory criteria as being simpler. However, API remains convinced that only the vaporizable portion of the flammable liquid should be included in the inventory.

Our concern stems from the fact that oil and gas operations handle complex substances which often will invalidate the appropriateness of the 10,000-pounds-of-inventory approach. For example, a release of 10,000 pounds of crude oil constitutes only a small fraction of the hazards of a release of 10,000 pounds of the C2-C6 hydrocarbon series. This is because only a small part of a crude oil release will immediately vaporize, and it is only the vaporizable portion that could potentially constitute a catastrophic hazard.

For these reasons, we propose . . . "Processes which involve flammable liquids or gases (as defined in 1910.1200(c) of this part) onsite in one location, in quantities that will vaporize 10,000 pounds or more under worst-case release conditions * * *"

While this approach requires a routine flash calculation, it does remove the judgement regarding credible release scenarios that is currently provided by the RP-750 approach.

However, OSHA believes that the modified API recommendation calls for the use of yet another judgement by its use of the undefined "worst case release conditions." Further, OSHA believes that RP 750 does not directly address the hazards to employees of fires which might occur rather than explosions. For example, in appendix A of RP 750, the general discussion on the probability of ignition and explosion of vapor clouds (Ex. 2: 11, p. 11) reads:

When a hydrocarbon vapor cloud forms, the cloud may dissipate harmlessly, be consumed by a flash fire without causing significant blast overpressures, or explode . . .

Although vapor cloud explosions have occurred after release as small as 1 ton, most of these explosions have occurred as a result of release of more than 5 tons . . .

OSHA's proposed process safety management standard was directed toward the hazards of fires as well as the hazards of explosions.

For these reasons, OSHA continues to believe that the use of a 10,000 pound threshold for flammable liquids or gases is a reasonable approach and the provision has been retained in the final standard. This final provision becomes paragraph (a)(1)(ii).

In the proposed application section (paragraph (b)(1)(ii)(A)) OSHA proposed to exempt from coverage hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane or oil used for comfort heating). OSHA believed that this type of use did not have the same catastrophic potential as those which were proposed. The exemption would exclude fuels used in general heating systems and refueling systems (for fleets) throughout the country. Such uses would still be regulated by other existing specific OSHA standards (such as § 1910.106, flammable and combustible liquids, and § 1910.110, liquefied petroleum gases) which adequately address these uncomplicated uses.

Additionally, in Issue 3 of the hearing notice (55 FR at 46075) OSHA indicated that some confusion existed regarding this proposed exemption. For example, some participants asked if this exemption included furnaces used in a process. Therefore OSHA solicited comments on this issue. Organization Resources Counselors (ORC, Ex. 131, p. 3-4) commented:

A number of persons testifying during the public hearings indicated concern and confusion over the wording of the proposed

exemption for hydrocarbon fuels that are present in quantities greater than 10,000 pounds, but are not part of a process. Examples of these would be propane or oil used for comfort heating and gasoline or diesel fuel for use in industrial vehicles. To remedy this confusion, ORC recommends that subparagraph (b)(1)(ii)(A) be amended to read:

Hydrocarbon fuels used solely as a fuel at a facility which is not otherwise covered by this rule.

This change will ensure that facilities which use hydrocarbon fuels in a processing step are not excluded from coverage under the standard, but that this subparagraph of the final rule properly continues to exclude facilities at which processing aberrations are absent . . .

Further the American Petroleum Institute (Ex. 137, p. 12-13) observed:

It is our understanding that OSHA's intention in providing exemption (b)(1)(ii)(A) was to exclude the enormous number of small business locations across the nation which would not be covered by the proposed rule, except for their on-site storage of hydrocarbon fuels for low-risk applications such as heating, drying, and the like. Such activities are not the subject of this rule, and this exclusion is entirely appropriate.

On the other hand, interpreting this exclusion to apply to hydrocarbon fuels used for process-related applications such as furnaces, process heaters, and the like at facilities covered by the rule was not intended.

OSHA agrees with these participants and has changed the final provision to clarify its intent not to exclude from coverage hydrocarbon fuels used for process related applications such as furnaces, heat exchangers and the like at facilities covered by this rule. It becomes final paragraph (a)(1)(ii)(A) and exempts from coverage:

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

The second proposed exemption concerned flammable liquids stored or transferred which are kept below their atmospheric boiling point without benefit of chilling or refrigeration and was proposed paragraph (b)(1)(ii)(B). Again, OSHA did not believe that the flammable liquids as described in the exemption have the same potential for a catastrophe as those proposed. Again an OSHA standard already regulates the treatment of the exempted flammable liquids (§ 1910.106, flammable and combustible liquids).

While many participants supported the exemption concerning flammable liquids stored or transferred which are kept below their atmospheric boiling

point without benefit of chilling or refrigeration, they recommended that OSHA clarify the exemption (e.g., Ex. 3: 48, 71, 106, 108, 119, 120; Ex. 93; Ex. 119; Tr. 2012) by using established language from its standard concerning flammable and combustible liquids. For example, the American Petroleum Institute (Ex. 3: 106A, p. 4-5) concluded:

OSHA's phrase "atmospheric boiling point" introduces unnecessary problems in applying this important exemption to various complex substances such as crude oil which do not have precise boiling points. OSHA has previously resolved this problem by providing definitions for "atmospheric tank" and "boiling point" in subpart H—1910.106(a)(2) and (a)(5).

OSHA agrees with this suggestion concerning the use of existing definitions; this does not change the intent of the exemption and merely clarifies the exemption. Therefore, proposed paragraph (b)(1)(ii)(B) becomes final paragraph (a)(1)(ii)(B) and has been clarified by adding existing language from OSHA's standard for flammable and combustible liquids, § 1910.106, "atmospheric tank" and "boiling point," and providing a definition for these terms in lieu of the proposal's term "atmospheric boiling point." OSHA believes that this exemption is reasonable and appropriate.

In the proposed paragraph (b)(1)(iii) proposed to cover the manufacture of explosives as defined in paragraph (a)(3) of § 1910.109, "Explosives and blasting agents." Additionally, proposed paragraph (b)(1)(iv) covered the manufacture of pyrotechnics (as defined in paragraph (a)(10) of § 1910.109), including fireworks and flares.

Although there is an existing OSHA standard for explosives and pyrotechnics (§1910.109), that standard does not address the hazards associated with their manufacture. OSHA believed that the requirements contained in the proposed process safety management standard should be applied to the explosive and pyrotechnic manufacturing process because of their potential for producing a major accident during manufacture. Therefore the proposal addressed a gap that exists in the Agency's current standard for explosives and pyrotechnics.

Some rulemaking participants (e.g., Ex. 3: 40, 52, 60; Tr. 3011-21) asserted that the manufacture of explosives and pyrotechnics should not be covered by proposed § 1910.119, because the hazards associated with these substances are already adequately covered by § 1910.109 of the OSHA standards, as well as requirements of

other regulatory agencies. For example, a commenter from the Society of Explosives Engineers (S.E.E., Ex. 3: 40, p.1-2) stated:

Because explosives are currently regulated by so many Federal, state and local agencies, it is highly questionable that they could result in a catastrophic event typical of those described by OSHA in the background discussion.

S.E.E. believes that uniform, workable regulations are a key factor in the promotion and maintenance of explosive safety. We further believe that the use, storage, handling and transportation of explosives are already adequately covered by regulations in 29 CFR (OSHA), 30 CFR (MSHA and OSM), 49 CFR (DOT) and the regulations of state and local regulatory agencies and there is no need for OSHA to include the manufacture of explosives in 29 CFR 1910.119.

With respect to the manufacture of fireworks, a hearing participant from the American Pyrotechnics Association (APA, Tr. 3011) testified:

The APA endorses the concept of Federal standards designed to adequately prevent or minimize the consequences of chemical accidents involving highly-hazardous chemicals. However, the APA believes that the statements cited by the Agency are incorrect.

The inclusion of fireworks manufacturing processes is unwarranted and could be interpreted to require protective measures which could impose substantial burdens on the fireworks industry without making a significant contribution toward work place safety.

In its comment (Ex. 3: 52), the APA further asserted that a gap does not exist in the OSHA standards with respect to the manufacture of fireworks. APA stated that the Bureau of Alcohol, Tobacco and Firearms (BATF) currently regulates the quantity of explosive and pyrotechnic materials which may be used at one time, and the distances between process and storage buildings. The APA contended that the BATF requirements and the requirements contained in § 1910.109 of the OSHA standards, together with OSHA enforcement of provisions contained in the National Fire Protection Association (NFPA) standard, "Manufacture, Transportation, and Storage of Fireworks" (NFPA-1124), adequately regulates the manufacture of fireworks.

Other rulemaking participants, however, strongly supported the inclusion of the manufacture of explosives and pyrotechnics within the scope of this proposed standard, and objected to excluding these activities. For example, a commenter from the Oil, Chemical & Atomic Workers (OCAW, Ex. 114, p.1-2) said:

[A]s far as the inclusion of the explosives industry in the standard coverage, OCAW

feels there is no room for debate. These industries are no different from the industries that fall within the scope of the proposed 1910.119. Further, the fact that there is already an explosive standard 1910.109 does not justify their exclusion from 1910.119 as 1910.109 does not address process safety in any manner.

OCAW buttressed their position (Ex. 114) concerning the inclusion of explosives manufacturing within the scope of this proposed standard by elaborating on the similarity of the explosives industry to other chemical industries that are proposed to be covered by § 1910.119.

In its post-hearing comment, the United Steelworkers of America (USWA, Ex. 118) asserted:

In the proposed Process Safety Management of Highly Hazardous Chemicals standard, paragraphs (b)(1) (iii) and (iv) proposed to include the manufacture of explosives and pyrotechnics. The United Steelworkers of America supports this inclusion. It is unthinkable that OSHA would even consider to exempt this industry, given the products that it manufactures and its accident history. How anyone could argue that the strategies for effective process safety management outlined in the proposed standard could not, or would not, enhance the overall safety of this industry and aid in the prevention and mitigation of major accidents is beyond reason.

Also in their comment, USWA described several incidents that occurred in the explosives industry, and with respect to one particular plant (Ex. 118, p.2), remarked:

In the past 50 years, 60 workers lost their lives at the plant. Of the six major accidents at the facility, not inclusive of the most recent incident, five of these were directly related to process safety hazards that are not covered by § 1910.109 or any other existing OSHA standard. Even though OSHA was able to cite the company for specific violations of existing standards, it has been repeatedly forced to rely on the general duty clause to address major concerns because of the absence of a process safety management standard.

One rulemaking participant (Ex. 3: 23) disagreed that § 1910.119 should apply to the manufacture of explosives and pyrotechnics and suggested, instead, that § 1910.109 be revised to include safety provisions for these manufacturing activities. Other rulemaking participants (e.g., Ex. 3: 62, 100, 116) believed that proposed § 1910.119 provided a technically sound, realistic methodology to improve explosive manufacture safety. They suggested, however, that the provisions of § 1910.119 be incorporated into § 1910.109 of the OSHA standards, so that all requirements pertaining to explosives will be contained in one standard.

For example, a hearing participant from the Institute of Makers of Explosives (IME, Tr. 1244) testified:

IME supports OSHA's proposed regulation for process safety management as a technically sound, logical, and methodical way to offer a methodology to improve explosive manufacture safety. However, IME recommends that OSHA delete the manufacture of explosives from § 1910.119(b)(1)(iii) and incorporate these safety regulations for the manufacture of explosives into 29 CFR 1910.109 Explosives and Blasting Agents at (b)(12).

It was contended (Ex. 100) that this approach would continue OSHA's 20-year history of maintaining a vertical regulation for commercial explosives; eliminate the alleged ambiguity that exists in the proposed rulemaking by including the manufacture of explosives in the application of the standard; and, would recognize the unique conditions under which explosives are manufactured.

In subsequent post-hearing comments, however, both Hercules and the IME (Ex. 125; Ex. 130) submitted draft regulations for the manufacture of commercial explosives. They suggested that the manufacture of commercial explosives be removed from the scope of § 1910.119, and that these draft regulations be included in a revision to § 1910.109 as an appropriate code to regulate the manufacture of commercial explosives.

OSHA appreciates the time and effort involved in developing these draft regulations, and believes that they constitute an excellent source document that the Agency can utilize when it revises the standards contained in § 1910.109. However, OSHA will not incorporate these draft regulations into § 1910.109 as a part of this rulemaking process since they did not receive the type of public comment and evaluation contemplated by section 6(b) of the Occupational Safety and Health Act.

After a thorough analysis of all of the information contained in this rulemaking record, OSHA remains convinced that the hazards associated with the manufacture of explosives and pyrotechnics have the potential of resulting in a catastrophic incident, and pose a significant risk to employees and that the manufacture of explosives and pyrotechnics should be covered by the provisions of the final process safety management rule.

However, the Agency has been persuaded by those participants who suggested that OSHA delete the manufacture of explosives and pyrotechnics from proposed § 1910.119, and incorporate the provisions of the

process safety management standard into 29 CFR 1910.109, "Explosives and Blasting Agents." This will have the effect of referencing in one place, the specific and significant OSHA requirements pertaining to explosives and blasting agents.

Accordingly, proposed paragraph (b)(1)(iii) has not been retained in the final rule for § 1910.119. Rather, § 1910.109 has been revised to add a new paragraph, (k)(2), that requires the manufacture of explosives to comply with the provisions contained in § 1910.119, process safety management of highly hazardous chemicals.

Similarly, proposed paragraph (b)(1)(iv) has not been retained in the final rule for § 1910.119. Again, § 1910.109 has been revised to add another new paragraph, (k)(3), that requires the manufacture of pyrotechnics, including fireworks and flares, to comply with the provisions contained in § 1910.119, process safety management of highly hazardous chemicals.

During this rulemaking process, some concern was expressed that this standard could be interpreted, inappropriately, to apply to all explosive and pyrotechnic manufacturing operations, even those operations of the manufacturing process where explosives or pyrotechnics are not present (e.g., Ex. 3: 62; Ex. 125; Ex. 130). This is not the intent of OSHA. The Agency wants to make it clear that the provisions contained in this final rule apply to explosives and pyrotechnics manufacturing operations only when such substances or other chemicals covered by the standard or in appendix A are present.

Finally, in paragraph (b)(1)(v) OSHA proposed a means for assuring that newly developed toxic chemicals which were not listed in appendix A but were introduced into a process would be evaluated for their degree of hazard and be included in the standard's coverage. A formula, the Substance Hazard Index (SHI), was contained in appendix B of the proposal. The formula relied on the availability of information concerning a chemical's level of hazard as established by the American Industrial Hygiene Association (AIHA) in its Emergency Response Planning Guidelines (ERPGs). The purpose of the SHI was to establish, using certain data, a relative ranking of toxic chemicals.

OSHA acknowledged in the proposal in Issue 2 [55 FR at 29158] that there might be some shortcomings in the use of the SHI. As noted, an important part of the SHI formula relied on the availability of the AIHA computation of

ERPGs for individual chemicals. Only a few ERPGs are presently available.

Generally participants objected (e.g., Ex. 3: 2, 12, 17, 33, 45, 46, 47, 48, 50, 59, 60, 64, 69, 71, 82, 86, 95, 101, 112, 122, 127, 132, 137, 152, 162, 171; Ex. 148; Tr. 968, 1017, 2177, 2654) to using the SHI and cited several reasons for not using it. They observed that OSHA is deferring rulemaking to a private entity; there is no reason to believe that ERPG development can or will be accelerated in order to be responsive to the standard; the 500 pound threshold quantity is arbitrary; and OSHA already has a sound mechanism for adding chemicals to appendix A, the rulemaking process.

OSHA has been convinced by participants in the rulemaking not to use the SHI formula to add additional toxic chemicals to the appendix A list at this time. While OSHA believes a formula would be a worthwhile approach to including new toxic chemicals under the standard, it has been persuaded by commenters that it should use section 6(b) rulemaking procedures until such time as a better formula can be developed by OSHA. Therefore this paragraph has been deleted from the final rule and OSHA will either try to develop a better formula or rely on rulemaking on a chemical by chemical basis to add chemicals to appendix A.

Certain exemptions were contained in the proposed application paragraph of the process safety management rule (paragraphs (b)(2) (i) through (iii)). These exemptions included: retail facilities; oil and gas well drilling and servicing; and normally unmanned remote facilities.

With respect to the exclusion of retail facilities and normally unmanned remote facilities, OSHA believed that such facilities did not present the same degree of hazard to employees as other workplaces covered by the proposal. Therefore OSHA should not require a comprehensive process safety management system in addition to other applicable OSHA standards addressing flammable and combustible liquids, compressed gases, hazard communication, etc., for retail facilities and unmanned remote facilities.

Certainly, highly hazardous chemicals may be present in both types of work operations. However, OSHA believes that chemicals in retail facilities are in small volume packages, containers and allotments, making a large release unlikely. OSHA received few comments disagreeing with the exemption of retail facilities (e.g., gasoline stations). OSHA has retained the exemption in the final rule.

In normally unmanned remote facilities (defined in proposed paragraph (c) and called "normally unoccupied remote facilities" in final paragraph (b)), the likelihood of an uncontrolled release injuring or killing employees is effectively reduced by isolating the process from employees. OSHA believes that the present OSHA standards contained in subpart H, such as § 1910.101, compressed gases, and § 1910.106 flammable and combustible liquids and in part 1910, subpart Z, toxic and hazardous substances, adequately address the chemical hazards presented in these work operations.

OSHA did receive significant comment supporting the exemption of normally unmanned remote facilities (e.g., Ex. 3: 30, 62, 64, 69, 71, 79, 129). Others suggested that OSHA redefine "normally unmanned remote facility" (e.g., Ex. 26, 32, 39, 69, 80, 82, 106, 108, 129). OSHA has retained the exclusion of normally unmanned remote facilities because the Agency believes such facilities pose a reduced likelihood of releases that could harm employees. The issue of modifying the definition will be discussed in the section concerning definitions.

OSHA also proposed to exclude oil and gas well drilling and servicing operations because OSHA had already undertaken rulemaking with regard to these activities (48 FR 57202). OSHA continues to believe that oil and gas well drilling and servicing operations should be covered in a standard designed to address the uniqueness of that industry. This exclusion is retained in the final standard since OSHA continues to believe that a separate standard dealing with such operations is necessary.

Finally, a number of participants requested special consideration for their processes or exemption from the standard. For example, concern was expressed by participants who conduct batch processing operations (e.g., Ex. 3: 50, 55, 74, 164, 169; Ex. 89; Tr. 972, 3202) regarding their ability to comply with the standard due to the dynamic nature of batch processing. With respect to this, the Synthetic and Organic Chemical Manufacturers Association (SOCMA, Ex. 3: 50, p.6-7) stated:

Batch processes are distinct from continuous operations in that a continuous operation has a constant raw material feed to the process and continual product withdrawal from the process. A batch process has an intermittent introduction of frequently changing raw materials into the process, varying process conditions imposed on the process within the same vessel depending on the product being

manufactured. Consequently under the process safety rule as proposed, a batch processor will be required to perform a process hazard analysis each time an order comes in for a chemical that may differ only slightly from the one previously produced.

A batch processing plant is in a constant state of change, always being adapted for different projects. It is not unusual for a batch processor to have a different plant configuration weekly. SOCMA suggests that batch processors be given the flexibility to do a process hazard analysis that is representative of many similar batches. If this recommendation is not adopted, then given the fundamental differences of batch processors, SOCMA recommends that OSHA address batch process safety in a separate rulemaking.

The Ecological and Toxicological Association of the Dyestuffs Manufacturing Industry (Ex. 3: 55) noted:

Based on our near total dependence on batch processing, we support the comments submitted by SOCMA. * * * We also strongly urge OSHA to address batch process safety in a separate rule making given the major differences in operation of continuous and batch processing plants.

However, other participants who have been involved in running both continuous processing and batch processing indicated that the standard for process safety management is appropriate for batch processing (Ex. 128; Tr. 1031, 1936). The Chemical Manufacturers Association (CMA, Ex. 128, p.7-8) stated:

CMA does not believe that facility owners/operators with batch processes should be exempted from complying with the proposed PSM standard. * * * The key question is whether the hazardous material is present in an amount at or above the threshold quantity. If the answer to this question is yes, then the provisions of the proposed standard should apply. CMA companies have extensive experience handling listed materials both in batch and continuous facilities. CMA supports applying the provisions of the proposed standard to any facility (batch or continuous) where the threshold quantities are exceeded.

OSHA agrees that the key question for coverage is whether the highly hazardous chemical is present in an amount at or above the threshold. However, OSHA acknowledges the concern of SOCMA regarding the potential difficulty of conducting a separate process hazard analysis for each variation of a batch process. OSHA has accepted SOCMA's suggestion concerning the development of a generic process hazard analysis which is representative of similar batches. Accordingly, OSHA has included information in appendix C on conducting process hazards analyses for batch operations.

Some participants felt that their use of a particular highly hazardous chemical should not be covered in the process safety management standard since they observed that their type of process had not been included in the events described in the proposal; they did not feel their processes could create a catastrophic event; and that the broad definition of process used by OSHA captured industries which did not really process chemicals in the same manner chemical plants and refineries do. These participants address, for example, ammonia refrigeration (Ex. 3: 162, 168); steelmaking (Ex. 3: 161, 172); research and development facilities including pilot plants (Ex. 3: 56, 69; Tr. 062); bulk liquid terminals (Ex. 3: 8, 11, 16A, 37); and chlorination facilities (Ex. 90).

First, the catastrophic events described in the notice of proposed rulemaking were simply examples of what could happen upon the release of a highly hazardous chemical and in no way reflect all incidents which have occurred or which have the potential to occur. The National Wildlife Federation (Ex. 3: 86, p.3) observed:

The Acute Hazardous Events (AHE) Database, put together by EPA, catalogued 11,048 events spanning 8 years. In other words, this partial listing of the chemical incidents in the U.S. provides a record of nearly 4 accidents every day.

Second, OSHA has developed what it considers to be a reasonable and appropriate coverage of processes involving highly hazardous chemicals and further believes that those chemicals in their threshold amounts have the potential for a catastrophic release. OSHA believes its listing of highly hazardous chemicals fully meets the intent of the Clean Air Act Amendments (CAAA) which require OSHA to promulgate "a chemical process safety standard designed to protect employees from hazards associated with accidental release of highly hazardous chemicals in the workplace" and which require the standard include a "list of highly hazardous chemicals which includes toxic, flammable, highly reactive and explosives substances."

Third, as the Chemical Manufacturers Association succinctly observed, and with which OSHA concurs, the key question should be whether the highly hazardous chemical is present at or above the threshold quantity. Further, the United Steelworkers of America (Ex. 118, p.4) stated:

In the opinion of the USWA, there is no need to write a specific exemption for any industry. Section (b)(1) already limits the standard to those processes which involve a

highly hazardous chemical in sufficient quantities to cause a major accident. If a particular plant does not contain such a process, it will not be covered. If it does contain a hazardous process, it should be covered. There is no legitimate need for any further exemption * * *.

OSHA agrees with this rationale.

Finally, many participants (e.g., Ex. 3: 39, 41, 51, 69, 96, 106, 150, 173; Ex. 91; Ex. 93; Ex. 127; Tr. 1532, 1818, 2579) addressed their belief that gas processing should be excluded from the coverage of the process safety management standard. For example, the Gas Processors Association (Ex. 3: 28A, 1-3) stated:

75% * * * of GPA member companies are small-to-medium sized independent, non-integrated producers and processors of natural gas. * * * GPA suggests that a policy similar to those found in certain plans developed for other government agencies could be utilized. In this approach small, remote, low risk facilities which qualify should be part of a two-tier concept in which the operator would develop and have available locally a plan describing efforts toward process safety management in lieu of full process hazard management. In the event of a major release or failure to maintain pre-defined accident experience standards, the local plan would be submitted automatically to OSHA for review and action. OSHA could require revision of the plan or mandate full compliance with Part 1910.119.

The American Gas Association (Ex. 3: 51, p.2) observed:

OSHA's broad proposal could apply to natural gas and liquefied natural gas (LNG) facilities used in the distribution, transmission and storage of gas, except for those facilities that are "unmanned remote facilities."

AGA further observed (p.3) that the standard is overly broad and that it is inappropriate because OSHA is preempted and there are major differences in processes and risk of chemical explosions or accidents at natural gas and LNG facilities as compared with chemical plants and refineries.

The American Petroleum Institute (API, Ex. 3: 106A, p.2) remarked:

API is concerned that OSHA's proposal to include all flammable liquids and gases * * * will result in the application * * * to an enormous number of relatively low hazard facilities, such as natural gas handling facilities, diluting industry's overall ability to comply with this important rule.

API urges OSHA to exclude certain natural gas handling facilities * * *. Our rationale is as follows:

High methane natural gas has a density less than that of air, which aids in dispersion * * * has low reactivity and low burning speed * * * flame speeds in natural gas

clouds are far below those that would produce dangerous overpressure.

Confinement, such as in enclosed compressor buildings, can increase the risk of localized damage; however, flame speeds decelerate very rapidly beyond the boundaries of the confinement, and overpressure decreases markedly, even if well mixed vapor clouds exist outside. Natural gas is flammable, of course, and does present a heat radiation hazard when burning. However, the lack of open air overpressures limit the extent of potential injuries.

At the Washington, DC, hearing an OSHA panel member inquired of a representative of API (Tr. 1885):

OSHA Panel Member: * * * you're talking about some exemptions for gas processing plants, basically those that are dealing mainly with methane * * * could you expand as to what type of radiation hazard we're talking about in a typical situation? Is the danger area 100 meters, 10 meters, 1,000 meters * * *

API Representative Response: That depends purely on the size of the cloud and for how long it burns. If we're talking about an unplanned release that burns in a matter of seconds, then we're talking about, at most, a very few thousand BTUs that would—per square foot—that would be felt over a distance of only a few hundred feet, and probably less than 100 yards from outside the burn cloud. Now of course, if people were inside the burn cloud, that's an entirely different matter. They would probably be killed by the cloud or by inhaling the combustion gases.

OSHA disagrees with commenters that gas processing should be excluded from coverage. While OSHA is very concerned with explosions, OSHA is also concerned with fires resulting from releases of highly hazardous chemicals (55 FR at 29150) which as indicated above can occur and clearly endanger employees in the area. Therefore, OSHA believes that gas plants are appropriately covered by the process safety management standard.

Definitions: Paragraph (b)

Paragraph (b) contains the definitions of terms as they are used in the final rule. The proposed standard contained definitions for the following terms: Facility, highly hazardous chemicals, hot work, normally unmanned remote facility, process, and substance hazard index (SHI).

The final standard contains definitions for the following terms: Atmospheric tank, boiling point, catastrophic release, facility, highly hazardous chemical, hot work, normally unoccupied remote facility, process, replacement in kind, and trade secret. OSHA has added definitions for "atmospheric tank" and "boiling point" which are already in use in the

§ 1910.106 standard for flammable and combustible liquids in order to clarify the exemption from coverage for flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

A definition for catastrophic release was also added. The Organization Resources Counselors (Ex. 3: 53, p.3) advocated:

OSHA should add a definition for "catastrophic release" to make it clear that this standard is directed to major accidents which, as stated in the preamble, "have the potential of not only placing employees in grave and imminent danger but also could endanger employees throughout the workplace and even the general public." ORC recommends that the definition read as follows:

"Catastrophic release" means a major uncontrolled emission, fire, or explosion, involving one or more highly hazardous chemicals, that presents serious danger to employees or other persons both within and outside of the immediate workplace.

Other commenters supported the addition of a similar definition (Ex. 3: 12, 17, 48, 64, 71, 97, 101).

OSHA agrees that a definition for catastrophic release will provide for better consistency in the final standard. In the proposed standard OSHA used "catastrophic release" in paragraph (a), purpose, but in paragraph (m), incident investigation, OSHA used the term "major accident." Accordingly, OSHA has defined "catastrophic release" as recommended by ORC, leaving out any reference to "outside the immediate workplace" since OSHA only has jurisdiction to assure workplace safety. Consequently OSHA has changed "major accident" to "catastrophic release" in paragraph (m), incident investigation.

Some participants recommended defining "major accident" to mean any event involving fire, explosion, or release of a substance covered by this section which results in a fatality or five or more hospitalizations for medical treatment (Ex. 3: 106A). OSHA believes that the ORC definition for "catastrophic release" better reflects the intent of the Clean Air Act Amendments which require OSHA to develop a standard to prevent accidental release of chemicals which could pose a threat to employees and that, a definition of "major accident" is not needed.

Few participants raised significant issues concerning the definitions for facility, highly hazardous chemical and hot work. Therefore, these definitions remain the same as proposed.

As noted, OSHA excluded from coverage normally unmanned remote

facilities for the reasons discussed above in the application section. OSHA defined "normally unmanned remote facility" in the proposal (proposed paragraph (b)(2)(iii)) as:

Normally unmanned remote facility means a facility which is operated, maintained and serviced by employees who visit the unmanned facility only periodically to check the operation and perform necessary operating or maintenance tasks. No employees are permanently assigned. Facilities meeting this definition must be remote from other facilities.

The American Petroleum Institute (API, Ex. 3: 106) suggested that OSHA recognize that unmanned facilities may exist in remote areas away from the general public locations which possess little potential for a catastrophic event. API as well as other participants (e.g., Ex. 3: 26, 32, 69, 80, 82, 106, 108, 119, 120, 129; Tr. 1540, 3127) recommended retention of this exemption with certain modifications including a redefinition to include 10 or fewer persons potentially affected. API (Ex. 3: 106A, p.3-4) stated:

OSHA recognizes that "unmanned" facilities may exist in remote, away-from-the-general-public locations which possess little potential for catastrophic event. API agrees that it is appropriate to exclude such facilities from this rule in order to allow industry to address more significant facilities with the limited resources available.

API urges OSHA to retain this important exemption and clarify its application by defining the term "normally unmanned" to mean "facilities where the number of persons potentially affected by a major accident is 10 or less". This approach is similar to that taken by the Department of Transportation.

In addition, API suggests that a definition for "remote facility", similar to that published by API in Publication 2510A, "Fire-Protection Considerations for the Design and Operation of Liquefied Petroleum Gas (LPG) Storage Facilities," April 1989, page 4, would be useful and should be included in the rule. The definition in Publication 2510A states: "Remote facility means a facility that is 4000 feet or more from populated or industrial areas involving 10 or more persons."

API emphasizes that its purpose in urging these revisions is not to detract from the need to safely operate remote facilities; rather, it is to support the need to prioritize the allocation of limited resources, within OSHA and industry, for the implementation of the proposed rule.

OSHA's rationale for the exclusion of normally unmanned remote facilities from coverage was that these facilities did not have any employees present on a regular basis, i.e., a daily shift. Rather, employees only periodically visited the facility to check the operation and perform maintenance. OSHA believed that the likelihood of an uncontrolled release injuring or killing employees

was effectively reduced by the isolation of the process from employees. The reasons for the exclusion do not allow, nor does OSHA agree with, a redefinition of normally unmanned remote facility to a facility where the number of persons affected by a major accident is 10 or less.

Other participants supported the definition of normally unmanned remote facility but suggested that OSHA clarify the idea that the facility must be remote from other facilities (e.g., Ex. 3: 17, 25, 39, 48, 53, 64, 121). The Organization Resources Counselors (Ex. 3: 53, p. 5) noted:

It is important to emphasize that a "normally unmanned remote facility" is not meant to apply to an area that is located in a distant corner of a large facility. Rather, it is meant to apply to facilities that are so far removed from any other facility that they could not contribute to a catastrophic release, fire or explosion as defined by this standard.

Additionally some participants recommended that OSHA modify the language regarding the status of employees who visit the facility periodically (e.g., Ex. 3: 30, 53, 62). They observed that OSHA used the description in the definition "no employees are permanently assigned." Participants pointed out that an employee who visits such facilities periodically may in fact be assigned to the facility. The Chemical Manufacturers Association (Ex. 48, p. 8) suggested that OSHA define normally unmanned in the following manner:

"Normally unmanned remote facility" means a facility which is operated, maintained and serviced by employees based at a different location and who visit the remote facility to perform periodic tasks. Remote facilities are not within the boundaries nor are they contiguous to other operations of the employer.

OSHA agrees with these recommendations and has revised the definition to clarify that the facility must be "remote" and has changed the word "unmanned" to "unoccupied" to better reflect the Agency's intent. Accordingly this definition has been revised to read:

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.

The definition of "process" remains essentially the same as proposed except for certain changes made to eliminate unnecessary words, and a modification

and addition of language to clarify the intent of the definition. OSHA has eliminated the words "conducted by an employer." These words serve no purpose because OSHA is only addressing processes conducted by an employer.

The term "process" when used in conjunction with the application statement of the standard establishes the intent of the standard. The intent of the standard is to cover a "process" where the use, storage, manufacturing, handling or the on-site movement of a highly hazardous chemical exceeds the threshold quantity at any time. The boundaries of a "process" would extend to quantities in storage, use, manufacturing, handling or on-site movement which are interconnected and would include separate vessels located such that there is a reasonable probability that an event such as an explosion would affect interconnected and nearby unconnected vessels which contain quantities of the chemical that when added together would exceed the threshold quantity and provide a potential for a catastrophic release. In order to clarify this intent, a new sentence has been added to clarify the fact that interconnected and nearby vessels containing a highly hazardous chemical would be considered part of a single process and the quantities of the chemical would be aggregated to determine if the threshold quantity of the chemical is exceeded. The new sentence reads as follows: "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." Vessels located at more remote distances must be evaluated by the employer to determine if they would interact during an incident, and if such a reasonable condition exists these vessels would be included in the process. Where a dike is used around a liquid storage vessel to fully contain released material and prevent it from interacting with another vessel outside the dike, and neither vessel by itself contains the threshold quantity, then this physical barrier would be considered acceptable in making the two vessels remote from each other.

Additionally, some unnecessary words have been eliminated and the use of the word "movement" used in the proposal has been changed to "on-site movement" to clarify that transportation falling under DOT jurisdiction is not covered.

OSHA believes that its definition of process reflects the intent of the CAAA

which requires that the standard be designed to protect employees from hazards associated with accidental releases of highly hazardous chemicals in the workplace.

Based on comments, OSHA has decided to add a definition for "replacement in kind" to clarify the types of changes which are not intended to be included in paragraph (1), management of change. The final definition states that "replacement in kind" means a replacement which satisfies design specifications.

Numerous participants expressed concerns (Ex. 3: 46, 48, 71, 76, 80, 81, 89, 97, 106, 112, 129; Ex. 162; Ex. 171; Tr. 1011, 1823, 2178) regarding trade secrets. For example, the Chemical Manufacturers Association (CMA, Ex. 3: 48, p. 2) remarked:

CMA also recommends that OSHA adopt the definition for "trade secret" as found within the Hazard Communication Standard (HCS) * * * The final standard should also incorporate appendix D from the HCS.

In its post-hearing comment, CMA (Ex. 128, p. 18) expressed its concern again that:

The issue of trade secret protection has not been addressed within the proposed standard. Trade secret information may be included within a number of documents created as a part of implementing the proposed PSM standard. Unless trade secrets are protected, items which include trade secret information collected by OSHA as a result of an inspection could be made public. This situation could result in damage to an employer's competitive position. CMA previously provided curative language and strongly suggests that OSHA consider using it in the final standard.

OSHA has decided to include the definition for trade secret from § 1910.1200, Hazard Communication, and has included provisions in a new paragraph. These trade secret provisions will be discussed below.

Employee Participation: Paragraph (c)

In the proposed standard, OSHA required that a team be used to conduct a process hazard analysis (proposed paragraph (e)(3)). The proposal required that the team have expertise in engineering and process operations, and the team was required to have at least one employee who had experience and knowledge specific to the process being evaluated. In Issue 5 of the proposal (55 FR at 29158), OSHA asked whether it should require an employee representative on the process hazard analysis team, as well as on the incident investigation team required for incident investigations (proposed paragraph (m)). It had been proposed that an incident

investigation team consist of persons knowledgeable in the process. OSHA asked if the presence of an employee representative on the teams would assist in developing a cooperative participatory environment and the necessary flow of information from management to employees and from employees to management.

Several rulemaking participants supported the concept of having an employee representative on both the process hazard analysis team and the incident investigation team (Ex. 3: 20, 25, 47, 115; Tr. 2088, 2235, 2345). However, numerous participants objected to OSHA mandating the inclusion of an employee representative on the teams required by the standard and most stressed that team members should be chosen on the basis of their expertise and not on union membership (e.g., Ex. 3: 9, 21, 26, 28, 29, 30, 32, 41, 45, 59, 62, 69, 70, 76, 77, 80, 103, 106, 109, 112, 120, 123, 127, 129, 141, 155; Tr. 670, 740, 763, 1012, 1813, 2061, 2157, 2573-4, 3238, 3351, 3411).

The issue of employee participation in process safety management received even greater attention after the Clean Air Act Amendments (CAAA) were signed. The CAAA contains a requirement in section 304(c)(3) that the employer "consult with employees and their representatives on the development and conduct of hazard assessments and the development of chemical accident prevention plans and provide access to these and other records required under the standard."

Participants focused on what they believed was the intent of the CAAA and its language and suggested the manner in which the intent should be included in the final standard. Representatives from the United Steelworkers of America observed:

(Tr. 2235) The Clean Air Act Amendments make it clear that workers and their representatives—it is in the law—are to have an important role in process safety management.

(Tr. 2258) I want to clarify that the word participation and consultation means only that. They do not imply the power to veto or to change the programs required under this proposed standard . . .

(Tr. 2358) Consult to us means—or should mean that we are part of the process, that we have a voice in discussing the kind of information that is developed in writing and reviewing those reports. You know, it doesn't mean that we get to write the report to the exclusion of management, but it means that we ought to be part of the team.

Other participants suggested that the language in the CAAA be incorporated as a separate paragraph in the OSHA final standard and asserted that the language did not mandate an employee

representative on the team conducting process hazards analyses or incident investigations.

A participant from Exxon U.S.A. (Tr. 3314) stated:

We conclude that the "consult with employees" provision in the Clean Air Act Amendments does not require that employees or their representatives be PHA [process hazard analysis] team members.

The requirement calls for the employer to exchange views on a process hazard analysis with employees and their representatives before a PHA is started.

Review of the wording in the clean Air Act would appear to call for a more structured exchange of views with wage personnel before starting a PHA.

Designated union representatives, such as union members on a plant safety committee, could be included in pre- and post-PHA discussions with wage employees.

A representative from the National Petroleum Refiners Association (Tr. 3372-74) testified:

As you are well aware, the operative wording from the Clean Air Act Amendment is consult with employees and their representatives on the development and conduct of hazard assessments and the development of chemical accident prevention plans, and provide access to these and other records required under the standard.

Now that is the law of the land, and we are clearly going to have to do that.

In Shell Oil Company, we think we know how to do that. We have consulted—we have well established procedures in place for consulting with our unions . . .

We don't—speaking for Shell Oil Company, we don't believe that we need additional OSHA words—pages of regulations to help us interpret what consult with employee representatives means . . .

Now, what is our position on involvement on teams? First, we support the involvement of workers on teams. We feel that the worker, the operator, the maintenance person, the foreman also can contribute significantly to the value of a PHA team.

But what they bring to that team is their knowledge of the unit in question, their knowledge of the operating practices, their knowledge of the maintenance practices in that particular unit, and those are the attributes they bring to that team and the participant workers should be selected on the basis of bringing those skills to the team rather than filling a role.

After a thorough analysis of the CAAA and the rulemaking record on this issue, OSHA has concluded that it is important for one member of each team be an employee who is knowledgeable about the process. This employee may very well be an employee representative; or, an employee representative may be participating on a team because of some expertise that the individual can contribute to the team. However, OSHA does not believe it necessary or appropriate to mandate

team membership on the basis of organization affiliation (i.e., union membership), nor does the Agency believe that this was the intent of the CAAA.

OSHA believes that the intent of the CAAA demands a broader approach to employee participation. A participant from the United Steelworkers of America (Tr. 2257) asserted:

Workers and their representatives should have the right to participate in the development of hazard analysis, incident investigations and all safety audits. They should be consulted with respect to training, maintenance and emergency response programs.

OSHA agrees with this participant. This confirms OSHA's belief that a broader participation was envisioned by the CAAA. OSHA believes that employers must consult with employees and their representatives on the development and conduct of hazard assessments (OSHA's process hazard analyses) and consult with employees on the development of chemical accident prevention plans (the balance of the OSHA required elements in the process safety management standard). And, as prescribed by the CAAA, OSHA is requiring that all process hazard analyses and all other information required to be developed by this standard be available to employees and their representatives.

Therefore, as suggested by several rulemaking participants, OSHA has added language contained in the CAAA to the final rule in a new provision, paragraph (c). OSHA believes that this new provision, which requires broad and active employee participation in all elements of the process safety management program through consultation will enhance the overall program. OSHA also believes that the CAAA requirements demand that an employer carefully consider and structure the plant's approach to employee involvement in the process safety management program. Consequently, OSHA believes that it must require the employer to address this issue to ensure that the employer actively considers the appropriate method of employee participation in the implementation of the process safety management program at the workplace. Thus, OSHA has included a specific requirement that an employer develop a plan of action on how the employer is going to implement the employee participation requirements.

The new paragraph which has been added to the final process safety management rule, paragraph (c), reads as follows:

Employee participation. Employers shall develop a written plan of action regarding the implementation of the employee participation required by this paragraph.

Employers shall consult with employees and their representatives on the conduct and development of process hazard analyses and on the development of the other elements of process safety management in this standard.

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.

Process Safety Information: Paragraph (d)

Paragraph (d) addresses process safety information. OSHA proposed that the employer develop and maintain certain important information about a covered process such as information about the hazards and characteristics of the chemicals used, information about the process technology and how it works and information about the process equipment. This process safety information was to be communicated to employees involved in operating the process.

The compilation of information concerning process chemicals, technology and equipment provides the foundation for identifying and understanding the hazards involved in a process and is necessary in the development of a complete and thorough process hazard analysis, as well as other provisions in the final rule including management of change, operating procedures, and incident investigations, etc.

A number of participants had recommendations to clarify the process safety information provisions. OSHA has made changes to this paragraph based on these recommendations, where such suggestions did not change the intent of the provisions.

OSHA has decided to allow the compilation of process safety information to occur on a schedule consistent with the schedule for conducting process hazard analyses as described in final paragraph (e)(1). It is necessary to assemble the process safety information specified in the final rule in order to conduct an adequate process hazard analysis. Therefore it is reasonable to allow the collection and compilation of process safety information on a given process to be completed before a process hazard analysis on that process is begun, instead of requiring the compilation of all process safety information on all processes to be completed before any process hazard analyses are begun.

Many participants objected to the requirement that the process safety information must be communicated to

employees (e.g., Ex. 3: 17, 26, 33, 41, 48, 53, 103, 106, 109, 112, 119, 158).

Participants noted that a lot of the process safety information was highly detailed and expressed their doubts concerning the usefulness of communicating such detail to employees. They believed that such information should be made available to employees rather than communicated to them. Paragraph (c) of the final rule, employee participation, requires that employees and their representatives must have access to process hazard analysis reports and to all other information required to be developed under this standard. The recommended change to make the information available is unnecessary in view of this requirement. Also, OSHA believes that process safety information pertinent to the employees job tasks is required to be communicated to employees by the final standard: To operating employees in paragraph (g); to contract employees in paragraph (h); and to maintenance employees in paragraph (j). Therefore the requirement contained in paragraph (d) to communicate the process safety information to employees has been deleted since it is provided for by other provisions of the final standard, such as employee participation, contractors, and training.

The process safety information required by paragraph (d)(1) pertains to the hazards of the highly hazardous chemicals in the process. OSHA proposed that the information include: toxicity information; permissible exposure limits; physical data; reactivity data; corrosivity data; thermal and chemical stability data; and the hazardous effects of inadvertent mixing of different materials that could foreseeably occur. Most of the information may already be available from the material safety data sheet (MSDS). MSDSs would be acceptable in meeting this requirement to the extent that the required information is available on the MSDS. The information required to be collected on the hazards of the chemicals is unchanged from the proposal.

In paragraph (d)(2) OSHA proposed that the employer develop and maintain information pertaining to the technology of the process itself. Paragraph (d)(2)(i) specified the required information and included the following: a block flow diagram or simplified process flow diagram; process chemistry; maximum intended inventory; safe upper and lower limits for such factors as temperatures, pressures, flows or compositions; and the consequences of any deviation in the process including those affecting the safety and health of

employees. The final requirements remain virtually the same as those proposed except for a few minor editorial changes.

OSHA indicated in proposed paragraph (d)(2)(ii) that it might be difficult to obtain technical information for older existing processes. Therefore, it proposed to allow employers to develop such material from a hazard analysis conducted in accordance with paragraph (e) for processes initiated before January 1, 1980. OSHA believed that a properly conducted process hazards analysis should systematically identify technical information regarding the process and allow for adequate estimation of safe parameters for the process.

OSHA has reconsidered this paragraph and has decided that the best technical information available is the original information. Rather than include an arbitrary date, OSHA has decided to allow an alternate method of obtaining the technical information only for those processes where such information does not exist. In reviewing the record OSHA concluded that the American Petroleum Institute's RP 750 had acceptable language which met the intent of the Agency. Accordingly, OSHA has changed the final paragraph, (d)(2)(ii), to read as follows:

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.

The final type of information that the proposal required to be collected ((d)(3)) pertains to the equipment in the process. Since the equipment used in a process can have a significant adverse impact on the facility and employee safety, OSHA wanted to assure that the equipment is appropriate for the operation and that it meets appropriate standards and codes such as those published by the American Society of Mechanical Engineers, the American Petroleum Institute, etc.

In paragraph (d)(3)(i) OSHA proposed that information be compiled concerning equipment used in the process including: materials of construction; piping and instrument diagrams (P&IDs); electrical classification; relief system design and design basis; ventilation system design; design codes employed; material and energy balances for processes built after the effective date of this standard; and safety systems (such as interlocks, detection, monitoring and suppression systems). Again, this paragraph remains virtually unchanged except for minor editorial changes.

In paragraph (d)(3)(ii) OSHA proposed that the employer document that the process equipment being used complies with applicable consensus codes and standards, where they exist; or be consistent with recognized and generally accepted engineering practices. OSHA has modified this paragraph by eliminating the list of codes and standards producing organizations. The discussion in paragraph (j), mechanical integrity, discusses the reasons for this change.

Paragraph (d)(3)(iii) required that when existing equipment was designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer must ascertain that the equipment is designed, installed, maintained, inspected, tested and operated in such a way that safe operation is assured.

There are many instances where process equipment has been in use for many years. Sometimes the codes and standards to which the equipment was initially designed and constructed are no longer in general use. For this type of situation, OSHA wants to ensure that the older equipment still functions safely, and is still appropriate for its intended use. OSHA is not specifying the method for this documentation. Under this approach the employer would be permitted to use any of several methods such as: documenting successful prior operation procedures; documenting that the equipment is consistent with the latest editions of codes and standards; or performing an engineering analysis to determine that the equipment is appropriate for its intended use. This paragraph remains the same as that which was proposed except the final rule requires the employer to determine and document that the equipment is "designed, maintained * * * and operating in a safe manner rather than "operating in such a way that safe operation is assured," as was proposed.

OSHA believes that the final provisions concerning process safety information meet the requirements in section 304(c)(1) of the CAAA. In this section OSHA must require employers to:

(1) Develop and maintain written safety information identifying workplace chemical and process hazards, equipment used in the processes, and technology used in the processes.

Process Hazard Analysis: Paragraph (e)

The vast majority of commenters addressed proposed paragraph (e) concerning process hazards analysis, often referred to as "hazard evaluation" (e.g., Ex. 3: 20, 21, 25, 26, 27-29, 33-35, 39,

41, 43-45, 59, 64, 69, 70, 76, 77, 79, 80, 83, 89, 96, 109, 112, 115, 119, 120, 122, 123, 126, 129, 138, 141, 149, 152, 155, 156, Ex. 91; Ex. 127; Ex. 141; Ex. 148; Tr. 671, 735, 968, 1018, 1114, 1206, 1922, 2059, 2156, 2174, 2572, 2650, 2689, 2773, 3136, 3259, 3348, 3683). These commenters were generally supportive of the provisions regarding process hazards analyses recognizing that the process hazard analysis is a key component of a process safety management system because it is a thorough, orderly, systematic approach for identifying, evaluating and controlling processes involving highly hazardous chemicals. However, participants recommended certain modifications to the process hazard analysis provisions. Participants also addressed several issues OSHA raised in the notice of proposed rulemaking (Issues 3, 4 and 5; 55 FR at 29158) concerning process hazard analysis timeframes, acceptable methodologies and process hazard analysis team membership.

In paragraph (e)(1) OSHA proposed to require employers to conduct an initial process hazard analysis on facilities covered by the standard in order to identify, evaluate and control the hazards of the process. By properly performing a hazard analysis, the employer can determine where problems may occur, take corrective measures to improve the safety of the process and preplan the actions that would be necessary if there were a failure of safety controls or other failures in the process. Paragraph (e)(1) required the employer to conduct the process hazard analyses using one of the methodologies listed.

Paragraph (e)(1) of the final standard reflects several changes from the proposal. The final standard still requires employers to conduct a process hazard analysis to identify, evaluate and control the hazards in a process. The provision addressing methodologies has been moved to paragraph (e)(2).

Also in paragraph (e)(1) is a new requirement that an employer select a process hazard analysis method which is appropriate to the complexity of the process being analyzed. This requirement was implicit in the proposal. The new language simply states OSHA's concern that an employer not choose an inappropriate process hazard analysis methodology.

OSHA anticipates that employers will be able to readily explain their plans for completing process hazard analyses and their reasoning for prioritizing which processes will be addressed first. Therefore OSHA is requiring that employers determine and document the priority order for conducting process

hazard analyses based on such considerations as the extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. This requirement is written flexibly in recognition of the fact that different processes will require different considerations for prioritization.

A phase-in period for process hazard analyses may be necessary, particularly, for facilities with multiple covered processes. However OSHA believes that plants with a limited number of processes, with simple processes, or which have already completed a number of process hazard analyses, should complete process hazard analyses as soon as possible. Therefore, the final standard language indicates that process hazard analyses must be conducted as soon as possible.

In Issue 3 of the preamble to the proposal (55 FR at 29154) OSHA noted that no time period was specified in which to complete initial process hazard analyses. It had been suggested to OSHA that a 1-, 2-, 3-, or 5-year delay be allowed for employers to complete initial process hazard analyses. These extended compliance scenarios were based on the perception that there were not enough technical experts who had the experience to carry out the analyses required by the proposal. The issue was discussed extensively in the rulemaking.

A significant majority of participants discussed the timeframes they believed would be necessary to complete initial process hazard analyses. Recommended timeframes ranged from immediately to as many as ten years. The majority of commenters supported either a 5-year timeframe (e.g., Ex. 3: 21, 16, 33, 41, 43, 44, 48, 59, 64, 70, 76, 80, 77, 96, 109, 112, 122, 123, 129, 134, 138, 141, 149, 155, Ex. 127; Tr. 1018, 1114, 1206, 1922, 2059, 2156, 2689) or a 7-year timeframe (e.g., Ex. 3: 27, 28, 29, 39, 45, 69, 77, 106, 120; Ex. 91, Ex. 148; Tr. 671, 735, 968, 2174, 2572, 2478, 2594, 2650, 2773, 3136, 3259, 3348, 3683) in which initial process hazard analyses could be completed on covered processes. These suggested timeframes were based on similar reasons. For example, the National Cooperative Refinery Association (NCRA, Ex. 3: 21) stated:

NCRA, like most independent refineries, does not have sufficient staff to complete a project of this magnitude without extensive use of contract consultants * * * Preliminary information indicates that it will be very difficult, if not impossible, for us to complete the analysis of all of the process units in the refinery in less than five years.

The American Petroleum Institute (API, Ex. 3: 106A, p. 7) noted:

API shares OSHA's concern that compliance with this rule could overwhelm existing resources unless an adequate implementation period is allowed. Further, API believes that experienced personnel needed to lead and participate in the process hazard analysis studies are not available in numbers sufficient to comply with the rule in fewer than seven years.

Marathon Oil Company (Ex. 3: 108) observed:

To start off, Marathon supports process safety management. Since the American Petroleum Institute published API Recommended Practice 750, "Management of Process Hazards" in January 1990, we have started implementing RP-750. This is a major, resource-intensive effort that we accepted voluntarily and estimate that it will require at least five years for implementation.

Phillips Petroleum (Ex. 3: 129, p. 3) indicated:

Completion of initial PHA should be within five years of the effective date. We feel this timeframe is needed to achieve quality results with the limited resources available, and the amount of complexity of the information to be handled.

Sun Refining and Marketing Company (Ex. 3: 155, p. 1-2) remarked:

Sun recommends that OSHA require all of the initial process hazards analyses be completed within five years of the effective date. While Sun recognizes the magnitude of work which will be required to implement these regulations as well as the limited number of resources, we believe that industry should take an aggressive approach to implementing this portion of the regulations. With such an approach, Sun believes a five year implementation schedule can be achieved and will accomplish process safety in a reasonable and realistic time frame.

OSHA accepts participants remarks that resources may be stretched by the requirement to conduct process hazard analyses. Further, OSHA agrees with participants that a five-year period may be necessary to complete good quality process hazard analyses but remains unconvinced that a seven-year timeframe is necessary, especially in light of the concentrated efforts directed toward meeting API's RP 750 published in January 1990 and the Chemical Manufacturers Association process safety management initiatives already described. After considering the evidence in the record on this issue, the Agency finds that the 5-year phase-in period to complete process hazard analyses required by the standard is feasible.

In recognition that time will also be needed to compile the information required in paragraph (d), process safety information, which is needed to conduct a process hazard analysis, OSHA has adopted a schedule that requires at least 25% of the process hazard analyses to be

completed each year, starting with the second year after the effective date of the standard. These provisions become final paragraphs (e)(1)(i) through (e)(1)(iv).

Finally, OSHA has added a new paragraph (e)(1)(v) which grandfathers process hazard analyses completed 5 years before the effective date of the standard. These process hazard analyses must meet the requirements contained in paragraph (e) and will have to be updated and revalidated, based on their completion date, in accordance with the requirements in paragraph (e)(6). Many commenters addressed the grandfathering of these analyses and OSHA agrees that appropriate grandfathering should be allowed. It would not be reasonable to require that resources be expended to conduct another process hazard analyses when a recent one already exists since these same resources could be better used to conduct initial process hazard analyses on other processes.

OSHA proposed a performance oriented requirement with respect to the process hazard analysis so that an employer would have flexibility in choosing the type of analysis that would best address a particular process. Consequently in paragraph (e)(1) OSHA proposed that an employer use one or more of certain listed methodologies to perform a process hazard analysis. The methodologies included: what-if; checklist; what-if/checklist; failure mode and effects analysis; hazard and operability study; and fault free analysis. More detailed information concerning the methodologies was included in nonmandatory appendix D. In Issue 4 in the proposal (55 FR at 29158), OSHA asked whether OSHA should consider additional methodologies, such as those approved by the American Institute of Chemical Engineers. Additionally, OSHA asked if appendix D, which contained descriptions of the methodologies in the proposal, should be made mandatory in order to assure a degree of uniformity when employers apply methodologies.

A vast number of participants opposed restricting process hazard analyses methodologies (e.g., Ex. 3: 9, 12, 17, 20, 21, 25, 26, 27, 28, 29, 30, 33, 38, 39, 41, 45, 47, 48, 50, 59, 62, 64, 69, 70, 71, 72, 73, 79, 83, 88, 92, 96, 99, 101, 106, 108, 109, 113, 115, 119, 120, 121, 127, 134, 137, 138, 139, 146, 150; Ex. 91; Ex. 127; Tr. 670, 736, 970, 1020, 1115, 1290-1, 1617, 1927, 2004, 2060, 2114, 2176, 3411, 3507). For example, Johnson Wax (Ex. 3: 12, p.28) stated:

[T]he six methodologies are not the only ones in current use or under development.

For this reason, we do not believe OSHA should limit "process hazard analyses" techniques to these six. Instead, we would recommend that OSHA allow any recognized "equivalent" methodology also be allowed under this rule.

We would urge OSHA to explicitly state that other "process hazard analyses methodologies" would be acceptable if they can provide "equivalent" information to those listed. This will allow new methodologies to be used to "meet" this rule as they are developed. Otherwise the Agency will "freeze" process hazard analyses to current technologies.

Exxon Company, U.S.A. (EUSA, Ex. 3: 39, p.5), noted:

Restricting process hazard analysis (PHA) methodologies is a critical issue, and one of our most serious concerns.

EUSA is vigorously opposed to restricting PHA methodologies to the six currently listed in the proposed rule. This would indeed freeze technology in the new and rapidly evolving field of chemical process risk management, thereby excluding new and better methods which will most certainly be developed.

The American Paper Institute (Ex. 3: 45, p.15) commented:

OSHA's proposal to list "acceptable" process hazard analysis methodologies is unnecessarily narrow. The better approach would be to eliminate the list and make this a performance-oriented requirement. OSHA should simply mandate that the employer use an appropriate methodology for the process hazard analysis.

Realities of the workplace argue for maximum flexibility in this area. For example, the employer may need to modify one of the established methodologies. In some cases, the employer may need to develop a new approach because none of the existing methodologies is appropriate for the process to be evaluated. The precise methodology is unimportant so long as the method used addresses the elements specified in proposed section (e)(2).

If OSHA elects to publish a list of acceptable methodologies, the rule should stress that these are examples and that other * * * methodologies may be used so long as they are appropriate * * *.

OSHA agrees with these commenters regarding the use of the methodologies. While many of these commenters indicated that OSHA should require methodologies recognized by the American Institute of Chemical Engineers, OSHA has decided against doing so since it agrees with those participants who believed that any methodology should be allowed as long as it meets the specified criteria described in paragraph (e). Therefore OSHA has added an additional paragraph to its list of acceptable methodologies allowing employers to use other appropriate methodologies capable of adequately addressing and

analyzing the elements in paragraph (e)(3) of the final rule.

OSHA has decided not to retain the proposal's nonmandatory appendix D, Process Hazard Analysis Methodologies. Since OSHA is now allowing other appropriate methodologies, OSHA believes the appendix no longer serves the purpose for which it was intended. Further, OSHA believes that the proposal's nonmandatory appendix E, Sources of Further Information (which becomes final appendix D), provides more thorough information to employers seeking assistance in conducting process hazard analyses. This information appendix has been expanded to provide additional sources.

Comments were received directed toward clarifying OSHA's proposed paragraph (e)(2) concerning what a hazard analysis must address (final rule paragraph (e)(3)). The proposal required that the analysis address the hazards of the process; engineering and administrative controls applicable to the hazards and their interrelationships; the consequences of failure of these controls; and a consequence analysis of the effects of a release on all workplace employees.

Proposed paragraph (e)(2)(i) which required that employers address the hazards of the process remains the same as proposed. The paragraph becomes final paragraph (e)(3)(i).

Under the Clean Air Act Amendments, section 304(c)(2), OSHA must require employers to perform a workplace hazard assessment (OSHA's process hazard analysis), including, as appropriate, identification of potential sources of accidental release, an identification of any previous release within the facility which had a likely potential for catastrophic consequences in the workplace, estimation of workplace effects of a range of releases, and an estimation of the health and safety effects of such ranges on employees.

OSHA believes that the provisions contained in proposed paragraph (e)(2) concerning what a hazard analysis must address were responsive to the CAAA but did not require the identification of any previous incident which had a likely potential for catastrophic consequences. The inclusion of previous incidents will help to assure that the process hazard analysis adequately addresses a wide enough range of concerns. OSHA has included a requirement in the final rule for employers to identify any previous incident which had a likely potential of catastrophic consequences in the workplace. This provision is responsive

to the CAAA and it becomes final paragraph (e)(3)(ii).

In proposed paragraph (e)(2)(ii), OSHA proposed to require that the process hazard analysis address the engineering and administrative controls applicable to the hazard and their interrelationships. The American Petroleum Institute (API) recommended that additional language be added concerning the detection of and monitoring for releases. OSHA believes that such information is important for employers to consider and has decided to accept the API (Ex. 137) suggestion for the most part. The paragraph becomes final paragraph (e)(3)(iii) and requires that the process hazard analysis address:

Engineering and administrative controls applicable to the hazards and their interrelationships, such as the 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)

It should be noted, however, that detection methodologies is being used only as an example and there may be many other interrelationships that must be covered to comply with this provision for a particular process.

In proposed paragraph (e)(2)(iii), OSHA required that the "consequences of failure of these controls" be addressed. OSHA has changed this paragraph to clarify what is meant by "these." The final paragraph now requires that the process hazard analysis address "consequence of failure of engineering and administrative controls." This change merely clarifies the fact that OSHA wants employers to examine the failure of engineering and administrative controls; it does not change the intent of the provision. This provision becomes final paragraph (e)(3)(iv).

In paragraph (e)(2)(iv) of the proposal OSHA required that employers address a failure of controls through "a consequence analysis of the effects on all workplace employees." Participants encouraged OSHA to rephrase the paragraph to better define its intent (e.g., Ex. 3: 26, 28, 45, 48, 69, 71, 77, 120; Tr. 1013, 1227-28, 1533, 1810, 2014). For example, Chevron Corporation (Ex. 3: 26A, p.5) stated:

The term "consequence analysis" can be interpreted to mean many different types of evaluations, including studies and documentation far beyond what Chevron believes OSHA intends and far beyond what would add value to a PHA study. Additionally, Mobil Research and

Development Corporation (Ex. 3: 69, p.3) noted:

[W]e are concerned that the term "consequence analysis" . . . could be misinterpreted as requiring highly specialized modeling and risk assessment techniques such as Probabilistic Risk Assessment (PRA) that are not called for in paragraph (e)(1) . . . PRA's, vapor cloud modeling and other quantitative hazard assessment techniques are difficult to apply as a basis for regulatory control. Judgments and assumptions made by the individuals performing the assessments are subjective and findings are difficult to validate and compare to other assessments. Moreover, no nationally accepted risk criteria for industrial processes have been established.

OSHA has modified the paragraph to indicate that it did not intend employers to conduct probabilistic risk assessments to satisfy the requirement to perform a consequence analysis. OSHA agrees with commenters that specialized techniques such as vapor cloud modeling would add an unnecessary burden with respect to assessing the effects of releases on employees. OSHA believes employers can establish a reasonable range of possible effects of releases on employees without conducting these specialized quantitative analyses. Further OSHA believes it has insufficient data in this rulemaking record on which to establish what would be a reasonable quantitative analysis. Therefore, this clarified paragraph becomes final paragraph (e)(3)(vii) and requires a qualitative evaluation of the possible safety and health effects of failure of engineering and administrative controls on employees in the workplace. This evaluation is for the purpose of guiding decisions and priorities in planning for prevention and control, mitigation and emergency response. OSHA believes this better reflects what it intended to accomplish by the proposal.

Additionally, OSHA has added two additional elements to final paragraph (e)(3). OSHA believes and participants suggested (Tr. 2609, 2705, 2781, 3542) that facility siting should always be considered during process hazard analyses. In order to assure that employers do consider siting, OSHA has decided to specifically emphasize it. Facility siting becomes final paragraph (e)(3)(v).

Finally, OSHA has added paragraph (e)(3)(vi) to the final rule which requires that employers address human factors in the process hazard analysis. In response to an OSHA concern expressed during the rulemaking regarding the consideration of human factors in process hazard analyses, the Chemical

Manufacturers Association (CMA, Ex. 3: 128, p.6) observed:

Human error is but one, albeit important, cause for chemical process accidents. A number of the provisions of the proposed PSM standard implicitly require companies to address the possibility of human error. . . . Some individuals have testified that OSHA has not provided for the consideration of human error in the proposed standard-CMA disagrees with this shortsighted conclusion. However, CMA further stated that if the Agency wished to highlight the importance of addressing human factors issues, OSHA should include a requirement. OSHA agrees and, as noted above, has added a provision to highlight this concern.

Proposed paragraph (e)(3) required employers to conduct a process hazard analysis using a team approach. OSHA believes that in order to conduct an effective, comprehensive process hazard analysis, it is imperative that the analysis be performed by competent persons, knowledgeable in engineering and process operations, and those persons be familiar with the process being evaluated. Some employers may have a staff with expertise to perform a process hazard analysis. This staff will already be familiar with the process being evaluated. However, some companies, particularly smaller ones, may not have the staff expertise to perform such an analysis. The employer, therefore, may need to hire an engineering or consulting company to perform the analysis. OSHA believes it is important to note that in all situations, the team performing the process hazard analysis must include at least one employee from the facility who is intimately familiar with the process.

OSHA also believes that a team approach is the best approach for performing a process hazard analysis. This is because no one person will possess all of the knowledge and experience necessary to perform an effective process hazard analysis. Additionally, when more than one person is performing the analysis, different disciplines, opinions, and perspectives will be represented and additional knowledge and expertise will be contributed to the analysis. In fact, some companies even include an *individual on the team who does not* have any prior experience with the particular process being analyzed to help insure that a fresh view of the process is integrated into the analysis. Additionally, as discussed in the rulemaking, employees and other experts may be brought onto the team on a temporary basis to contribute their specialized knowledge to the conduct of the process hazard analysis.

The proposed provision required that the process hazard analysis be performed by a team with members who are knowledgeable in engineering and process operations, and that the team have at least one employee who has experience and knowledge specific to the process being evaluated.

In Issue 5 of the proposal (55 FR at 29158), OSHA inquired whether an employee representative should be included on process hazard analysis teams and incident investigation teams to assist in developing a cooperative participatory environment and to assist in developing the necessary flow of information.

OSHA received significant comment on the issue of teams and their makeup (e.g., Ex. 3: 9, 12, 15, 17, 20, 21, 25, 26, 28, 30, 32, 38, 39, 41, 45, 48, 50, 53, 59, 62, 69, 70, 76, 80, 81, 82, 83, 95, 96, 103, 106, 108, 109, 112, 113, 119, 120, 123, 127, 129, 134, 138, 139, 141, 143, 150, 155, 156; Ex. 91; Ex. 101; Ex. 134; Ex. 138; Ex. 143; Tr. 741, 1595-96, 1813, 2007, 2061, 3238, 3351, 3411). A vast majority of these commenters generally supported a team approach to conducting process hazard analysis as well as the team membership as specified in the proposal. As discussed previously, a great number of participants objected to the inclusion of an employee representative (union representative) on these teams; and as already indicated, OSHA has decided not to specifically require an employee representative on the team. Instead, the Agency has chosen to include a separate paragraph (final paragraph (c)) addressing employee participation in the process safety management program, which would require employee participation in the process hazard analysis by requiring that employers consult with employees and their representatives on the conduct and development of process hazard analyses. (See previous discussion of employee participation, final paragraph (c).) However, OSHA continues to require that an employee who has experience and knowledge specific to the process being evaluated be included on the team.

Numerous commenters noted that the proposal omitted a crucial team member, a person knowledgeable in the process hazard analysis methodology being used to evaluate the process in question (e.g., Ex. 3: 9, 17, 48, 69, 83, 103, 109, 115, 120, 153; Ex. 101; Tr. 1021, 1291). OSHA agrees with these commenters and has added a requirement that one team member must be knowledgeable in the specific process hazard analysis methodology being used. This paragraph concerning process hazard analyses

teams becomes paragraph (e)(4) of the final rule.

In proposed paragraph (e)(4), the employer was required to address the findings and recommendations of the process hazard analysis team, to document actions taken, and communicate the actions taken to employees whose work assignments are in the facility affected by the recommendations or actions. The employer was also required to assure that recommendations were implemented in a timely manner. With these provisions, OSHA wanted to assure that the results of a process hazard analysis were fully utilized to improve process safety.

Many commenters objected to OSHA's requirement that the recommendations resulting from the process hazard analyses be implemented in total (e.g., Ex. 3: 26, 30, 38, 39, 45, 48, 50, 69, 70, 81, 101, 106, 108, 109, 115, 120, 121, 129, 153, 155; Ex. 95, 136, 138, 148; Tr. 670, 970, 1015, 1811, 1854, 1931, 2061, 2159, 2654, 3351, 3411, 3510). The Fertilizer Institute (Ex. 3: 109, p.7) remarked:

Paragraph (e)(4) should be modified so that employers are not required to implement every recommendation offered by a Process Hazard Analysis Team. It is critically important that a PHA Team have freedom to make broad recommendations, at risk of being wrong, since they will not have time to completely research each recommendation. Working with the Team, Management must retain the responsibility for deciding which recommendations should be implemented* * *.

The Synthetic Organic and Chemical Manufacturers Association (SOCMA, Ex. 3: 50, p. 5-6) observed:

SOCMA also agrees with OSHA's requirement that employers establish a system to promptly address the team's findings. However, SOCMA does not agree that the recommendations of the team should be "implemented" because that implies that every recommendation developed by the process hazard analysis team must be acted on exactly as recommended. Many times, on further study, process hazard analysis team recommendations are resolved in more effective ways than those originally envisioned by the team. The employer should be given the option to implement solutions that are more effective than those recommended by the team.

OSHA agrees with these participants that a process hazard analysis team should be encouraged to make broad recommendations. It is also possible that not all team recommendations will be correct or will resolve the problem found in the best way. OSHA has accordingly restructured, changed and added language to the final paragraph to

reflect the concerns of many participants. In the final paragraph, the employer must assure that the recommendations resulting from the process hazard analysis are "resolved" in a timely manner and that the resolution is documented. In this way, when a team recommendation is incorrect, the employer can analyze it and then document in writing why the recommendation is not being adopted or is being adopted with modification.

In conjunction with this change OSHA believes that when an employer decides that a recommendation requires action, then an employer should develop a written schedule of the actions which are to be completed. It is OSHA's intention that the actions to be taken as a result of the process hazard analysis recommendations be completed as soon as possible. In most cases, OSHA believes that employers will be able to complete these actions within a one to two year timeframe, but notes that in unusual circumstances longer completion periods may be necessary. The final paragraph becomes paragraph (e)(5) and the above language has been incorporated into the final provision.

In the proposal, paragraph (e)(5), the process hazard analysis was to be updated and revalidated at least every five years, using the process hazard analysis team to assure that the process hazard analysis is consistent with the current process. The Agency believed that this five year update and revalidation interval was a reasonable timeframe, particularly in consideration of the long life span, without change, of many processes. OSHA also believed that there were adequate safeguards elsewhere in the proposal to protect employees when the process changed. (See for example, paragraph (d), process safety information and (l), management of change.)

In Issue 3 of the proposal (55 FR at 29158) OSHA invited comment on whether the five year update and revalidation cycle was appropriate. Many participants addressed this provision and most supported the 5-year update and revalidation provision (e.g., Ex. 3: 17, 26, 33, 41, 45, 48, 50, 59, 64, 69, 88, 95, 96, 101, 109, 119, 120; Tr. 740, 1114, 1598, 1809, 2157, 2774, 3349, 3411). For example, Pennzoil (Ex. 3: 41, p.11) noted:

Pennzoil fully supports updating and revalidating the PHA every five (5) years, provided that OSHA does not intend updating and revalidating to mean doing a completely new PHA. As we understand the proposed language, during a PHA review, our PHA team would evaluate the previous PHA, examine the extent of any changes that might have occurred since the PHA was implemented (or last reviewed) and decide

what work is needed to make the PHA current. Given our understanding of how these updates will work and our limited resources, we believe that this interval is very practical.

The American Paper Institute (Ex. 3: 45, p.14) indicated:

API [American Paper Institute] believes that OSHA's proposal to require process hazard analyses updates and revalidations every five years is an appropriate choice. Adequate safeguards exist in the proposed rule to address potential concerns that might arise between periodic updates and validations. Elsewhere, OSHA has proposed that facilities prepare for and deal with changes; compliance with the requirements governing changes will provide ample protection until completion of the next regularly scheduled process hazard analysis validation/update. By selecting the five-year interval, OSHA has avoided imposing an unnecessary burden on facilities.

The American Petroleum Institute (Ex. 3: 106A, p.12) stated:

OSHA's proposal to update and revalidate every PHA on a five year basis is acceptable, providing it is not intended to mean that a team must necessarily conduct a new and complete PHA. API understands the proposed language to mean that the PHA team could evaluate the previous PHA, examine the extent of change that had occurred in the interim and the procedures used for implementing change, and reach a conclusion regarding the scope and extent of the work necessary to update and revalidate the PHA. With this understanding, we support the five-year interval. The procedures required by paragraphs (1) Management of change and (i) Pre-startup safety reviews will ensure the interim integrity of process safety.

Texaco Inc. (Ex. 3: 120, p.6) observed:

Paragraph (1), Management of Change, outlines the items the employer must address prior to any change. This enables the employer to determine the scope and extent of the work necessary to update and revalidate the process hazard analyses. Consequently, Texaco believes the five (5) year update and revalidation requirement for process hazard analyses is appropriate.

OSHA agrees with these commenters and has retained the five year update and revalidation schedule. Finally, OSHA has decided to clarify that the update and revalidation should occur five years after the completion of the initial process hazard analysis. This paragraph has been redesignated as paragraph (e)(6).

In paragraph (e)(6), OSHA proposed that employers retain the two most recent process hazard analyses and/or updates for each process covered as well as the documented responses to the process hazard analysis recommendations. Few participants addressed this particular provision. OSHA has determined, based on the

discussions in the rulemaking, particularly those concerning the update and revalidation of process hazards analyses, that the proposed requirement to retain the two most recent process hazard analyses and/or updates for each process failed to recognize the full importance of documents developed relative to process hazard analyses. This requirement has been modified in the final rule. New paragraph (e)(7) requires that employers retain the process hazard analysis and their updates and revalidation. The Agency does not believe that this requirement will pose an undue burden on employers in that retention of these documents is necessary to conduct the periodic updates and revalidations which are required under the standard.

OSHA believes that the process hazard analysis provisions contained in the final standard meet the requirements contained in section 304(c) (2), (4), and (5) of the Clean Air Act Amendments. The requirements state that the OSHA standard must require employers to:

(2) Perform a workplace hazard assessment [OSHA's Process Hazard Analysis] including, as appropriate, identification of potential sources of accidental release, an identification of any previous release within the facility which had a likely potential for catastrophic consequences in the workplace, estimation of workplace effects of such range on employees.

(4) Establish a system to respond to the workplace hazard assessment findings, which shall address prevention, mitigation, and emergency responses.

(5) Periodically review the workplace hazard assessment and response system.

Operating Procedures: Paragraph (f)

Paragraph (f) of the proposal contained provisions requiring the development and implementation of written operating procedures. The procedures are to provide clear instructions for safely conducting activities involved in covered processes and they must be consistent with the process safety information. To have an effective process safety management program, OSHA believed that tasks and procedures directly and indirectly related to the covered process must be appropriate, clear, consistent, and most importantly, communicated to employees.

Many different tasks may be necessary during a process, such as initial startup, handling special hazards, normal operation, temporary operations and emergency shutdown. The appropriate and consistent manner in which the employer expects these tasks and procedures to be performed consistent with the facility's operating

procedures is sometimes referred to as standard operating procedures.

It is important to have written operating procedures so employees working on a process do a given task in the same manner. There is less likelihood that incidents will occur if written operating procedures are developed so even a new employee or one who is relatively inexperienced will respond to a given event in a preconsidered and prescribed manner. It is also important that the procedures be written so that they can be communicated to employees in the most effective manner possible. Such written procedures comprise the employer's policy with respect to what is to be accomplished, and how it is to be accomplished safely. This will ensure that employees will perform like tasks and procedures in a consistently safe manner, and employees will know what is expected of them. These procedures must also be available for ready reference and review during production to make sure the process is operated properly. Accordingly, OSHA proposed that the employer develop and implement written operating procedures that provide clear instructions for safely conducting all activities involved in each process.

In proposed paragraph (f)(1)(i), OSHA required that the operating procedures address steps for each operating phase, including initial startup, normal operation, temporary operations, emergency operations, normal shutdown, and startup following turnaround or emergency shutdown.

In proposed paragraph (f)(1)(ii) OSHA proposed that the operating procedures address the process operating limits, including the following: consequences of deviation; steps required to correct and/or avoid deviation; and safety systems (including detection and monitoring equipment) and their functions.

In paragraph (f)(1)(iii), OSHA proposed that the operating procedures address safety and health considerations regarding the process, including the following: properties of, and hazards presented, by the chemicals used; precautions necessary to prevent exposure; control measures to be taken if physical contact or airborne exposure occurs; safety procedures for opening process equipment (such as pipe line breaking); quality control for raw materials and control of hazardous chemicals inventory levels; and any special or unique hazards.

Few participants criticized the contents or the merits of paragraph (f) in general. However, OSHA has restructured and clarified certain provisions of paragraph (f)(1). One

change includes a division of proposed paragraph (f)(1)(D) which addressed emergency operations, including emergency shutdowns, and who could initiate them. Proposed paragraph (f)(1)(D) has been divided into final paragraph (f)(1)(D) and final paragraph (f)(1)(E). Final paragraph (f)(1)(D) concerns emergency shutdown and requires that the employer assign shutdown responsibility to a qualified operator to ensure a safe and timely shutdown.

The second change is the relocation of (f)(1)(ii)(C), safety systems and their functions, to a separate paragraph. This paragraph becomes final paragraph (f)(1)(iv).

Proposed paragraph (f)(2) required that a copy of the operating procedures be readily accessible to employees who work in or maintain a process and it is retained in the final rule. This requirement assures that a ready and up-to-date reference is available to employees when needed. It will also form a foundation for training which employees need under this final rule.

In proposed paragraph (f)(3) OSHA proposed that the operating procedures be reviewed to assure that they reflect current operating practices and any changes to the process or facility. Since it is extremely important to the safe operation of covered processes that operating procedures remain current and accurate, OSHA has added a precaution to guard against the use of outdated or inaccurate operating procedures by requiring that an employer verify annually that the operating procedures are current and accurate. No other changes were made to the paragraph and it becomes final paragraph (f)(3).

Finally, OSHA has been persuaded by participants in the rulemaking that it should add another requirement to paragraph (f). Throughout the rulemaking OSHA has expressed its concern regarding the control of hazardous activities within a facility. For example, in the notice of hearing in issue 1 (55 FR at 48075), OSHA asked whether it should require employers to issue permits for hazardous activities in addition to those for which hot work permits were required. It had been suggested that issuing permits would provide greater control of hazardous activities at a facility and would also facilitate a better coordination of contractor activities. A variety of participants objected to OSHA expanding the required permit system (e.g., Ex. 3: 154, 163, 166; Ex. 116; Tr. 1853).

However, the Organization Resources Counselors (ORC, Ex. 131, p. 5)

recommended and others concurred (Ex. 3: 165):

(T)he addition of a new paragraph to . . . provide for the development and implementation of an on-going mechanism to ensure that all workers performing non-routine work are informed of existing hazards, appropriate precautions, and emergency procedures. . . .

The objectives of these requirements are, first, to insure that those persons operating high hazard processes are cognizant of any non-routine work (i.e., maintenance, construction, sampling or other activity) that is occurring in the process. The second objective is to insure that those in responsible control of the facility are also in control of such non-routine work so as to insure that the work does not undermine the safe control of the process. The third objective is to provide information to those workers performing non-routine work regarding the hazards and necessary precautions attendant to that work.

Ordinarily, in chemical plants, maintenance and construction activities are supervised by persons other than those in direct control of the process. Implementation of these practices will insure that control over all activity in high hazard plants remains with those who manage the production units while they are in operation.

OSHA agrees that this approach will provide significant safety to employees impacted by on-going work activities and prefers this performance oriented approach provision. Therefore OSHA has added a new paragraph (f)(4) in the final standard requiring the employer to develop and implement safe work practices to provide for the control of hazards during work activities.

OSHA believes that the provisions concerning operating procedures included in the final standard meet the requirements of sections 304(c) (6) and (7) of the CAAA which state that the OSHA standard must require employers to:

(6) Develop and implement written operating procedures for the chemical process including procedures for each operating phase, operating limitations, and safety and health considerations.

(7) Provide written safety and operating information to employees and training employees in operating procedures, emphasizing hazards and safe practices

Training: Paragraph (g)

OSHA believes that the implementation of an effective training program is one of the most important steps that an employer can take to enhance employee safety. The Agency also believes that an effective training program will help employees understand the nature and causes of problems arising from process operations, and will increase employee awareness with respect to the hazards particular to a

process. OSHA is convinced that an effective training program will significantly reduce the number and severity of incidents arising from process operations, and can be instrumental in preventing small problems from leading to a catastrophic release.

While there were a few concerns expressed with respect to OSHA's performance-oriented approach to training, no participant disagreed with the importance of training. In fact, there was consensus among rulemaking participants that training is a necessary and integral part of any effective process safety management program.

Proposed paragraph (g)(1) covered initial training, and required each employee presently "involved" in a process, and each new employee before working in a newly assigned process, to be trained in an overview of the process and in the operating procedures that were specified in proposed paragraph (f) of the proposal. The proposal also required the training to include emphasis on the specific safety and health hazards, procedures, and safe work practices applicable to the employee's job tasks.

An extensive amount of comment and testimony resulted from this proposed provision. In its analysis of this rulemaking record, the Agency identified three broad topics that were addressed by rulemaking participants in relation to this proposed provision concerning initial training. These topics were: the application of this proposed provision (to whom the training applies); OSHA's approach (including the amount and method of training, and the content of the training program); and grandfathering of training (the recognition of training received by employees prior to promulgation of this standard).

Application

Several rulemaking participants (Ex. 3: 17, 33, 53, 71; Tr. 313; Tr. 389) remarked that the training coverage for "employees involved in a process" was too broad, and could be misinterpreted to mean contractor employees and maintenance employees, in addition to the operating employees that they assumed that this proposed provision was meant to address. They suggested that this proposed paragraph be renamed "Operator Training" and the applicability of this proposed paragraph be clarified; or, they suggested addressing training for all employees in this proposed paragraph, including training for contractor employees and maintenance employees. For example, a hearing participant from the

Organization Resources Counselors (ORC Tr. 313) testified:

To clarify the training requirements of this proposal, ORC recommends that OSHA either include the training appropriate for maintenance and contractor personnel in additional, separate subsections of paragraph G, or rename paragraph G as "operator training", and highlight those paragraphs in J and H which call for the training of other types of employees.

Another hearing participant from Chevron (Tr. 389) said:

Training should cover operating employees rather than as currently worded, "employees involved in the process" which is subject to interpretation.

A commenter from Allied Signal (Ex. 3: 17, p. 9) stated:

(I)t should be noted that the requirements of paragraph (g) are appropriate only for employees involved in operating the process. Training for mechanical personnel is referenced in paragraph (j)—specifically (j)(2)(ii)—and training for contractor employees is specified in paragraph (h).

Additionally, a commenter from ARCO Chemical Company (ACC, Ex. 3: 71, p. 3) remarked:

ACC recommends that OSHA limit the application of the training requirements of the proposed rule to those employees directly involved in the process with training limited to relevant operating procedures necessary for the safe performance of job tasks.

When OSHA proposed that this provision apply to employees "involved in a process," it intended for this provision to apply to only those employees, including managers and supervisors, who are actually involved in "operating" the process. While most OSHA standards, by their terms, apply to all employees in a particular situation and contract employees are considered "employees" in the broad sense of the word, this standard distinguishes in the training requirements between contract employees and direct hire employees. This was done primarily for emphasis and in recognition of the fact that in some segments of industry covered by the process safety management standard, contractors make up a substantial portion of on-site workers. OSHA wanted to focus attention on that situation and did so by imposing separate but similar training objectives for direct hire and contract employees. This is the reason, as discussed below, that training requirements for contractor employees and maintenance employees were addressed in separate paragraphs in the proposal.

OSHA agrees with rulemaking participants that this intent was not clear in the proposed rule. Therefore, the phrase "involved in a process" is being

replaced with the phrase "involved in operating a process" in paragraph (g)(1) of the final rule. This is intended to cover all direct hire employees not involved in maintenance. This paragraph is not intended to be limited to equipment operators. OSHA believes that this change together with other changes made to the training requirements for contractor and maintenance employees (addressed in paragraphs (h) and (j), respectively), will clarify the Agency's intent.

Approach

A few rulemaking participants (e.g., Tr. 1286, 2259, 2268-70, 2409) disagreed with OSHA's performance-oriented approach with respect to training, and contended that the proposed training requirements were inadequate and should be strengthened. For example, a hearing participant from the Laborers' National Health and Safety Fund (Tr. 1286) stated:

The training required in 119 (g) and (h) suffer from the usual deficient approach that's been taken b[y] OSHA in the past in that form, content, duration, scope, proficiency and competency aspects, among others, are not addressed. This key element in achieving reduced worker and public risk from operations covered by 119, is seriously deficient.

A participant from the Oil, Chemical and Atomic Workers (Tr. 2408-09) testified:

This standard doesn't propose to do anything. If you examine it closely, it is going to require industry to do no more than it does now, [no] more than it has said it has done over the last 20 and 30 years, and [no] more certainly than we think ought to be done in some of those areas.

When it talks about training, it talks about training for operators. And essentially, when we look at the standard, we think it calls upon industry to do what it has done.

When we looked at training and tried to fashion what the standard meant in terms of training for maintenance, our conclusion was that the standard essentially said, Do what you have done. When we looked at contractors in the one paragraph in the standard that talked about contractors, it essentially said, Do what you have done. And we don't believe that what has been done is enough * * *.

Additionally, a hearing participant from the United Steelworkers of America (USWA, Tr. 2268-69) remarked:

Although both unions are pleased at OSHA's initial inclination to make training a component of the proposed 1910.119 standard, we find the proposal severely lacking in specific and detailed regulatory language, as well as scope and breadth.

In addition, we find the voluntary and self-regulatory—i.e., strictly performance-based— aspects of OSHA's proposed training

requirements to be insufficient to assure the safety of workers, chemical facilities and their communities.

USWA and the International Chemical Workers Union recommended specific subjects that an effective training program should include, and suggested that a stratified approach to training be used by OSHA in the final rule (Tr. 2270-77). This stratified approach would consist of a minimum number of hours of training for two categories of employees: employees who have the potential to affect imminent danger situations and employees who have the potential to be affected by but not affect any imminent danger situations.

It was suggested that the first category, employees who have the potential to affect imminent danger situations, be separated into two subgroups of employees. The first group would consist of managers and supervisors directly responsible for highly hazardous chemical operations with imminent danger potential. It was suggested that these employees receive a minimum of 80 hours of initial training, and a minimum of 40 hours of refresher training annually, thereafter. The second group would consist of all workers who could, through the course of their production, maintenance or emergency work activities affect highly hazardous chemical imminent danger situations. These workers would include, but not be limited to, chemical and petroleum operators and their assistants, electricians, plumbers, pipefitters, etc. It was recommended that this group of employees receive a minimum of 40 hours of initial training, and a minimum of 40 hours of refresher training annually, thereafter.

It was further suggested that the second category of employees, those who have the potential to be affected by an imminent danger situation, be provided with a minimum of eight hours of training annually.

A few other rulemaking participants (e.g., Ex. 3: 5, 138; Tr. 47) also suggested that OSHA specify a minimum number of training hours in the final rule. However, the vast majority of rulemaking participants supported a performance-oriented approach to training (e.g., Ex. 3: 9, 17, 20, 28, 29; Ex. 138; Tr. 76, 313-14, 388, 674, 1021, 1207, 1318, 1508, 1538, 1596, 1617, 1663, 1815, 2008, 2062, 2158). They asserted that there were several levels of complexity of operations among the various covered processes and experience and skill levels vary widely among employees. As a result, a specified number of training hours might be too little for some

employees, and more than is actually needed by other employees.

They contended that the employer should evaluate the complexity of operation, experience, and skill levels of employees. With this information, the employer would be able to determine the content of the training program as well as the amount and frequency of training that would best assure that employees will be able to perform their job tasks in a safe and effective manner. For example, a hearing participant from the Organization Resources Counselors (ORC, Tr. 313-14) testified:

Choice of the most appropriate means for determining employee comprehension and expertise, however, must be the responsibility of the employer rather than mandated by regulation, as only the employer has the knowledge necessary to do this.

Moreover, the employer is responsible for the safe management of processes involving highly hazardous chemicals and must be free to use whatever method he or she determines will best ensure that employees can and do perform their jobs safely.

ORC also strongly opposes the notion that minimum hours of training must be specified in this standard to ensure that employees receive adequate training. The level and extent of training necessary should be dependent upon the complexity of the operation.

A commenter, who is an independent consultant (Ex. 3: 9, p. 2), remarked:

As for training, setting a specific time period for the training seems unreasonable. Experienced personnel certainly need far less time than newly hired personnel. Also, the extent of training varies based on the difficulty of the operations being performed. Training is needed for all facilities where hazardous materials are present but, again it is impossible to set a specific single criteria for training covering all situations.

Another commenter from the Gas Processors Association (GPA, Ex. 3: 28, p. 12), stated:

GPA's position is that OSHA should not specify a minimum amount of training because the training needs vary greatly depending on the size, complexity, and nature of the operation and hazards involved. For example, at a small, simple operation the requirement for 40 hours of initial training may greatly exceed the amount of training necessary to assure that employees are properly and adequately trained for that operation. Other large complex operations could dictate that 40 hours or more of initial training be provided for some employees involved in the operation. In summary, employers should custom design the training program for a location based on that operation's specific requirements. Forty hours of initial training and 8 hours of refresher training for many operations could be unnecessary.

A hearing participant from Manufacturing Technology Strategies (Tr. 1318) said:

In terms of the amount of training required, we believe that time limits are not appropriate. Once again, it is our belief that the technology determines the extent and complexity of the needed training, and since this technology is highly variable from site to site, it is not possible to say 40 hours is sufficient or that 8 hours once annually would keep the person up to speed.

Additionally, a hearing participant from the Institute of Makers of Explosives (Tr. 1617-18) remarked:

On training, OSHA should neither specify a minimum number of hours for initial or refresher training, nor should OSHA require any specific method for training validation. The employer can best determine the degree of initial and refresher training needed. The level of training should depend on the complexity of the job, the skill level of the trainee, and the skills needed to safely perform the job. For example, an employee in a chlorine repackaging operation will not need the same amount or level of training as an employee at a chloralkali production facility.

Finally, OSHA's expert witness (Tr. 2007-08) testified:

In my experience, I have found that the amount of training should depend upon the complexity of the operation and the competence and experience level of the person being trained. A simple reaction using one reactor will require much less operator training than a complex chemical or petrochemical operation.

Therefore, I do not think that there should be a minimal number of hours of training specified in the standard. The training requirements should not be rigid, but should cover the essential parts of the process involved to ensure that employees are competent to perform their duties.

After a careful analysis of the rulemaking record with respect to proposed paragraph (g)(1), OSHA has concluded that a performance-oriented approach to training is appropriate. The Agency believes that employers can determine the amount of training and the content of the training program that best reflects the operation's complexity and the experience and necessary skill level of their employees.

Proposed paragraph (g)(1) has been redesignated as (g)(1)(i) in the final standard and has been revised to read as follows:

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.

Grandfathering

Many rulemaking participants (e.g., Ex. 3: 26, 33, 38; Ex. 138; Ex. 143; Tr. 388, 1022, 1122, 1207, 1618) contended that OSHA should recognize training that employees received prior to the promulgation of this standard. For example, a commenter from Chevron (Ex. 3: 26, p. 7) stated:

The rule also does not address training received prior to the effective date of the rule. To help alleviate some of the compliance burden placed on employers without compromising the safety of employees, OSHA should include a grandfather clause within the initial training requirement. As long as employees have received training comparable to that required by the standard, the employer should not be required to retrain these employees for the sake of the standard. These employees will still be covered by the refresher and supplemental training requirements of paragraph (g)(2).

A participant from Kodak (Ex. 3: 33A, p. 8-9), said:

OSHA needs to grandfather initial training requirements for existing employees. It would be an incredible burden to require retraining of all employees, many of whom are experienced with and participated in development of the process and operating procedures.

A commenter from Monsanto (Ex. 143, p. 2) asserted:

Further, performance against established criteria by employees who are already performing these jobs should suffice for validation. These employees should not have to attend a training course on what they are already doing and again demonstrate their proficiency on the job to satisfy training/validation requirements. It will, therefore, be important that OSHA specifically "grandfather" training that has already been accomplished and employees are performing their jobs.

In testimony, a hearing participant from the American Petroleum Institute (API, Tr. 1122) observed:

API believes that where employers previously have provided initial training that meets OSHA basic requirements, recipients of that training should be grandfathered and not be required to repeat the initial training.

Also, OSHA's expert witness (Tr. 1207) remarked:

I suggest that training be phased in by grandfathering existing process operators, exempting them from the initial training requirement but making them subject to periodic refresher and supplemental training requirements.

OSHA agrees that previous training should be recognized if the employer certifies in writing that employees have the required knowledge, skills, and

abilities to safely carry out their duties and responsibilities, particularly since employees must still be provided with refresher training in accordance with paragraph (g)(2) of this section (discussed below in this preamble).

Therefore, OSHA is adding a new provision, (g)(1)(ii), to the final rule to allow grandfathering of initial training under certain circumstances. The new paragraph reads as follows:

In lieu of initial training for those employees already involved in operating a process on (Insert effective date of standard), 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.

Proposed paragraph (g)(2) required refresher and supplemental training to be provided to each employee at least annually to assure that the employee understands and adheres to the current operating procedures of the process. Although the need for refresher training was well supported throughout this rulemaking record, some rulemaking participants (e.g., Ex. 3: 5, 26, 27, 30, 33, 38; Tr. 47, 1121, 1814-15, 2273) disagreed with OSHA that refresher training should be provided annually.

Some rulemaking participants contended that annual refresher training may not be necessary for some employees, and that OSHA should use a performance-oriented approach that would permit the employer to determine the appropriate frequency. Other rulemaking participants recommended that refresher training be held at least every three years. Some rulemaking participants asserted that OSHA should specify a minimum number of hours of refresher training, while still other rulemaking participants suggested that OSHA specify a minimum of 40 hours of refresher training annually. For example, a commenter from South Alabama University (Ex. 3: 5) said:

I believe that employees that deal with hazardous substances should have a minimum of 40 hours training. Refresher training should be the same amount of time.

A hearing participant from the American Petroleum Institute (Tr. 1814-15) testified:

[R]efresher training should be required every three years, not every year, as proposed by OSHA and be restricted to operators.

A commenter from Dupont (Ex. 120) suggested that this proposed provision be revised to read as follows:

Refresher and supplemental training shall be provided to each employee to assure that the employee understands and adheres to the current operating procedures. The employer

shall, in consultation with employees, prioritize and document refresher and supplemental training frequencies, which are not to exceed three years.

Another commenter, who was from ARCO (Ex. 3: 30A, p. 5), remarked:

Paragraph (g)(2) should be amended to provide refresher and supplemental training on a frequency necessary to assure that the employee understands and adheres to the current operating procedures of the process. The words "at least annually" should be removed.

The key objective of this section is to assure that employees are knowledgeable about the current operating procedures and this should be a performance based requirement.

Also, a commenter from Chevron Corporation (Ex. 3: 26, p. 8) stated:

Item (g)(2) should be modified to require refresher training every three years rather than annually.

Paragraph (1) Management of Change will require ongoing supplemental training for all covered changes.

After analysis of the rulemaking record on this issue, OSHA has concluded that as with the initial training, it would be inappropriate to prescribe a minimum number of hours of refresher training since there is a wide variation in operation complexity, and in the experience and skill levels of employees. The Agency believes that the employer, in consultation with employees, can best determine the appropriate frequency of refresher training.

OSHA believes, however, that the frequency of refresher training should be held at least every three years to assure that employees understand and adhere to current operating procedures.

Additionally, the Agency considers the terms "refresher training" and "supplemental training" to be similar and, consequently, has removed the term "supplemental training" from this provision of the final rule.

Accordingly, proposed paragraph (g)(2) has been revised in the final rule to read as follows:

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 in the process. The employer, in consultation with the employees involved in operating a process, shall determine the appropriate frequency of refresher training.

Proposed paragraph (g)(3) required the employer to certify that employees had received and successfully completed the required training. It also required the certification to identify the employee.

the date of the training, and the signature of the person doing the training.

The purpose of this proposed provision was to assure that employees not only receive training but, also, that they understand and can demonstrate what they have learned in order to perform their job tasks safely. This is especially important where, as here, comprehensive training and the understanding of the training plays such a crucial role in the risk reduction associated with the process safety management rule. OSHA also believed this proposed provision was necessary to serve as a tracking mechanism for the training that employees receive and when employees received the training.

Many rulemaking participants (e.g., Ex. 3: 21, 25, 26, 23, 30, 38; Ex. 134; Ex. 143; Tr. 389, 1022, 2009) were concerned that OSHA might revise this provision in the final rule to specify particular methods to validate that employees understood the training they had received such as written tests, oral examinations, on-the-job demonstrations, etc. It was suggested that some method, or combination of methods, would be appropriate to verify that employees have understood the training, but OSHA should not mandate any specific method of validation.

Based on the rulemaking record, OSHA believes that its performance-oriented approach with respect to the certification of training is appropriate and it recognizes that any one of several methods, or combination of methods, can be effective in verifying that employees understand the training that they have received. Employers are therefore free to devise the method that works best in their establishment to ascertain that employees have understood their training. Consequently, OSHA is not mandating any specific methods of training validation in the final rule.

Several rulemaking participants (e.g., Ex. 3: 28, 29, 33; Tr. 1599, 2158) suggested that OSHA replace the term "certify" with "document" because they believe some form of documentation was important but certification was unnecessary. OSHA agrees that the term "document" is descriptive of the Agency's intent, and has substituted the term "document" for "certify" in this provision of the final rule.

Additionally, the Agency believes that it is important that the training documentation contain the name of the person conducting the training, as opposed to the signature of the person conducting the training as was proposed. OSHA is therefore requiring the trainer name and is eliminating the

requirement for a signature. Also this will allow employers to keep training records on computer if they so desire.

Therefore, proposed paragraph (g)(3) has been retitled "Training documentation", and has been revised in the final rule to read as follows:

The employer shall document 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.

Section 304(c)(9) of the Clean Air Act Amendments mandated that this standard contain a provision requiring employers to "train and educate employees and contractors in emergency response in a manner as comprehensive and effective as that required by the regulation promulgated pursuant to section 126(d) of the Superfund Amendments and Reauthorization Act" (SARA). That section of SARA requires that workers receive a specified minimum number of hours of training unless the worker "has received the equivalent of such training."

It is the Agency's position that the training requirements contained in paragraph (g) of the final rule, together with the requirements pertaining to emergency planning and response contained in paragraph (n) of the final rule (particularly the training requirements mandated by § 1910.38(a)), provide "equivalent training" to the training required for emergency response under section 126(d) of SARA. In addition, those employees who would be involved in emergency response must meet the training requirements in § 1910.120, Hazardous Waste Operations and Emergency Response, referenced in paragraph (n) of this final rule, which is directly responsive to section 126(d) of SARA.

Contractors: Paragraph (h)

In this final rule, paragraph (h), contractors, attempts to distinguish between the many types of contract workers who may be present at a job site and indicates the type of contract worker that the special training provisions of the regulation are attempting to cover. Among the many categories of contract labor that may be present at a particular job site, it is important to appreciate the differences among them. For example, contractors may actually operate a facility for an owner (who may own the facility but have little to do with the daily operation). In this case the contractor is the employer responsible for the

covered processes and would obviously be treated as the "employer." Some contractors are hired to do a particular aspect of a job because they have a specialized area of expertise of which the host employer has little knowledge or skill (for example, asbestos removal). Other contractors work on site when the operation has need for increased manpower quickly for a short period of time, such as those involved in a turnaround operation. While paragraph (h)(2) sets forth the duties of the host employer to contract employers, the extent and the depth of these duties will depend to some degree on the category of contractor present. For example, should a contract employer provide employees to operate a process, then those employees would obviously have to be trained to the same extent as the directed hire employees "involved in operating a process" under paragraph (g) of the final standard.

Generally speaking, all OSHA standards cover all employees including contract employees. In something of a break with tradition, the process safety management rule has separate provisions covering the training of contract employees. This was done primarily for emphasis since contract employees make up a significant portion of some segment of industries covered by the final rule. This is not to say, however, that paragraph (h) is the only section of the process safety rule that applies to contractors. As already indicated, under appropriate circumstances, all of the provisions of the standard may apply to a contractor (i.e., a contractor operated facility). After all, employees of an independent contractor are still employees in the broadest sense of the word and they and their employers must not only follow the process safety management rule, but they must also take care that they do nothing to endanger the safety of those working nearby who work for another employer. Moreover, the fact that this rule has a separate section that specifically lays out the duty of contractors on the job site does not mean that other OSHA standards, lacking a similar section, do not apply to contract employees.

OSHA has a long history of enforcing OSHA standards on multi-employer worksites. Nothing in this rule changes the position that the Agency has long taken in cases such as *Anning-Johnson* (4 O.S.H. Cas. (BNA) 1193), *Harvey Workover, Inc.* (7 O.S.H. Cas. (BNA) 1687) and in its *Field Operations Manual* (CPL 2.45B CH-1, Chapter V-9). As a general matter each employer is responsible for the health and safety of

his/her own employees. However, under certain circumstances an employer may be cited for endangering the safety of another's employees. In determining who to hold responsible, OSHA will look at who created the hazard, who controlled the hazard and whether all reasonable means were taken to deal with the hazard.

OSHA proposed in paragraph (h)(1) that the employer inform contractors performing work on or near a process, of the known potential fire, explosion or toxic release hazards related to the contractor's work and the process; ensure that contractor employees are trained in the work practices necessary to safely perform their job; and inform contractors of any applicable safety rules of the facility. OSHA also proposed in paragraph (h)(2) that the employer explain to contractors the applicable provisions of the emergency action plan. The purpose of these proposed requirements was to assure that contractors are aware of both the hazards associated with the work being performed and the actions to be taken during emergencies. Finally, OSHA proposed paragraph (h)(3) that contract employers assure that their employees follow all applicable work practices and safety rules of the facility.

In Issue 7 in the proposal (55 FR at 29159), OSHA requested comments on the extent and adequacy of contractor training. OSHA also asked if the standard should require contractors to inform the plant employer of the hazards presented by the contractor's work, and whether the contractor should be required to inform the employer of any hazards found during the contractor's work.

OSHA received a significant number of comments regarding the proposed contractor provisions (e.g., Ex. 3: 2, 4, 8, 11, 12, 16A, 17, 20, 25, 26, 29, 30, 32, 33, 37, 38, 39, 41, 43, 44, 45, 48, 59, 62, 66, 69, 70, 72, 80, 81, 83, 91, 95, 96, 99, 101, 104, 106, 108, 109, 112, 113, 115, 119, 120, 122, 123, 124, 127, 129, 130, 134, 150, 151, 152, 155, 156; Ex. 91; Ex. 103; Ex. 115; Ex. 128; Ex. 131; Ex. 133; Ex. 134; Ex. 138; Ex. 146; Tr. 741, 1013-14, 1227, 1538, 2009, 2158, 2365, 2445, 2574, 2655, 2695, 3157, 3442, 3605, 3752). Participants generally supported the inclusion of contractor provisions in the final standard. The Department of Environmental Protection of the State of New Jersey (Ex. 3: 20, p. 3) observed:

Contractors should be informed about the potential hazards and risk related to the contracted work. Clear communication must take place between the facility and the contractor concerning safety rules, emergency action plan, scope of work and unforeseen hazards found.

Chevron Corporation (Ex. 3: 29, p. 10) remarked:

Chevron agrees it is appropriate to address contractors in this rule to the extent that the contractors' activities actually bear on process safety.

The Chemical Manufacturers Association (CMA, Ex. 3: 48, p. 15) stated:

CMA concurs with OSHA's decision to address contractor safety within the context of the proposed process safety management standard. Overall, CMA agrees with OSHA's approach * * *

The National Maintenance Agreements Policy Committee, Inc. (NMAPC, Ex. 3: 151, p. 2) remarked:

The NMAPC is in full support of OSHA's attempt to increase the level of safety for all workers at hazardous process facilities and to mitigate the potential for catastrophic accidents. There has been some discussion suggesting that outside contractors are of and by themselves a contributing factor to accidents in these facilities. Nothing could be further from the truth.

Unsafe conditions during maintenance operations are not caused by construction techniques, maintenance methods, tools or workers employed by contractors. What is needed is the assurance that proper training and communication is maintained between the owner and the maintenance contractor during maintenance operations.

Many participants criticized the proposed provisions, observing that they could be interpreted to mean that a plant employer would be responsible for training contractor employees, a responsibility they believed properly belongs to the contract employer (e.g., Ex. 3: 4, 8, 11, 16A, 17, 28, 30, 41, 48, 53, 59, 60, 62, 71, 87, 88, 91, 97, 101, 104, 113, 119, 120, 121, 127, 156, 161; Ex. 115; Ex. 127; Tr. 1597, 3510). The Santa Fe Pacific Pipeline, Inc. (Ex. 3: 124) observed that contractors in some cases are larger organizations than the employer and since an employer is paying a contractor as an expert, questioned how an employer could be expected to provide such training.

Other participants believed that the proposed contractor provisions were inadequate and urged OSHA to more thoroughly address contractors in the final standard (e.g., Ex. 3: 131; Tr. 1287, 1812, 2574, 3197, 3240). For example, the Food and Allied Service Trades Department of the AFL-CIO (Ex. 3: 25, p. 7) noted:

Unfortunately Paragraph (h) perpetuates the dual standard created between regular plant workers and contract employees by this proposed standard. The proposed training programs are far more complete than those for contract workers although both are working at the same worksite, encounter the same dangers and may even be performing

similar tasks. The reasons for the disparity in the training requirements are not immediately obvious to us and make little sense. We are unsure why OSHA has opted to establish one set of standards for some workers and a completely different set for others.

Organization Resources Counselors (ORC, Ex. 131, p. 4) stressed:

As discussed in our earlier comments and testimony, the issue of ensuring that contract personnel are adequately trained and supervised to safely perform work in and around highly hazardous chemical processes is an important one. It has become a highly controversial one as well. A number of commenters representing both labor and industry have questioned the adequacy of the language proposed by OSHA to deal with this issue.

ORC continues to recommend that the proposed standard's provisions for ensuring that contract personnel are adequately trained and supervised to safely conduct their work should be considerably strengthened. Also this section (paragraph (h)) should be organized to clearly delineate areas of site employer and contractor responsibility.

Many participants provided specific suggestions on how to revise the proposed provisions to improve, strengthen and clarify the language. Participants in addition to ORC suggested that the final rule should better delineate the duties and responsibilities of site employers who employ contractors and the duties and responsibilities of contractors who are providing specialized services at an employer's site (e.g., Ex. 3: 48, 106, 109; Ex. 128; Ex. 131; Tr. 2574, 3172, 3240, 3260, 3350, 3605).

On September 24, 1991, OSHA published a notice in the *Federal Register* announcing the availability of a report by the John Gray Institute on contractors and peer review of the report. The public was given an opportunity to comment and reexamine the contractor provisions of the proposed process safety management standard in light of the John Gray Report (56 FR 48133). (See preamble discussion in Part I, Background.) The comment period ended on October 24, 1991, and OSHA received 37 comments in response to the notice.

Generally commenters viewed some of the issues addressed in the John Gray Report (the Report) as important considerations (Ex. 154: 4, 5, 12, 16, 23, 24, 25, 28, 30). However, many commenters expressed their belief that the report should not be used as a basis in the development of the final contractor provisions in the final process safety management standard (e.g., Ex. 154: 4, 5, 7, 10, 12, 14, 15, 20, 23, 24, 30, 33, 34, 36, 37). Commenters

questioned the credibility of the Report's findings and recommendations and pointed to criticisms leveled at the report by its peer reviewers and the criticisms that resulted from the special evaluation of the final John Gray Report (Ex. 154: 3) conducted for The Business Roundtable by the University of Texas at Austin and Texas A&M University (e.g., Ex. 154: 4, 11, 14, 15, 18, 20, 22, 23, 24, 28, 30, 34, 36, 37, 38). The evaluation concluded (p. 2) that the John Gray Report's "conclusions are based on a highly problematic research design, research methodologies, data, analysis of data, and interpretation of results" and further observed (p.2) that the review teams (one from the University of Texas at Austin and one from Texas A&M University) "are unanimous in concluding that the JGI [John Gray Institute] report should be treated with extreme caution and should not be used as a basis for establishing national policy or industry standards."

Additionally, some commenters observed that the John Gray Report only dealt with the petrochemical industry and that OSHA should not use it to draw conclusions with regard to other industry segments covered by the process safety management standard (Ex. 154: 10, 14, 15).

OSHA has not used the final John Gray Report as a basis for requirements in the development of its final provisions concerning contractors. A review of the comments in the record indicates that significant other information and data is available on which the final contractor provisions can be based. While OSHA has decided not to use the Report as a basis for the final contractor provisions, OSHA believes that the final provisions have benefitted by the additional public input which reconfirms, clarifies and expands on comments and testimony previously received. OSHA believes the safety and health of all employees working in processes involving highly hazardous chemicals will benefit from a safer workforce and a safer workplace.

Despite concerns regarding the John Gray Report, several commenters noted that the Report did address some issues which they agreed with in principle; as a result these commenters suggested additional revisions to further strengthen the contractor provisions in the final standard (e.g., Ex. 154: 7, 13, 19, 20, 24, 25, 27, 36). The Associated Builders and Contractors (Ex. 154: 7, p. 1-2) asserted:

We urge OSHA to expand and strengthen Subparagraph (h) of the proposed rule to clearly assign responsibility to the plant manager and the contractor with respect to

the training and supervision of contract workers.

Subparagraph (h) should specifically state that the contractor is responsible for training and supervising its own employees to ensure that they perform their jobs safely and in accordance with the facility's safety rules. The standard should address safety in the selection of contractors, requiring facility owners to obtain and assess the safety performance records of contractors during a pre-bid, qualification round. Similarly, facility owners should conduct periodic reviews of contractors' safety records throughout the performance of the contract and verify contractors are fulfilling their responsibility to provide appropriate health, safety and craft training.

Safety is a shared responsibility. The facility owner hires the contractor for their expertise and contracts for supervisory personnel, as well as skilled tradesmen. The contractor has been selected for their ability to do the job correctly and safely which requires providing personnel with appropriate craft and safety training for each task. Consequently, the contractor is in the best position to train and supervise its own employees.

Communication between plant management and contractors is essential for a safe workplace. The facility owner must provide the contractor with sufficient information to enable the contractor to educate their employees about existing chemicals, potential hazards and site specific safety and health procedures. The contractor must provide its employees with site specific and task specific safety training. Owners may require the contractor to provide additional training on specified topics, and in some instances, may provide funding for the additional training. The facility owners should monitor the contractor's training of employees and audit the contractor's performance.

ABC supports expansion of Subparagraph (h) to incorporate the assignment of responsibility outlined above to improve health and safety practices and process management.

After carefully considering the record, OSHA believes that the expansion of the proposed contractor provisions is necessary and appropriate.

Accordingly, OSHA has been convinced by participants in the rulemaking to revise, reorganize, and add requirements to the final standard's provisions regarding contractors, final paragraph (h). Before discussing the final contractor provisions, OSHA would like to direct interested persons to final Appendix D, Sources of Further Information, which lists several sources of helpful assistance to employers who use contractors.

First, OSHA has added an application statement, paragraph (h)(1), to clarify which contractors are covered by the standard (e.g., Ex. 3: 28, 29, 33, 48, 62, 69, 70, 80, 95, 99, 106, 113, 130, 134, 151; Ex. 128; Ex. 154: 18, 19; Tr. 2774, 3260, 3350).

In the proposal, OSHA intended to cover those contractors whose work brings them into direct contact with, or whose work could affect the hazards of processes covered by the standard. OSHA believes that contractors providing incidental services are adequately covered under the 29 CFR 1910.1200, Hazard Communication standard. Therefore, the final contractor application provision better reflects OSHA's intent regarding which contractors will be covered by the final standard. This paragraph becomes final paragraph (h)(1) and reads as follows:

(h) *Contractors.* (1) *Application.* This paragraph applies to contractors performing operating duties, maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process area. 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.

At the request of some rulemaking participants (e.g., Ex. 3: 33, 48, 106, 109; Ex. 128; Ex. 131; Tr. 3172, 3240, 3350, 3605, 3731) who believed that the contractor provisions needed to be clarified and better organized in the final rule, OSHA has delineated the responsibilities of employers and contractors. OSHA believes that the delineation will provide clearer and better organized requirements. Accordingly, OSHA has added paragraph (h)(2), employer responsibilities, and paragraph (h)(3), contract employer responsibilities.

The final provisions concerning employer responsibilities read as follows:

(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 contractors 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 process areas covered by this section.

(v) The employer shall periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3).

(vi) The employer shall maintain a contract employee injury and illness log related to the contractor's work in process areas.

Paragraph (h)(2)(i) of the final standard, requires that an employer, when selecting a contractor, obtain and evaluate information regarding a contractor employer's safety performance and programs. Several commenters noted that this should be an important consideration on the part of an employer when hiring a contractor (e.g., Ex. 115; Ex. 128; Ex. 154: 4, 16A, 18, 19, 20, 23, 24, 25, 30, 31, 35, 36, 38; Tr. 831, 1263, 2034, 2696, 2761, 3525, 3760).

OSHA agrees with these remarks and believes that an employer should be fully informed about a contract employer's safety performance. Therefore the Agency is requiring an evaluation of a contract employer's safety performance (e.g., an employer's experience modification rate) and safety programs. OSHA believes that evaluating safety performance and programs is an important measure in preserving the integrity of processes involving highly hazardous chemicals. OSHA anticipates that the requirement will provide employers an opportunity to assure that they are not introducing additional hazards to their processes; and will give employers an opportunity to request that contract employers improve their safety performance or make other adjustments to their safety programs in order to enhance the safety of all employees working in processes involving highly hazardous chemicals. The final rule, being performance oriented, does not require that employers refrain from using contractors with less than perfect safety records. However, the employer does have the duty to evaluate the contract employer's safety record and safety programs. Where the evaluation indicates some gaps in the contract employer's approach to safety, the employer may need to be more vigilant in the oversight and may need to develop and implement more stringent safe work practices to control the presence of contractors in covered process areas (see (h)(2)(iv)).

Paragraphs (h)(2) (ii) and (iii) of the final standard were contained in the proposed standard. These provisions require the communication of basic process hazard and emergency information to contract employers and have been retained in the final rule.

Paragraph (h)(2)(iv) of the final standard references a new paragraph concerning safe work practices which was added to the final provisions concerning operating procedures (see discussion in paragraph (f), operating procedures). Organization Resources Counselors (ORC, Ex. 131, p.5) observed:

In the final rule * * * we also recommend that paragraph (h) [Contractors] * * *

contain a provision requiring the employer to develop a procedure for controlling access into covered facilities by contractor personnel. This provision cross-references the general requirements already contained in [the safe work practices in paragraph (f)].

ORC noted the objectives of these additional provisions were to insure that those persons operating high hazard processes are cognizant of any nonroutine work that is occurring and to insure that those in responsible control of the facility are also in control of nonroutine work. The Agency strongly agrees that these additional provisions are important in safely controlling activities in covered processes involving highly hazardous chemicals.

In paragraph (h)(2)(v) of the final standard, OSHA is requiring employers to periodically evaluate the performance of contract employers in fulfilling their obligations. Many participants recommended or followed this type of approach (e.g., Ex. 3: 53, 59, 71, 86; Ex. 115; Ex. 128; Ex. 131; Tr. 1624, 2010, 2442, 2714). ARCO Chemical Company (ACC, Ex. 3: 71, p. 23) stated:

ACC further recommends that OSHA require employers using contractors to verify that all contractor employers have been trained by contractor employers through new requirements * * * These new requirements should stipulate that contractor employers document training of their employees and provide a copy of that documentation to employers for each contractor employees assigned per the contract. This will facilitate a second new requirement for periodic performance assessment that should be placed on employers using contractors to use such documentation for verification purposes. Requiring that a contractor employer document training they provide also holds them accountable, a control measure absent from the proposed rule.

Finally, OSHA has added paragraph (h)(2)(vi) to the final rule which requires a log of injuries and illnesses to be kept by the employer. This was supported by a variety of commenters (e.g., Ex. 3: 39, 86, 106, 152; Ex. 154: 15, 19, 24, 36, 37, 38; Tr. 1227-28, 1283, 1812, 2783, 3319, 3350, 3524, 3617) and many claimed to be doing it already. For example, a participant from Brown and Root Industrial Services (Tr. 3617) responded to a question from an OSHA panel member as follows:

OSHA Panel Member: You would not be at all opposed to the concept of requiring the site employer to keep track of injuries and incidents on the worksite involving everybody on the worksite. Is that correct?
Response: I support that.

OSHA agrees that an employer should be informed of all of the injuries and illnesses occurring in processes involving highly hazardous chemicals at

the plant regardless of whether they be the employer's employees or the contractor's employees.

Paragraph (h)(3) of the final rule delineates the contract employer responsibilities and it includes the following provisions:

(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 all applicable work practices and 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 during the contract employer's work.

Paragraphs (h)(3) (i) and (ii) of the final standard were included in the proposal. These provisions require the communication of basic process hazard and emergency information to the contract employer to the contract employees. They have been retained in the final rule.

Paragraph (h)(3)(iii) of the final rule requires the contract employer to document that each contract employee has received and understood required training. Numerous commenters suggested that such a requirement (Ex. 3: 41, 48, 59, 113, 139, 152; Ex. 128; Ex. 154: 15, 16A, 17, 18, 24, 25, 30, 31, 35, 37, 38, Tr. 1620) is necessary to help ascertain that employees have been properly trained.

The requirements in paragraph (h)(3)(iv) of the final standard were also contained in the proposal except for the addition of the requirement pertaining to safe work practices discussed above. It is vitally important that contract employers assure that their employees follow the rules of the facility.

Paragraph (h)(3)(v) was added to the final rule as a result of the request for information in the proposal (55 FR at 29159). OSHA asked if the standard should require contract employers to inform the plant employer of the hazards presented by the contractor's work, and

whether the contractor should be required to inform the employer of any hazards found during the contractor's work. Participants supported the inclusion of this requirement (Ex. 3: 28, 41, 48, 53, 70, 71, 97, 106, 112, 113, 115, 120, 123, 146; Ex. 115; Ex. 127; Ex. 128; Tr. 1597, 2010, 2656, 3263, 3450).

Finally, the section 304 requirements of the Clean Air Act Amendments (CAAA) state that the OSHA standard must require employers to:

(8) Ensure contractors and contract employees are provided appropriate information and training.

(9) Train and educate employees and contractors in emergency response in a manner as comprehensive and effective as that required by the regulation promulgated pursuant to section 126(d) of the Superfund Amendments and Reauthorization Act.

OSHA believes that the contractor provisions contained in the final standard meet the requirements contained in section 304(c) (8) and (9) of the CAAA in a manner as comprehensive and effective as that required by the regulation promulgated pursuant to section 126(d) of the Superfund Amendments and Reauthorization Act for the reasons described in the preamble discussion regarding section 126(d) of the Superfund Amendments in paragraph (g). Training.

Pre-startup Safety Review: Paragraph (i)

Proposed paragraph (i)(1) required the employee to perform a pre-startup safety review for new facilities and for modified facilities when the modification necessitated a change to the process safety information. The purpose of this proposed requirement was to make sure that certain important considerations had been addressed before any highly hazardous chemical was introduced into a process.

Rulemaking participants (e.g., Ex. 3: 17, 26, 59, 62, 128) agreed with the importance of performing a pre-startup safety review to assure that adequate safety measures are in place and are operational. However, a few commenters (e.g., Ex. 3: 45, 71) did not believe it was necessary to require a pre-startup safety review for all modified facilities, particularly when the modifications were minor. These commenters suggested adding the word "significant" to this provision to describe the degree of modification that would necessitate a pre-startup safety review.

It was not the intent of OSHA to require a pre-startup safety review for each facility that may be modified slightly. OSHA believes that a pre-startup safety review is necessary for

modified facilities only when the modification is significant enough to require a change in the process safety information. The Agency has made minor editorial changes to this provision in the final rule to clarify its intent.

Proposed paragraph (i)(1) has been revised to read as follows:

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.

Paragraph (i)(2) of the proposal required that the pre-startup safety review confirm that construction was in accordance with design specifications, ((i)(2)(i)); safety, operating, maintenance, and emergency procedures were in place and were adequate ((i)(2)(ii)); process hazard analysis recommendations had been addressed and actions necessary for startup had been completed ((i)(2)(iii)); and, operating procedures were in place and training of each operating employee had been completed ((i)(2)(iv)).

OSHA did not receive any negative comments with respect to proposed paragraphs (i)(2)(i) and (i)(2)(ii). Therefore, these two provisions of the final rule remain the same as that which was proposed.

A few commenters (e.g., Ex. 3: 48, 71; Tr. 1933-35) believed that paragraph (i)(2)(iii) of the proposal was unclear and asked whether it implied that a process hazard analysis was required before startup for both new facilities and modified facilities. This was not the intent of OSHA. OSHA wants to assure that a process hazard analysis is performed for new facilities before startup, and that recommendations resulting from the process hazard analysis have been addressed before startup. The Agency believes that any actions necessary before startup in modified facilities will be addressed by the requirements contained in paragraph (1) of this section pertaining to management of change. Therefore, OSHA has revised paragraph (i)(2)(iii) of the final rule to clarify its intent.

Other commenters (e.g., Ex. 3: 71, 87) asserted that it is not necessary that all recommendations resulting from a process hazard analysis be implemented before startup. OSHA agrees with these commenters. Certainly, all of the recommendations resulting from a process hazard analysis need to be addressed or resolved, but it may not be necessary in every case to complete all of the recommendations prior to startup.

Accordingly, proposed paragraph (i)(2)(iii) has been revised in the final rule to read as follows:

For new facilities, a process hazard analysis is performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change, paragraph (1).

In proposed paragraph (i)(2)(iv) OSHA required that operating procedures be in place prior to the introduction of a highly hazardous chemical to a process. Several commenters (e.g., Ex. 3: 53, 64, 71) noted that proposed paragraph (i)(2)(ii) also required that operating procedures be in place prior to the introduction of a highly hazardous chemical to a process. OSHA agrees that paragraph (i)(2)(ii) of the final rule already requires operating procedures to be in place and, therefore, the redundant reference to operating procedures has not been retained in paragraph (i)(2)(iv) of the final rule.

Mechanical Integrity: Paragraph (j)

Proposed paragraph (j) contained requirements for maintaining the mechanical integrity of process equipment in order to assure that such equipment is designed, installed, and operates properly.

Paragraph (j)(1) of the proposal specified certain process equipment to which the requirements of this paragraph would apply. This equipment included pressure vessels and storage tanks; piping systems (including piping components such as valves); relief and vent systems and devices; emergency shutdown systems; and controls, alarms, and interlocks. The Agency believed that any of this equipment could have a significant impact on the safety of a process that is covered by this standard if the equipment was improperly designed or installed or, if such equipment did not function as intended.

In the proposal OSHA specifically requested information and comments on whether the equipment listed in proposed paragraph (j) included equipment that does not impact the safety of a process, or whether additional equipment should be listed and covered by paragraph (j) (55 FR at 29159).

Several rulemaking participants (e.g., Ex. 3: 39, 41, 53, 71, 76; Ex. 127; Tr. 316, 1023, 1539, 1812) suggested that the Agency define the term "critical," and add this term to describe the process equipment that is to be covered by this paragraph. Some of these rulemaking participants also believed that the employer should be permitted to determine what process equipment should be identified as "critical." For example, a commenter from Chevron Corporation (Ex. 3: 26A, p.12) stated:

The basic intent of the mechanical integrity provision in the proposed rule is to ensure that highly hazardous chemicals are contained within the process and not released in an uncontrolled manner. To achieve this intent, Chevron believes OSHA should use performance language and require the employer to develop and maintain a list of equipment that the employer has determined to be critical to process safety. This equipment would be subject to the provisions of paragraph (j).

A commenter from the Chemical Manufacturers Association (CMA, Ex. 3: 48, p. 17) asserted:

Since all process equipment within a plant is not necessarily associated with Appendix A materials or flammable liquids or gases, CMA believes that section (j) should only apply to "Critical Equipment". CMA recommends that section (j) and a definition for critical equipment be reworked to ensure that this section pertains only to "Critical Equipment".

Rather than specify types of equipment as is in (j)(1), OSHA should use a performance oriented approach and require the employer to develop and maintain a list of equipment that has been determined to be critical to process safety. This equipment would be subject to the provisions of paragraph (j).

A hearing participant from the Gas Processors Association (GPA, Tr. 1539) testified:

GPA recommends that companies be required to define critical equipment at each facility and maintain a current list. GPA does not believe a generic list can be appropriate for all facilities.

Additionally, a commenter from the Chlorine Institute (Ex. 3: 113, p.3) added:

Instead of listing non specific equipment as is done in paragraph (j), the rule should require that the employer determine which process equipment is critical to prevention of a catastrophic release.

Other rulemaking participants (e.g., Ex. 3: 45, 51, 64, 96) agreed with the approach that the Agency proposed. For example, a commenter from the American Paper Institute (Ex. 3: 45, p.19) stated:

The list of equipment subject to the mechanical integrity requirements seems appropriate, except API believes that OSHA should add pumps to the list of process equipment.

A commenter from the Northwest Pipeline Corporation (Ex. 3: 96, p.4) said:

The equipment listed in paragraph (j) impacts the safety of a process and is adequate with respect to process safety at Northwest's facilities that would fall within the scope of the proposed standard.

Another commenter, who is from the Occidental Chemical Corporation (Ex. 3: 70-A, p.8), remarked:

"Critical" process equipment will vary from process to process. The generic listing in section (j) seems to be complete.

OSHA agrees with those rulemaking participants who believe that the goal of the mechanical integrity provisions is to ensure that highly hazardous chemicals covered by the standard are contained within the process and not released in an uncontrolled manner. The equipment OSHA has listed in proposed paragraph (j)(1) constitutes process equipment that the Agency considers critical in achieving this goal.

OSHA also agrees with those rulemaking participants who stated that process equipment will vary from process to process. This is the reason that the Agency did not propose that the employer determine the equipment "critical" to the process. Equipment considered critical to a process by one employer may not necessarily be considered critical to a different process by another employer. As a result, there could be confusion with respect to which equipment is subject to the requirements contained in paragraph (j).

The Agency believes that there is certain equipment, critical to process safety, that is common to all processes. This is the equipment specified in proposed paragraph (j)(1). It is the position of OSHA that at least the equipment specified in proposed paragraph (j)(1) must be subject to the requirements contained in paragraph (j). However, if an employer deems additional equipment to be critical to a particular process, that employer should consider that equipment to be covered by this paragraph and treat it accordingly.

OSHA also concurs with those rulemaking participants who said that all process equipment within a plant is not necessarily associated with appendix A materials or flammable liquids or gases. Paragraph (j)(1) is intended to cover only that equipment associated with a process that is covered by this standard.

After careful evaluation of the information contained in the record, OSHA believes that it is appropriate for the mechanical integrity requirements in paragraph (j) to apply to the equipment listed in proposed paragraph (j)(1). OSHA is accepting the recommendation of the American Paper Institute (Ex. 3: 45) and the United Steelworkers of America (Tr. 2512) that pumps be added to the list since OSHA agrees that pumps in a covered process could also significantly impact the safety of a process.

Accordingly, Paragraph (j)(1) of the final rule remains the same as that which was proposed except pumps

(paragraph (j)(1)(vi) of the final rule) have been added to the list of process equipment that must meet the mechanical integrity requirements contained in paragraph (j).

Paragraph (j)(2) of the proposal pertained to written procedures with respect to mechanical integrity. Proposed paragraph (j)(2)(i), required the employer to establish and implement written procedures to maintain the on-going integrity of listed process equipment. The purpose of this proposed provision was to require a written program that would assure that process equipment receives careful, appropriate, regularly scheduled maintenance to assure its continued safe operation.

The Agency did not receive any comments on this proposed provision and it is contained in the final rule as proposed. However, this provision has been redesignated as paragraph (j)(2) in the final rule instead of paragraph (j)(2)(i), because (as discussed below) the subsequent proposed paragraph concerning training of maintenance employees will be redesignated in the final rule.

Paragraph (j)(2)(ii) of the proposal required the employer to assure that each employee involved in maintaining the on-going integrity of process equipment be trained in the procedures applicable to the employee's job tasks. Several rulemaking participants (e.g., Ex. 3: 17, 33; Tr. 313, 389) were concerned that there might be some confusion with respect to the training requirements contained in paragraph (g), which apply to employees who are involved in operating a process, and the training requirements contained in this provision, which apply to maintenance employees. It was suggested that all training requirements be contained in paragraph (g) or, alternatively, that the Agency clarify that there are separate training requirements for maintenance employees. Other rulemaking participants (e.g., Ex. 3: 17, 53, 71; Tr. 313, 389) suggested that, because of its importance, the training requirement for maintenance employees should be separated from proposed paragraph (j)(2) and given its own heading. For example, a commenter from Organization Resources Counselors, Inc. (Ex. 3: 53, p.14) stated:

Training is an important issue which warrants special attention. Such attention might be better focused if the requirements in (j)(2)(ii) were separated from the current paragraph (j)(2), identified as (j)(3), and given their own heading * * *

OSHA believes that this is an excellent suggestion because it will focus more attention on the importance

of training of persons involved in maintaining equipment and will better distinguish these training requirements from those contained in paragraph (g).

The Agency was also concerned that there might be some confusion between the training requirements in this mechanical integrity provision, and the training requirements contained in paragraph (g). It is the Agency's position that maintenance employees need not be trained in process operating procedures to the same extent as those employees who are actually involved in operating the process.

However, OSHA believes that maintenance employees must receive on-going training in an overview of the process and its hazards and training in the procedures applicable to their job tasks to assure that they can perform their tasks in a safe manner. Without continual attention to training needs due to process changes and other changes, little assurance will exist that maintenance employees will perform their tasks safely.

OSHA believes that assigning this paragraph its own heading will focus more attention on the training requirements contained in this provision, and will help to clarify the distinction between the training requirements pertinent to mechanical integrity and the training requirements pertinent to employees involved in operating a process.

The Agency also believes that it is necessary to revise this proposed paragraph to better describe its intent regarding the training of maintenance employees.

Consequently, this proposed provision has been redesignated as paragraph (j)(3), assigned the title of "Training for process maintenance activities", and has been revised to read as follows:

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.

Paragraph (j)(3)(i) of the proposal required inspections and tests to be performed on specified process equipment because of the potential safety and health hazards that could result if the equipment malfunctioned.

The Agency did not receive any comments on this particular provision, and it is contained in the final rule as proposed. However, it has been redesignated as (j)(4)(i) in the final rule instead of (j)(3)(i) as proposed.

In an effort to assure that inspections and tests are performed properly, proposed paragraph (j)(3)(ii) required

that inspection and test procedures follow applicable codes and standards. Paragraph (j)(3)(ii) also contained examples of codes and standards that an employer could use to comply with this proposed provision.

Many rulemaking participants disagreed with this proposed provision (e.g., Ex. 3: 12, 53, 64, 87, 97, 121; Tr. 722-23, 796-97, 2177). Some commenters were concerned that the Agency would incorporate by reference all of the codes applicable to testing and inspection such as those published by the National Fire Protection Association (NFPA), the American Society for Testing and Materials (ASTM), the American National Standards Institute (ANSI), etc. These commenters asserted that it would be difficult for an employer to obtain all such standards and decide which standards the Agency intended for them to use. They also stated that some of the standards may conflict with each other.

Other commenters were concerned that some of the standards may be outdated and no longer applicable to their process equipment. As a result, many of these commenters suggested that the employer be permitted to use their own internal standards, or that inspection and testing procedures follow recognized and generally accepted good engineering practices. For example, a commenter from the ARCO Chemical Company (ACC, Ex. 3: 71, p.26) remarked:

Subparagraphs (j)(3)(i) and (j)(3)(ii) require equipment testing and inspection per "applicable" codes and standards "where they exist." Since some of these standards may be outdated and no longer represent a consensus of "good engineering practices", OSHA should provide employers the option of using internal engineering standards and practices, or practices recommended by equipment manufacturers.

Further, as stated previously in ACC comments, such standards and guidelines often represent the minimum (least common denominator) agreed to by the participants in the organization specifying the performance requirements. Consequently, OSHA should also allow employers the option of using more demanding internal standards as the source of primary requirements.

A commenter from MARS Incorporated (Ex. 3: 87, p.2) added:

A second overall concern is our strong objection to what appears to be an attempt to incorporate by reference into the Standard—binding legal requirements—all relevant codes and standards issued by the American Society of Mechanical Engineers, the American National Standards Institute, the American Society of Testing and Materials and the National Fire Protection Association.

A commenter from Union Carbide (Ex. 3: 112, p.21) stated:

These sections, which pertain to compliance with applicable codes and standards for equipment testing and inspection, are very restrictive.

We suggest that this section be modified to provide employers the latitude to use internal engineering standards and practices and standards and practices recommended by equipment manufacturers, for compliance with this section.

Additionally, a commenter from the American Iron and Steel Institute (Ex. 3: 161, p.22) said:

Paragraph (j)(3) is unclear. It should be revised to specify that inspections and tests shall be performed on process equipment "in accordance with applicable codes, standards, or recognized and generally accepted engineering practice."

The codes and standards contained in proposed paragraph (j)(3)(ii) were examples of what the employer could use for inspection and testing of process equipment. The Agency did not intend to incorporate by reference into the standard all of the codes and standards published by these consensus groups. As noted above, the purpose of this proposed provision is to make sure that process equipment is inspected and tested properly, and that the inspections and tests are performed in accordance with appropriate codes and standards. The phrase suggested by rulemaking participants: "recognized and generally accepted good engineering practices" is consistent with OSHA's intent. The Agency also believes that this recommended phrase would include appropriate internal standards of a facility, as well as codes and standards published by NFPA, ASTM, ANSI, NFPA, etc.

Accordingly, proposed paragraph (j)(3)(ii) has been redesignated as paragraph (j)(4)(ii) in the final rule, and has been revised to read as follows:

Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.

Paragraph (j)(3)(iii) of the proposal required the frequency of inspections and tests to be consistent with applicable codes and standards; or, more frequently if determined necessary by prior operating experience. This proposed provision was a performance-oriented requirement that would provide flexibility for the employer to choose the frequency which would provide the best assurance of equipment integrity.

Several rulemaking participants (e.g., Ex. 3: 12, 53, 97, 161) suggested that if this provision is to be truly performance-oriented, employers should have the flexibility to follow internal standards and manufacturers' recommendations as well as applicable codes and standards.

OSHA agrees with these rulemaking participants. Since the phrase "recognized and generally accepted good engineering practices" would include both appropriate internal standards and applicable codes and standards, the Agency has decided to use this phrase in this provision of the final rule.

Accordingly, proposed paragraph (j)(3)(iii) has been redesignated as paragraph (j)(4)(iii) in the final rule, and has been revised to read as follows:

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.

Proposed paragraph (j)(3)(iv) required the employer to have a certification record that each inspection and test had been performed in accordance with paragraph (j). It also required that the certification identify the date of the inspection; the name of the person who performed the inspection and test; and the serial number or other identifier of the equipment.

Several rulemaking participants (e.g., Ex. 3: 33, 39, 71, 101) disagreed with the use of the term "certification" because they believed that the term "certification" could be misinterpreted to mean an assurance by a third party. These rulemaking participants suggested that "documentation" would be a better term. For example, a commenter from Monsanto (Ex. 3: 64, p. 9) stated:

In paragraph (j)(3)(iv), Monsanto recommends that the requirement for certification be deleted. The tests and inspections should be documented but certification, which implies a signature, should not be required. Electronic storage of the documentation is necessary and certification prohibits that or requires parallel hard copy be maintained in the files which is unnecessary.

A commenter from IMCERA (Ex. 3: 158, p. 8) remarked:

IMCERA feels that the word "certification" should be replaced with "documentation." . . . Certification is commonly used in connection with validation by an outside professional body. We believe that the word "documentation" would better serve in this statement and avoid unnecessary confusion.

OSHA agrees that the word "documentation" (or "document") is descriptive of the Agency's intention with respect to this information.

Additionally, since OSHA is permitting inspection and test procedures to follow recognized and generally accepted good engineering practices, the Agency believes that different information than that proposed should be included in the record to

identify the inspections and tests that were performed, and the results of those tests and inspections.

Therefore, proposed paragraph (j)(3)(iv) has been redesignated as paragraph (j)(4)(iv) in the final rule, and has been revised to read as follows:

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; the inspection or test that is performed; and, the results of the inspection or test.

Proposed paragraph (j)(4) required the employer to correct deficiencies in equipment which are outside acceptable limits before further use. OSHA received some excellent comments on this proposed provision. While most rulemaking participants agreed with the concept that equipment deficiencies must be corrected, several commenters (e.g., Ex. 3: 23, 39, 53, 64, 161) disagreed that the deficiencies must be corrected "before further use." It was contended that the phrase "before further use" would mean that the process would have to be shutdown, and that shutdown has its own inherent hazards. It was suggested that equipment operating beyond acceptable limits does not *always* create a serious hazard. Participants asserted that deficiencies might need to be corrected promptly, or in a time and manner to assure safe operation instead. As an example, a commenter from Allied Signal (Ex. 3: 17, p. 13) said:

We recommend that the words "before further use" be deleted from paragraph (j)(4), and that the paragraph be rewritten to read:

"The employer shall promptly correct deficiencies in equipment which are outside acceptable limits." The rationale for this change is that it is not always possible to correct a deficiency before further use, particularly with continuous process units. Moreover, immediate or rushed shut-downs can introduce risks that could otherwise be avoided.

A commenter from the Chevron Corporation (Ex. 3: 26, p. 12) remarked:

Under (j)(4) the OSHA-proposed language seems to require that when deficiencies are found, the process must be shut down before further use. But not all deficiencies result in an unsafe condition. Chevron therefore recommends the following for (j)(4):

"The employer shall correct deficiencies in critical equipment which are outside acceptable limits, before further use or in a time and manner to ensure safe operation."

Another commenter, who was from the ARCO Chemical Company (ACC, Ex. 3: 71, p. 26-27), stated:

ACC recommends that OSHA revise the (text) . . . to read as follows:

"The employer shall promptly correct deficiencies in critical equipment so that critical equipment is within safe and acceptable limits, which are included in the process safety information required by paragraph (d)".

This language would tie this section into the requirements of subparagraph (d)(3) which pertains to information covering the critical equipment in a process subject to the proposed rule.

This language has also substituted the word "promptly" for the phrase "before further use". This change is suggested to allow employers the decision-making responsibility for determining whether to continue to operate, to shut down, to isolate equipment, etc. Immediate actions can introduce increased process risks that could otherwise be avoided.

Additionally, a commenter from the AMOCO Corporation (Ex. 3: 95, p. 8) stated:

In refining processes, there are occasionally instances when a piece of equipment exceeds what is deemed "acceptable", and interim measures are taken to bring the equipment back into conformance with safe operating parameters. Under (j)(4) it would be mandatory to immediately shut down the entire process upon discovery of such a situation. Shutdowns and startups are inherently dangerous operations which we try to avoid unless absolutely necessary. In addition, the life expectancy of certain components is directly affected by the number of cycles to which they are subjected. We feel that safety is promoted rather than diminished by keeping shutdowns to a minimum. We therefore propose that the phrase "before further use" be replaced with "in a safe and timely manner".

The purpose of this proposed requirement was to require equipment deficiencies to be corrected promptly if the equipment was outside the acceptable limits specified in the process safety information. The comments have convinced OSHA that there may be many situations where it may not be necessary that the deficiencies be corrected "before further use" as long as the deficiencies are corrected in a safe and timely manner when necessary means are taken to assure safe operation.

Consequently, proposed paragraph (j)(4) has been redesignated as paragraph (j)(5) in the final rule, and has been revised to read as follows:

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

Paragraph (j)(5) of the proposal pertained to quality assurance of mechanical equipment. Proposed paragraph (j)(5)(i) required the employer to assure that equipment as fabricated meets design specifications. Some rulemaking participants (e.g., Ex. 3: 53, 59, 71; Tr. 1124) suggested that this proposed paragraph be clarified as it relates to the construction of new plants and equipment. The Agency agrees with these rulemaking participants since this was the actual intent of this proposed provision.

Another commenter (Ex. 3: 28) asserted that employers cannot be held accountable for the design specifications of the original equipment manufacturer, and suggested that the phrase, "meets design specifications" be replaced with the phrase, "is suitable for the process application." The Agency believes that the suggested change better describes the purpose of this proposed provision.

Accordingly, proposed paragraph (j)(5)(i) has been redesignated as paragraph (j)(6)(i) in the final rule, and has been revised to read as follows:

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 it will be used.

Proposed paragraph (j)(5)(ii) required appropriate checks and inspections to be performed as necessary to assure that equipment is installed properly and consistent with design specifications and manufacturer's instructions. The Agency did not receive any negative comments on this proposed provision and it is contained in the final rule unchanged. However, it has been redesignated as paragraph (j)(6)(ii) in the final rule.

Proposed paragraph (j)(5)(iii) required the employer to assure that maintenance materials, and spare parts and equipment, meet design specifications. Some commenters (e.g., Ex. 3: 28, 127, 158) expressed concerns with the phrase, "meet design specifications" similar to the concerns discussed above regarding paragraph (j)(6)(i) of the final rule. To clarify the Agency's intent and in order to be consistent with paragraph (j)(6)(i) of the final rule, the proposed paragraph, which becomes final paragraph (j)(6)(iii), has been revised to read as follows:

The employer shall assure that maintenance materials, and spare parts and equipment are suitable for the process application for which they will be used.

Hot Work Permit: Paragraph (k)

In proposed paragraph (k)(1), OSHA required the employer to issue a permit

for all hot work operations. The purpose of this proposed provision was to assure that the employer was aware of the hot work being performed, and that appropriate safety precautions had been taken prior to beginning the work.

The Agency did propose certain exceptions to this provision which included the following: Where the employer or the employer's representative, designated as responsible for authorizing hot work operations, is present while the hot work is being performed; and in welding shops authorized by the employer.

While a few rulemaking participants agreed with the Agency's approach (e.g., Ex. 3: 62, 152), many rulemaking participants (e.g., Ex. 3: 38, 53, 59, 71, 121, 153; Tr. 312-13) opposed the exceptions to this proposed provision. For example, a commenter from the Food and Allied Service Trades, AFL-CIO (Ex. 3: 25, p. 9) stated:

The first exception would forego the issuance of a permit if the employer or employer's representative is present during the work. We feel that this exception is unfounded and should be deleted from the rule.

Permits are required as a means of requiring employers to reexamine any and all processes for potential dangers. We feel that this analysis should take place for all hot work that may be necessary.

A commenter from Hoechst Celanese (Ex. 3: 76, p.3) said:

The exception to hot work permits provided for in paragraph (k)(1) is not appropriate. Strict adherence to established hazardous work permitting procedures must be maintained to assure safe work activity.

Another commenter, who was from MARS Incorporated (Ex. 3: 87, p.15), remarked:

The proposed standard requires that a hot work permit be required except where the person responsible for the permit is present. We are opposed to such an exemption and to any system that authorizes "general" hot work permits. The purpose of the permit system is not only to assure that the appropriate personnel are notified of the work. It is also to remind the person performing the work of the steps necessary to perform the job safely. Merely having the authorizing person present does not assure that all the proper steps are followed. The only way to do this is to require a permit which follows a systematic approach to granting the authority to do the work.

The second exception given is for hot work in welding shops. Unless the welding shop is located in the process area, it is not clear that such a location would be covered by the proposed Standard.

A hearing participant from Organization Resources Counselors, Inc. (ORC, Tr. 312-13) testified:

In the proposal, OSHA has addressed the issue of hot work, but ORC strongly disagrees with the proposal to exempt from hot work permitting procedures those cases where "the employer or his representative designated as responsible for authorizing hot work operations is present while the work is being performed."

Hot work permits and procedures should be followed regardless of who is present. Consistent use of effective safety procedures is an important step in preventing incidents which can result in catastrophic releases, fires, and explosions.

Additionally, a commenter from Vulcan Chemicals (Ex. 3: 101A, p.4) stated:

Vulcan Chemicals disagrees with the exceptions for performing hot work in paragraph (k). There should not be an exception to the hot work requirements because of the presence of an individual authorizing the work.

OSHA agrees with the commenters that the permit reminds the person performing the work of the steps necessary to perform the work safely; and if the hot work is performed on or near a covered process, then a permit should be required regardless of who is present. Additionally, this proposed provision would not require a permit for hot work operations in a welding shop unless the welding shop was located in a process area covered by the standard. OSHA believes that such a location would not exist. Consequently, the Agency has concluded that the proposed exceptions to this hot work provision are not appropriate, and the exceptions have not been retained in the final rule.

Therefore, paragraph (k)(1) of the final rule has been revised to read as follows:

The employer shall issue a hot work permit for hot work operations conducted on or near a covered process.

Proposed paragraph (k)(2) required the permit to certify that the fire prevention and protection requirements contained in 29 CFR 1910.252(a) had been implemented prior to beginning the hot work operations; indicate the date authorized for the hot work; and identify the equipment or facility on which the hot work was to be performed. It also required the permit to be kept on file until completion of the hot work.

Most rulemaking participants supported this proposed provision. However, one commenter (Ex. 3: 53) suggested that the Agency not address the contents of the permit. The Agency disagrees with this suggestion because it believes that it is important that employers are informed of what the Agency expects the permit to contain.

Another commenter (Ex. 3: 158) suggested that the word "certify" be

replaced with the word "document." The Agency is accepting this suggestion because it believes that the word "document" is descriptive of the intent of this proposed provision and is consistent with other changes made elsewhere in the final rule.

Accordingly, paragraph (k)(2) of the final rule remains the same as that which was proposed except for minor editorial changes which were made to clarify the intent of the requirement.

Management of Change: Paragraph (1)

OSHA believes that one of the most important and necessary aspects of a process safety management program is appropriately managing changes to the process. This is because many of the incidents that the Agency has reviewed resulted from some type of change to the process (e.g., the Flixborough incident).

Proposed paragraph (1) addresses management of change. While the Agency received some excellent suggestions concerning minor changes to improve this proposed provision, there was wide support for including a provision concerning the management of change in the final rule (e.g., Ex. 3: 41, 48, 62, 69, 71, 95, 101).

OSHA believes that it is necessary to thoroughly evaluate any contemplated changes to a process to assess the potential impact on the safety and health of employees and to determine what modifications to operating procedures may be necessary.

Proposed paragraph (1)(1) required the employer to establish and implement written procedures to manage changes (except for "replacement in kind") to process chemicals, technology, and equipment; and changes to facilities.

A few rulemaking participants suggested that the Agency define the term, "replacement in kind." For example, a commenter from Johnson Wax (Ex. 3: 12, p.22) remarked:

Under this rule, "replacements in kind" were exempted from the management of change requirements. While this term was offset by quotations to denote a specific definition, there was no definition in the rule itself.

Since OSHA apparently has a specific situation in mind for using this term, it should be explainable. If this is the case, we suggest that OSHA define this term in this part.

A commenter from the EXXON Company, U.S.A., (EUSA, Ex. 3: 39, p.4) stated:

[Subparagraph (1)(1) excludes "replacement in kind" from requirements of that paragraph. This term needs to be defined to avoid misunderstandings, e.g., it does not mean replacement with the same brand and model number. EUSA recommends:

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

OSHA agrees that this term should be defined and has included a definition for "replacement in kind" in paragraph (b) of the final rule.

Another commenter, who was from Air Products and Chemicals (Ex. 3: 84, p.3), said:

In Section (1) "Management of Change", the definition in subparagraph (1) is directed to physical changes only. It should be broadened to include changes in procedures. If a modification to the operating procedure is being recommended, it should undergo the same scrutiny as a piping change or other physical change.

The Agency agrees with this suggestion. OSHA believed that this intent was addressed in proposed paragraph (1)(2)(iii) and (1)(5). However, in order to resolve any ambiguity, the Agency is adding the word "procedures" to paragraph (1)(1) of the final rule.

Other rulemaking participants recommended that the phrase "changes to facilities" be replaced by the phrase "changes to facilities that affect a process." For example, a commenter from Amoco Corporation (Ex. 3: 95, p.8) stated:

Amoco endorses the management of change provisions at paragraph (1), with the provision that under (1)(1) " " " changes to facilities" be limited to " " " changes to facilities which affect a process", in order to exclude incidental changes which have no bearing on safety.

A commenter from the American Iron and Steel Institute (Ex. 3: 161, p.23) remarked:

Subsection (1) should be modified to make clear that it applies only to those changes which may affect process safety. For example, as currently defined, "facility" means the "buildings, containers, or equipment which contain a process". In the steel industry, the building containing a process may be quite large, and many changes could conceivably be made to the structure itself which would have no impact on the safety of the process contained within the building. We do not understand OSHA to intend that such a change would be subject to the requirements of subsection (1). This point should be made clear in the final rule.

Again, it was the intent of the Agency that the phrase "changes to facilities" would mean only those facilities that would have an impact on a process covered by the proposed standard. To clarify its intent, the Agency has revised paragraph (1)(1) of the final rule to read, "changes to facilities that affect a covered process."

Consequently, proposed paragraph (1)(1) has been revised in the final rule to read as follows:

The employer shall establish and implement written procedures to manage changes (except for "replacement in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.

Proposed paragraph (1)(2) contained several considerations that must be addressed prior to any change. OSHA did not receive any comments with respect to this proposed provision and it is contained in the final rule as proposed, except for a minor editorial change.

Proposed paragraph (1)(3) required that employees involved in the process be informed of and trained in the change in the process as early as practicable prior to its implementation. Some rulemaking participants (e.g., Ex. 3: 26, 69, 91, 101, 121) suggested that this proposed provision be revised to clarify that the Agency intended the phrase "employees involved in the process" to mean only operating employees. They asserted that this change would make it clear that the proposed provision did not apply to maintenance or contract workers. These commenters misinterpreted the Agency's intent. OSHA believes that all employees whose job tasks will be impacted by a change must be informed of and trained in those changes with respect to what affect such changes will have on their job tasks. Otherwise, contract employees or maintenance employees who are unaware of the change, may unwittingly cause an incident by doing their job tasks as they have in the past. OSHA believes this training requirement to be important for maintenance and contract employees as well as those employees involved in operating a process.

The Agency has revised this provision in the final rule to clarify that this information and training provision applies to operating employees as well as to maintenance and contract employees whose job tasks will be affected by the change.

Other rulemaking participants (e.g., Ex. 3: 26, 56, 59; Tr. 2015) recommended that the phrase "prior to its implementation" be changed to "prior to start-up" to eliminate a possible misinterpretation of meaning before the change is made. OSHA agrees that the requirements contained in this provision must be completed before start-up and not necessarily before implementation of the change.

Accordingly, proposed paragraph (1)(3) has been revised in the final rule to read as follows:

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 the affected part of the process.

Paragraph (1)(4) of the proposal required that if a change covered by this paragraph results in a change to the process safety information, that such information be appended and/or updated in accordance with paragraph (d) of this section. The Agency did not receive any comments on this proposed provision. It is, therefore, contained in the final rule as proposed, except for minor editorial changes that were made to eliminate unnecessary words.

Proposed paragraph (1)(5) required that if a change covered by this paragraph results in a change to the operating procedures, such procedures shall be appended and/or updated in accordance with paragraph (f) of this section. Again OSHA did not receive any comments on this proposed provision and it is contained in the final rule as proposed except for minor editorial changes that were made to eliminate unnecessary words.

Incident Investigation: Paragraph (m)

OSHA included requirements for incident investigation in the proposal because a crucial part of any process safety management program is the thorough investigation of any incident that resulted in, or could reasonably have resulted in a catastrophic release of a highly hazardous chemical in the workplace. Such investigations are extremely important for identifying the chain of events leading to the incident and for determining causal factors. Information resulting from the investigation will be invaluable to the development and implementation of corrective measures and for use in subsequent process hazard analyses.

Proposed paragraph (m)(1) required the employer to investigate every incident which results in, or could reasonably have resulted in (near miss), a major accident in the workplace. This proposed provision received wide support throughout the rulemaking proceeding, although several rulemaking participants (e.g., Ex. 3: 12, 26, 69, 112, 121, 149, 159; Ex. 91; Tr. 676, 1938) were opposed to the use of the term "major accident." These commenters contended that if this term is to be used, then OSHA should define "major." Other rulemaking participants (e.g., Ex. 3: 17, 53, 64, 71; Tr. 1575) suggested that the term "major accident" be replaced with the term "catastrophic release" and then "catastrophic release" should be defined. OSHA agrees that the applicability of this proposed provision should be better defined. The Agency

has decided to replace the term "major accident" with the term "catastrophic release" since this term is more consistent with the focus of the final rule and as discussed has added a definition for "catastrophic release" to paragraph (b) of the final rule.

Consequently, proposed paragraph (m)(1) has been revised in the final rule to read as follows:

The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of a highly hazardous chemical in the workplace.

Proposed paragraph (m)(2) required incident investigations to be initiated as promptly as possible, but no later than 48 hours following the incident. It is important that an incident investigation be initiated promptly so that events can be recounted as clearly as possible; to preserve crucial evidence; and so that there is less likelihood that the scene will have been disturbed. The Agency also realizes that circumstances may not facilitate an immediate investigation because of the potential emergency nature of some incidents. This is the reason that this proposed provision required investigations to be initiated as promptly as possible, "but not later than 48 hours following the incident."

A few rulemaking participants disagreed with the 48 hour requirement contained in this proposed provision, and suggested several alternatives. For example, a commenter from the National Solid Waste Management Association (Ex. 3: 57, p.8) remarked:

By "incident," NSWMA assumes that OSHA is referring to a release of a HHC. The NSWMA is opposed to the subjectivity introduced to this requirement by the word "could." In fact, all unintentional or unauthorized releases should be investigated. As weekends and holidays may interfere with the 48-hour deadline to initiate investigations, NSWMA recommends that the time frame be extended to 72 hours.

A commenter from Monsanto (Ex. 3: 64, p. 10) said:

Paragraph (m)(2) requires that an incident investigation begin no later than 48 hours following the incident. This is acceptable for incidents involving a fatality, multiple injuries or catastrophic releases. However, this is an unnecessarily stringent time requirement when investigating near-miss incidents [required in paragraph (m)(1)]. Frequently, such near-miss accidents are not recognized for their potential impact until more than 48 hours following the event. It is recommended that paragraph (m)(2) be changed to read:

"Incident investigations for catastrophic releases in the workplace shall be initiated as promptly as possible, but no later than 48 hours following the incident." This wording eliminates the 48 hour requirement for

incidents which could have but did not result in a major accident, i.e., near misses.

Also, a commenter from IMCERA (Ex. 3:158, p. 6-7) stated:

Should a potentially serious incident occur the employer would immediately conduct an investigation to determine cause and corrective action. This is just good safety and business practices. Rather than establish time frames i.e., 48 hours, IMCERA would prefer to see this section be reworded as follows:

Incident investigations shall be initiated as promptly as possible and completed in a timely manner.

As discussed previously, OSHA believes that it is necessary to initiate investigations as soon as possible after the incident and sees no reasonable basis for relating the time period to initiate the investigation to whether the incident was a fatality or a near miss. Although the Agency understands the concerns of these rulemaking participants, the Agency believes that the provision allows enough flexibility to the employer by requiring an incident investigation be initiated as soon as possible but not later than 48 hours following the incident. OSHA believes that 48 hours is a reasonable timeframe within which to initiate an investigation. Accordingly, proposed paragraph (m)(2) is contained in the final rule as proposed. It should also be noted that the investigation need only be initiated within this timeframe, not completed, although it is contemplated that there will not be unnecessary delay between initiation and completion of the incident investigation.

Paragraph (m)(3) of the proposal required an incident investigation team to be established and to consist of persons knowledgeable in the process involved and other appropriate specialties, as necessary.

While some rulemaking participants (e.g., Ex. 114; Tr. 2257) recommends that OSHA mandate that an employee representative be on the investigation team, most rulemaking participants (e.g., Ex. 3: 57, 108, 161; Ex. 101; Tr. 316, 678, 742, 1813) supported the performance-oriented approach of this proposed provision. These rulemaking participants asserted that the employer should be responsible for determining the composition of the team, and that the determination should be based on the ability of the team members to perform the investigation properly. Additionally, they stated that an employee representative may very well be selected to participate in the investigation; but, this should not be mandated by OSHA. OSHA is not requiring an employee representative on the process hazard analysis team or on

the incident investigation team. This issue has already been addressed in the discussion concerning final paragraph (c), employee participation.

The intent of OSHA is to assure that team members have the ability to properly perform the investigation promptly and that the employer have the flexibility to select team members (in consultation with employees and their representatives as described in paragraph (c)) that possess this ability. The Agency believes that this proposed paragraph adequately reflects this intent.

Additionally, the Agency believes that in cases where an incident involved a contract employer's work, then a contract employee should be involved in the investigation. Therefore, proposed paragraph (m)(3) has been revised to read as follows:

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.

Proposed paragraph (m)(4) required a report to be prepared at the conclusion of the investigation which included, at a minimum, the date of the incident; date that the investigation began; a description of the incident; the factors that contributed to the incident; and, any recommendations resulting from the investigation.

A very small number of rule making participants (e.g., Ex. 3: 58, 64) contended that there was no benefit in specifying the date the investigation began. OSHA disagrees. The Agency wants to make sure that the investigation is initiated promptly. Consequently, it is important that the date of the incident, as well as the date that the investigation was initiated, are both specified.

OSHA did not receive any other negative comments with respect to the contents of the report specified by this proposed provision. Accordingly, proposed paragraph (m)(4) is included in the final rule as proposed.

Proposed paragraph (m)(5) required that the report be reviewed with all operating, maintenance, and other personnel whose work assignments are within the facility where the incident occurred. The purpose of this proposed provision is to assure that the report findings are disseminated to appropriate personnel, because the information contained in the report might be important in preventing similar incidents.

There was wide support for requiring dissemination of the information contained in the report to appropriate personnel. However, several rulemaking participants (e.g., Ex. 3: 57, 112, 121, 161) suggested changes to this proposed provision to better identify to whom this information should be disseminated. For example, a commenter for Kodak (Ex. 3: 33, p. 14) remarked:

OSHA should understand that there are large facilities, some number in the thousands of employees, where employees of various disciplines have no need to interact with one another. Most employees at these large facilities have no work relationship to other process activities outside their own work area and consequently have no need to be informed of information regarding a process or investigation they have no commitment to or responsibility for. We therefore, recommend the following statement for (m)(5):

"The report shall be reviewed with all appropriate personnel."

A commenter from CIBA-GEIGY (Ex. 3: 56, p. 2-3) said:

CIBA-GEIGY agrees that an incident which occurs in an operator's work area should be reviewed with all affected operators. However, this provision as specified by OSHA defines those operators which are affected, and this definition will not always be correct.

CIBA-GEIGY, therefore, recommends that the language be amended to read that the accident will be reviewed with those personnel who are directly involved with the operations in which the accident occurred.

Another commenter, who was from the ARCO Chemical Company (Ex. 3: 71, p. 31) asked OSHA to consider the following language:

The report shall be reviewed with all affected operating personnel who have a need to know and/or whose job tasks are relevant to the incident findings.

Additionally, a commenter from Vulcan Chemicals (Ex. 3: 101A, p. 5) stated:

Vulcan Chemicals recommends that this wording be changed to read:

The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings.

After careful review of these comments, OSHA has decided to revise this proposed provision to more accurately identify to whom this information should be disseminated. Additionally, the Agency believes that the logical progression of an incident investigation is to address the report recommendations (discussed in proposed paragraph (m)(6)) before disseminating the information contained in the report to affected personnel.

Accordingly, proposed paragraph (m)(5) has been redesignated as

paragraph (m)(6) in the final rule, and has been revised to read as follows:

The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees when applicable.

Proposed paragraph (m)(6) required the employer to establish a system to promptly address the report findings and recommendations and to implement the report recommendations in a timely manner.

Many rulemaking participants (e.g., Ex. 3: 17, 26, 30, 33, 38, 45, 53, 59, 60, 81, 113; Ex. 128; Tr. 1124, 1811, 1938) disagreed that all of the report recommendations need to be implemented. It was contended that upon further evaluation, some recommendations may be inappropriate. These rulemaking participants suggested that the term "implemented" be replaced with such terms as "resolved", "addressed", or "respond." It was further suggested that resolution of the recommendations and findings be documented.

The Agency agrees that there may be situations where it is not necessary or appropriate to implement all of the report recommendations. It is the Agency's position, however, that it is necessary to document the resolution of the report findings and recommendations to assure that they have been adequately considered.

Accordingly, proposed paragraph (m)(6) has been redesignated as paragraph (m)(5) in the final rule, and has been revised to read as follows:

The employer shall establish a system to promptly address and resolve the report findings and recommendations. Resolutions and corrective actions shall be documented.

Paragraph (m)(7) of the proposal required incident investigation reports to be retained for five years in order to determine if an incident pattern develops or exists. A few rulemaking participants (e.g., Ex. 3: 97, 121) suggested that the investigation reports be retained for three years rather than five years. OSHA did consider a three-year retention period. However, the Agency believes it would be extremely useful if the report findings and recommendations were reviewed during the subsequent update or revalidation of the process hazard analysis. Consequently, the Agency believes it more appropriate to specify a five-year retention period to be consistent with paragraph (e) of the final rule, which requires the process hazard analysis to be updated or revalidated every five years. Therefore, proposed paragraph

(m)(7) is included in the final rule as proposed.

Emergency Planning and Response: Paragraph (n)

Proposed paragraph (n) required the employer to establish and implement an emergency action plan in accordance with the provisions contained in 29 CFR 1910.38(a). For information purposes the Agency also added a note that 29 CFR 1910.120 (a), (p) and (q) may also be applicable.

The Agency received little negative comment with respect to this proposed provision except with respect to the issue of drills discussed below. OSHA believes that the implementation of an emergency action plan is extremely important for plant sites which have processes covered by this standard because of the potential hazards posed by highly hazardous chemicals and the elements of the emergency action plan which must be implemented to preplan for emergencies involving these substances (including training) so that employees will be aware of, and execute, appropriate actions.

The emergency action plan requires, at a minimum, the implementation of, and training employees in, the following procedures:

Emergency escape procedures and emergency 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 has been completed;

Rescue and medical duties for those employees who are to perform them;

Preferred means of reporting fires and other emergencies; and

Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.

The emergency action plan also requires the establishment of a system to alert employees of an emergency. If the alarm system is to be used for alerting fire brigade members, or for some other purpose, a distinctive signal must be used for each purpose.

With respect to training, employers must review the emergency action plan with each employee initially when the plan is developed, whenever the employee's responsibilities or designated actions under the emergency action plan changes, and whenever the emergency action plan, itself, is changed.

OSHA believes that the preplanning and training required by the emergency action plan will assure the readiness of employees to respond appropriately and

safely to emergencies involving highly hazardous chemicals.

Additionally, as a part of emergency planning, OSHA is adding a provision that employers develop procedures to address small releases and spills, since it is not always obvious when such an event is, or is not, an emergency situation; and such an event may also warrant initiating an incident investigation.

The proposed paragraph concerning emergency planning and response was also the subject of one of the issues in the proposal (55 FR at 29159). The Agency asked whether or not drills or simulated exercises should be mandated by this proposed provision. Many participants addressed this issue and while the value of drills was expressed throughout this rulemaking record, most rulemaking participants who addressed this issue believed that drills should be recommended but not mandated (Ex. 3: 17, 26, 28, 29, 53, 59, 69, 80, 81, 109, 124, 136, 161).

The Agency has concluded that drills are certainly recommended, but OSHA believes that the employer is in the best position to assess the readiness of employees to respond correctly, to establish procedures for emergency action, including conducting drills or exercises when necessary. Additionally, OSHA believes that the subject of drills will be adequately addressed by the elements contained in the emergency action plan and applicable provisions of § 1910.120.

Paragraph (n) is included in the final rule as proposed except for the addition of a provision that requires establishment of procedures for handling small releases. Additionally, the note which made reference to the possible applicability of provisions contained in § 1910.120 has been added to the text of the provision.

Compliance Safety Audits: Paragraph (o).

This proposed paragraph contained provisions pertaining to an evaluation of an employer's process safety management system. OSHA believes that an audit with respect to compliance with the provisions contained in this section is an extremely important function. This is because it serves as a self-evaluation for employers to measure the effectiveness of their process safety management system. The audit can identify problem areas, and assist employers in directing attention to process safety management weaknesses.

Therefore, proposed paragraph (o)(1) required employers to certify that they have evaluated compliance with the

provisions of this section, at least every three years.

The concept of employers evaluating the effectiveness of their own process safety management system was endorsed, and widely supported, throughout this rulemaking process. However, there was some disagreement with the approach taken by OSHA in this proposed provision. Some rulemaking participants (e.g., Ex. 3: 71, 121) contended that paragraph (o) should focus more on evaluating the effectiveness of the process safety management system, rather than determining compliance with provisions contained in the standard. For example, a commenter from Kodak (Ex. 3: 33, p.2) remarked:

We are also concerned about the proposed Compliance Audit, which we suggest be retitled "Management Systems Audit." We agree that a periodic assessment is necessary, but it should be a review of the employer's entire process safety program, including elements that satisfy OSHA's requirements. It should not focus solely on the OSHA standard and must not be used for "compliance" purposes.

A commenter from Monsanto (Ex. 3: 64, p.11) stated:

Monsanto recommends that the title of this section be changed to "Management System Review". The focus should be an employer's review of its own process safety system, including compliance with this standard, not an employer's review of its compliance with this standard.

Other rulemaking participants (e.g. Ex. 3: 38, 119; Tr. 1014) suggested that the title of paragraph (o) be changed to "compliance audit" because it is more descriptive of the intent of this section. For example, a commenter from BP America (Ex. 3: 59, p.7) remarked:

BP America believes that paragraph (o) should be called "Compliance Audits" instead of "Compliance Safety Audits" to clarify the intent. The intent is to audit the Process Safety Management Program and is, therefore, an administrative audit, not a technical safety audit.

A commenter from IMCERA (Ex. 3: 153, p.7) stated:

OSHA should consider changing the title of Subpart (o) from "Compliance Safety Audit" to "Compliance Audit". The term "Compliance Audit" more accurately describes the intent of this section, which is designed to determine compliance with the provisions of the proposed rule.

The objective of proposed paragraph (o) is to assure that employers evaluate the effectiveness of their process safety management system as required by the standard. The Agency believes that an effective means of achieving this objective is by employers assuring that

the provisions contained in this standard are being met and in doing so, the employer will ascertain whether the procedures and practices required to be developed under the process safety management standard as adequate and being followed. Since this proposed paragraph contains provisions that focus on the means of achieving this objective, the Agency has decided to change the title of paragraph (o) of the final rule to "compliance audits" and to add wording to further clarify the intent of this provision.

Another concern expressed with respect to proposed paragraph (o)(1) was the requirement that audits be performed at least every three years. Some commenters (e.g., Ex. 3: 64, 70, 82; Ex. 143) asserted that every three years was too often and recommended a five year interval as an alternative.

OSHA disagrees. A five year interval between audits is too long. The Agency believes that it is necessary that audits be performed at least every three years in order to measure the effectiveness of the process safety management system. Accordingly, proposed paragraph (o)(1) has been retained in the final rule as proposed except for some additional clarifying language.

Proposed paragraph (o)(2) required that a team, comprised of at least one person knowledgeable in the process conduct the compliance audit. A few rulemaking participants (e.g., Ex. 3: 64, 71) remarked that it may not be necessary that the audit be performed by a "team." OSHA concurs. The Agency believes that it is important for the audit to be performed by at least one person knowledgeable in the process, but it is not necessary that it be performed by a team. Therefore, proposed paragraph (o)(2) has been revised in the final rule to read as follows:

The compliance audit shall be conducted by at least one person knowledgeable in the process.

Proposed paragraph (o)(3) required a report of the findings of the audit to be developed. There were no objections to the requirement that a report of the audit findings be developed. Therefore, proposed paragraph (o)(3) is contained in the final rule as proposed.

Proposed paragraph (o)(4) required the employer to promptly determine and document an appropriate response to each of the findings of the compliance audit, and certify that deficiencies have been corrected.

Some rulemaking participants (e.g., Ex. 38, 48, 64, 71, 158; Ex. 143) disagreed with the term "certify" and suggested that other terms such as

"document," "respond to," or "resolve" would be more descriptive of OSHA's intent.

The purpose of this proposed paragraph is to assure that employers determine an appropriate response to each of the report findings and if employers identify a deficiency that needs to be corrected, that they "document" the correction of the deficiency. Therefore, proposed paragraph (o)(4) is contained in the final rule as proposed except that the word "certify" has been replaced by the word "document."

Proposed paragraph (o)(5) required employers to retain the two most recent compliance audit reports, as well as the documented actions described in paragraph (o)(4) of this section. The purpose of this proposed provision is to focus on any continuing areas of concern that are identified through the compliance audits.

There were no objections to this proposed provision and it is contained in the final rule as proposed, except for minor editorial changes which were made to reflect the change in title of paragraph (o).

Trade Secrets: Paragraph (p)

A number of participants in the rulemaking expressed some concern that in the proposal OSHA did not appear to provide any trade secret protection (e.g., Ex. 3: 46, 48, 80, 89, 106A, 129; Ex. 53). One commenter suggested that OSHA might itself reveal trade secrets in that "items which include trade secret information collected by OSHA as a result of an inspection could be made public" (Ex. 128, p. 18). Others worried about the possibility that information could substantially affect the competitive position of an employer (Ex. 3: 71) and asked for some protection against unwarranted disclosure of such information (Ex. 3: 89).

As to concern that OSHA might itself reveal trade secret information, it should be noted that employers are amply protected under the U.S. Code, the Occupational Safety and Health Act and regulations promulgated under the Act. Federal law makes it a criminal offense for federal employees to disclose trade secret information that is not authorized by law (18 U.S.C. 1905). Section 15 of the Occupational Safety and Health Act (the Act) requires that all information reported to or obtained by a Compliance Safety and Health Officer (CSHO) in connection with any inspection or other activity which contains or which might reveal a trade secret to kept confidential. Such information shall not be disclosed except to other OSHA officials concerned with the

enforcement of the Act or, when relevant, in any proceeding under the Act. Other OSHA regulations further assure the protection of trade secrets (29 CFR 1903.7(b) and 1903.9). And the OSHA Field Operations Manual further emphasizes this point by stating "it is essential to the effective enforcement of the Act that the CSHO and all OSHA personnel preserve the confidentiality of all information and investigations which might reveal a trade secret" (III-58). Moreover, trade secret information is specifically excluded from disclosure under the Freedom of Information Act (5 U.S.C. 552(b)(4)).

As a general matter, OSHA believes that there are relatively few bona fide trade secrets among the information that is required to be gathered under this standard. However, the addition of provisions to protect trade secrets will give employers with legitimate trade secret concerns adequate protection, but require that they withhold information only on the basis of sound, legal justification.

Some commenters (e.g., Ex. 3: 76, 112) suggested that OSHA adopt the definition of "trade secret" used in the Hazard Communication standard; others, such as ARCO, suggested a more expansive (e.g., Ex. 3: 71, 106A) or more limited (e.g., Ex. 147) definition. OSHA has reviewed the definition of "trade secret" that is used in the Hazard Communication standard (29 CFR 1910.1200) and has decided to incorporate that definition of trade secret into the final standard. The Agency believes that this definition of trade secret is broad enough to offer adequate protection to employers with legitimate trade secrets, it is consistent with that used in the Restatement of Torts, and it has the additional advantage of being uniform with that used in the Hazard Communication standard so that many employers are already familiar with it. The final rule also incorporates Appendix D of the Hazard Communication standard which contains criteria to be used in determining whether material meets the definition of trade secret.

Some commenters (e.g., Ex. 3: 46, 80, 112) believed that trade secret information should be handled in the process safety management standard under the procedures set forth in the Hazard Communication standard. The United Steelworkers of America submitted for consideration a new draft section for trade secrets (Ex. 147, p.16-17). After reviewing these approaches and several others (see, for example, Ex. 3: 53), the Agency has decided that the best way of resolving the issue is to

adopt language that will clearly indicate the accessibility and the procedures for obtaining trade secret information under the final rule. Arguably the trade secret provisions (§ 1910.1200(i)) of the Hazard Communication standard alone would take care of access to all trade secret information pertinent to the process safety management rule; however some may feel that their application might be limited to chemical identity information. In order to clarify its intent, OSHA has specifically stated in the final rule that the employer must make all relevant information available to those individuals involved in carrying out various information using and compiling activities required by the final rule regardless of whether the information in question is considered a trade secret or not. This is vital to the effective operation of the process safety management rule. It is questionable as to how useful a compliance safety audit or a process hazard analysis could be if some of the information necessary to their completion were denied or delayed. The language is written in this way to emphasize the right to access this information. However, the employer may take reasonable steps, such as those described in the Hazard Communication standard, to protect against the unauthorized disclosure of trade secrets to unauthorized third persons. Such steps include the signing of a confidentiality agreement.

OSHA believes that employees and their representatives also may have the need to access such information. The final rule assures employees access to the process hazard analysis and other information required to be developed under the standard. Under certain circumstances, however, it might be appropriate to substitute more general information or to require some sort of a balancing of the need to know the information with the need to protect the employer. Therefore, the Agency is incorporating into the final rule the access procedures that were developed under the Hazard Communication standard with the exception of § 1910.1200(i)(13). Section 1910.1200(i)(13) provides "[n]othing in this paragraph shall be construed as requiring the disclosure under any circumstances of process or percentage of mixture information which is a trade secret." That section is not being incorporated into the process safety management trade secret provisions in recognition of the fact that employees are entitled to certain process information under the process safety management standard and this process information may at times contain trade

secret information. There is no reason why the Hazard Communication information access provisions will not work well for information contained in the process hazard analysis and other documents that contain trade secrets. Employers bear the burden of demonstrating that their trade secret claim is bona fide. The Agency will evaluate the appropriateness of that substantiation in the event that an employer denies a legitimate request for disclosure of the trade secret and a complaint is subsequently made to OSHA.

IV. Statutory Considerations

Introduction

Section 3(8) of the Act provides:

The term "occupational safety and health standard" means a standard which requires conditions, or the adoption or use of one or more practices, means, methods, operations, or processes, reasonably necessary or appropriate to provide safe or healthful employment and places of employment.

28 U.S.C. 652(8).

In two recent cases, reviewing courts expressed concern that OSHA's interpretation of this and other provisions of the Act pertaining to safety rulemaking could lead to overly costly or under-protective safety standards. In *International Union, UAW v. OSHA*, 938 F.2d 1310 (D.C. Cir. 1991), the District of Columbia Circuit rejected substantive challenges to the lockout/tagout standard and denied a request that enforcement of that standard be stayed, but it also expressed concern that OSHA's interpretation of the Act could lead to safety standards that are very costly and only minimally protective. In *National Grain & Feed Ass'n v. OSHA*, 868 F.2d 717 (5th Cir. 1989), the Fifth Circuit concluded that Congress gave OSHA considerable discretion in structuring the costs and benefits of safety standards, but, concerned that the grain dust standard might be under-protective, directed OSHA to consider adding a provision that might further reduce significant risk of fire and explosion.

It is, of course, beyond doubt that OSHA rulemakings involve a significant degree of agency expertise and policy-making discretion to which reviewing courts must defer. See e.g., *Building & Constr. Trades Dep't, AFL-CIO v. Brock*, 838 F.2d 1258, 1266 (D.C. Cir. 1988); *Industrial Union Dep't, AFL-CIO v. American Petroleum Inst.*, 448 U.S. 607, 655 n. 62 (1980). At the same time, the agency's technical expertise and policy-making authority must be exercised within parameters. The lockout/tagout and grain handling standard decisions

sought from OSHA more clarification on the question of parameters. In light of those decisions, OSHA believes it would be useful to state its view of the limits of its safety rulemaking authority and to explain why the agency is confident that its interpretive views have in the past and will continue in the future to avoid regulatory extremes.

Stated briefly, the OSH Act requires that before promulgating any occupational safety standard, OSHA demonstrate based on substantial evidence in the record as a whole that: (1) The proposed standard will substantially reduce a significant risk of material harm; (2) compliance is technologically feasible in the sense that the protective measures being required already exist, can be brought into existence with available technology, or can be created with technology that can reasonably be developed; (3) compliance is economically feasible in the sense that industry can absorb or pass on the costs without major dislocation or threat of instability; and (4) the standard employs the least expensive protective measures capable of reducing or eliminating significant risk. In addition, proposed safety standards must be compatible with prior agency action, be responsive to significant comment in the record, and to the extent allowed by statute, be consistent with applicable Executive Orders. These elements set the parameters for safety rulemaking and a decision-making framework for developing a rule within the parameters.

A. Congress Concluded That OSHA Regulations are Necessary To Protect Workers From Occupational Hazards and That Employers Should Be Required To Reduce or Eliminate Significant Workplace Health and Safety Threats

At section 2(a) of the Act, Congress announced its determination that occupational injury and illness should be eliminated as much as possible. "The Congress finds that occupational injury and illness arising out of work situations impose a substantial burden upon, and are a hindrance to, interstate commerce in terms of lost production, wage loss, medical expenses, and disability compensation payments." 29 U.S.C. 651(a). Congress therefore declared "it to be its purpose and policy * * * to assure so far as possible every working man and woman in the Nation safe * * * working conditions" * * *. 29 U.S.C. 651(b).

To that end, Congress instructed the Secretary of Labor to adopt existing federal and consensus standards during the first two years after the Act became

effective and, in the event of conflict among any such standards, to "promulgate the standard which assures the greatest protection of the safety or health of the affected employees." 29 U.S.C. 655(a). Congress also directed the Secretary to set mandatory occupational safety standards, 29 U.S.C. 651(b)(3), based on a rulemaking record and substantial evidence, 29 U.S.C. 655(b)(2), that are "reasonably necessary or appropriate to provide safe . . . employment and place of employment." When promulgating permanent safety or health standards that differ from existing national consensus standards, the Secretary must explain "why the rule as adopted will better effectuate the purposes of this Act than the national consensus standard." 29 U.S.C. 655(b)(8). Correspondingly, every employer must comply with OSHA standards and, in addition, "furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." 29 U.S.C. 654(a).

"Congress understood that the Act would create substantial costs for employers, yet intended to impose such costs when necessary to create a safe and healthful working environment. Congress viewed the costs of health and safety as a cost of doing business. . . . Indeed, Congress thought that the financial costs of health and safety problems in the workplace were as large as or larger than the financial costs of eliminating these problems." *American Textile Mfrs. Inst. Inc. v. Donovan*, 452 U.S. 490, 519-522 (1981) ("ATMI") (emphasis in original). "[T]he fundamental objective of the Act [is] to prevent occupational deaths and serious injuries." *Whirlpool Corp. v. Marshall*, 445 U.S. 1, 11 (1980). "We know the costs would be put into consumer goods but that is the price we should pay for the 80 million workers in America." S. Rep. No. 91-1282, 91st Cong., 2d Sess. (1970); H.R. Rep. No. 91-1291, 91st Cong., 2d Sess. (1970), reprinted in Senate Committee on Labor and Public Welfare, Legislative History of the Occupational Safety and Health Act of 1970, (Committee Print 1971) ("Leg. Hist.") at 444 (Senator Yarborough). "Of course, it will cost a little more per item to produce a washing machine. Those of us who use washing machines will pay for the increased cost, but it is worth it, to stop the terrible death and injury rate in this country." *Id.* at 324; see also 510-511, 517.

[T]he vitality of the Nation's economy will be enhanced by the greater productivity

realized through saved lives and useful years of labor.

When one man is injured or disabled by an industrial accident or disease, it is he and his family who suffer the most immediate and personal loss. However, that tragic loss also affects each of us. As a result of occupational accidents and disease, over \$1.5 billion in wages is lost each year (1970 dollars), and the annual loss to the gross national product is estimated to be over \$6 billion. Vast resources that could be available for productive use are siphoned off to pay workmen's compensation and medical expenses. . . .

Only through a comprehensive approach can we hope to effect a significant reduction in these job death and casualty figures.

Id. at 518-19 (Senator Cranston).

Congress considered uniform enforcement crucial because it would reduce or eliminate the disadvantage that a conscientious employer might experience where inter-industry or intra-industry competition is present. Moreover, "many employers—particularly smaller ones—simply cannot make the necessary investment in health and safety, and survive competitively, unless all are compelled to do so." Leg. Hist. at 144, 854, 1188, 1201.

Thus, the statutory text and legislative history make clear that Congress conclusively determined that OSHA regulations are necessary to protect workers from occupational hazards and that employers should be required to reduce or eliminate significant workplace health and safety threats.

B. As Construed by the Courts and by OSHA, the Act Sets a Threshold and a Ceiling for Safety Rulemaking That Provide Clear and Reasonable Parameters for Agency Action

OSHA has long followed the teaching that section 3(B) of the Act requires that before it promulgates "any permanent health or safety standard, [it must] make a threshold finding that a place of employment is unsafe—in the sense that significant risks are present and can be eliminated or lessened by a change in practices." *Industrial Union Dep't, AFL-CIO v. American Petroleum Inst.*, 448 U.S. 607, 642 (1980) (plurality) ("*Benzene*") (emphasis in original). When, as frequently happens in safety rulemaking, OSHA promulgates standards that differ from existing national consensus standards, it must explain "why the rule as adopted will better effectuate the purposes of this Act than the national consensus standard." 29 U.S.C. 655(b)(8). (National consensus and existing federal standards that Congress instructed OSHA to adopt summarily within two years of the Act's inception provide reference points

concerning the least an OSHA standard should achieve. 29 U.S.C. 655(a).)

As a result, OSHA is precluded from regulating insignificant safety risks or from issuing safety standards that do not at least lessen risk in a significant way. OSHA must also respond rationally to similarities and differences among industries or industry sectors. See *Building and Constr. Trades Dep't, AFL-CIO v. Brock*, 838 F.2d 1258, 1272-73 (D.C. Cir. 1988).

OSHA has also long accepted that "any standard that was not economically or technologically feasible would *a fortiori* not be 'reasonably necessary or appropriate' under the Act. See *Industrial Union Dep't v. Hodgson*, [499 F.2d 467, 478 (D.C. Cir. 1974)] ('Congress does not appear to have intended to protect employees by putting their employers out of business.')."
American Textile Mfrs. Inst. Inc., 452 U.S. at 513 n. 31; *American Iron and Steel Inst. v. OSHA*, 939 F.2d 975, 980 (D.C. Cir. 1991) (a standard is economically feasible even if it portends "disaster for some marginal firms," but it is economically infeasible if it "threaten[s] massive dislocation to, or imperil[s] the existence of," the industry).

By stating the test in terms of "threat" and "peril," the Supreme Court made clear in ATMI that infeasibility begins short of industry-wide bankruptcy. OSHA itself has placed the line considerably below industry-wide bankruptcy. See, for example, ATMI, 452 U.S. at 527 n. 50; 43 FR 27360 (June 23, 1978) (proposed 200 $\mu\text{g}/\text{m}^3$ PEL for cotton dust did not raise serious possibility of industry-wide bankruptcy, but impact on weaving sector would be severe, possibly requiring reconstruction of 90 percent of all weave rooms. OSHA concluded that the 200 $\mu\text{g}/\text{m}^3$ level was not feasible for weaving and that 750 $\mu\text{g}/\text{m}^3$ was all that could reasonably be required). See also 54 FR 29245-246 (July 11, 1989); *American Iron & Steel Institute*, 939 F.2d at 1003 (OSHA raised engineering control level for lead in small nonferrous foundries to avoid the possibility of bankruptcy for about half of small foundries even though the industry as a whole could have survived the loss of small firms).

OSHA standards must also be cost-effective in the sense that the protective measures being required must be the least expensive measures capable of achieving the desired end. ATMI, at 514 n. 32; *Building and Constr. Trades Dep't AFL-CIO v. Brock*, 838 F.2d 1258, 1269 (D.C. Cir. 1988). (Although the cotton dust and lead rulemakings involved health standards, the economic

feasibility ceiling established therein applies equally to safety standards. The feasibility boundary is the same for health and safety rulemaking since it comes from section 3(8), which governs all permanent OSHA standards.)

OSHA gives additional consideration to financial impact in setting the period of time that should be allowed for compliance, allowing as much as ten years for compliance phase-in. See *United Steelworkers of Am. v. Marshall*, 647 F.2d 1189, 1278 (D.C. Cir. 1980), cert. denied, 453 U.S. 913 (1981). In addition, OSHA's enforcement policy takes account of financial hardship on an individualized basis. OSHA's Field Operations Manual provides that, based on an employer's economic situation, OSHA may extend the period within which a violation must be corrected after issuance of a citation. CPL 2.45B, Chapter 3 E6d(3)(a) (Dec. 31, 1990).

To reach the necessary findings and conclusions, OSHA must conduct rulemaking to determine, based on substantial evidence, the qualitative and, if possible, quantitative nature of the risk with and without regulation, technological feasibility of compliance, availability of capital to the industry, the extent to which capital was required for other purposes, the industry's profit history, the industry's ability to absorb costs or pass them on to the consumer, the impact of higher costs on demand, and the impact on competition with substitutes and imports. See ATMI at 2501-2503; American Iron & Steel Institute generally.

OSHA's powers are further circumscribed by the independent Occupational Safety and Health Review Commission, which provides a neutral forum for employer contests of citations issued by OSHA for noncompliance with health and safety standards. 29 U.S.C. 659-661 (noted as an additional constraint in *Benzene* at 652 n. 59).

OSHA rulemaking is thus constrained first by the need to demonstrate that the standard will substantially reduce a significant risk of material harm, and then by the requirement that compliance is technologically capable of being done and not so expensive as to threaten economic instability or dislocation for the industry. Within these parameters, further constraints such as the need to find cost-effective measures and to respond rationally to all meaningful comment militate against regulatory extremes. Finally, it is axiomatic that significant departures from prior practice must be justified. *International Union, UAW v. Pendergrass*, 878 F.2d 309, 400 (D.C. 1989). In the twenty years since enactment, OSHA has promulgated numerous safety standards,

standards that provide benchmarks for judging risks, benefits, and feasibility of compliance in subsequent rulemakings. (OSHA's Hazardous Waste Operations and Emergency Response Standard, for example, required use of existing technology and well accepted safety practices to eliminate at least 32 deaths and 18,700 lost workday injuries at a cost of about \$153 million per year. 54 FR 9311-9312 (March 6, 1989). The excavation standard also drew on existing technology and recognized safety practices to save 74 lives and over 800 lost workday injuries annually at a cost of about \$396 million. 54 FR 45954 (Oct. 31, 1989). OSHA's Grain Handling Facilities standard relied primarily on simple housekeeping measures to save 18 lives and 394 injuries annually, at a total net cost of \$5.9 to \$33.4 million. 52 FR 49622 (Dec. 31, 1991).)

C. The PSM Standard Meets the Statutory Criteria

In promulgating the Clean Air Act Amendments of 1990, Congress conclusively determined that "a process safety standard designed to protect employees from hazards associated with accidental releases of highly hazardous chemicals in the workplace" is necessary and that the standard must, at a minimum, require employers to adopt fourteen specified planning, procedure and training safety measures. Public Law 101-549 (Nov. 15, 1990), reprinted at 29 U.S.C.A. 655 note (Supp. 1991). For the reasons explained in detail throughout this statement of findings and conclusions, the standard's fourteen planning, procedure and training requirements, when fully implemented, reduce the risk of catastrophic fire and explosion (330 fatalities and 1,917 injuries/illnesses annually) by 80 percent. This constitutes a substantial reduction of significant risk of material harm. Compliance is technologically feasible because the standard's requirements are already being implemented to some extent. Compliance is economically feasible because all regulated sectors can readily absorb or pass on compliance costs during the standard's first five years, and economic benefits will exceed compliance costs thereafter. The standard's costs, benefits, and compliance requirements are consistent with the Clean Air Act Amendments, as well as with other OSHA safety standards. OSHA considered and responded to all substantive comments on their merits; OSHA evaluated all suggestions for their impact on worker safety, their feasibility, their cost effectiveness, and their consonance with

the OSH Act and the Clean Air Act Amendments.

V. Summary of Regulatory Impact and Regulatory Flexibility Analysis, International Trade Impact Analysis, and Environmental Impact Assessment

Introduction

OSHA has created a new standard within Subpart H, Hazardous Materials, to deal with the risks involved in the storage, handling and processing of highly hazardous materials. The standard—referred to as process safety management, or PSM—emphasizes the application of management controls, rather than specific engineering guidelines, when addressing the risks associated with handling or working near hazardous chemicals. Implementation of process safety management programs and procedures will enable affected establishments to prevent the occurrence, and minimize the consequences, of significant releases of toxic substances, as well as fires, explosions and other types of catastrophic accidents.

The benefits of implementing PSM include the prevention of accidental fatalities, injuries and illnesses, and the avoidance of physical property damage. Furthermore, the standard will contribute to enhanced productivity due to fewer process disruptions and accidental shutdowns and decreased labor turnover as workers perceive a safer work environment; lead to more efficient utilization of space, labor and equipment in the wake of programmatic plant reviews; promote an integrated approach to process design, construction, operation, and maintenance, with process safety as the central focus of concern; reduce loss of raw materials and inadvertent waste generation; and increase product quality. Savings in these areas are expected to offset direct costs of compliance. OSHA also anticipates significant improvements in ergonomic and other chronic health and safety problems—including low-level exposure to toxic substances—through compliance with the PSM standard.

In response to recent catastrophic accidents in the petrochemical industry, OSHA in 1990 initiated the Special Emphasis Program in Petrochemical Industries (PETROSEP), whose purpose is to determine whether management systems governing safety and health procedures for maintenance activities, contractor activities, and operations are in place to control risk. The largest firms in SIC 2821, Plastic Materials and Resins, SIC 2869, Industrial Organic

Chemicals, Not Elsewhere Classified, and SIC 2911, Petroleum Refining, are the subject of the program. The PFTROSEP program focuses the attention of plant managers and contractors on the need to integrate the PSM philosophy into the safety culture of the worksite.

Executive Order 12201 (46 FR 13197) requires that a regulatory impact analysis be prepared for any proposed regulation that meets the criteria for a "major rule"; that is, one that would result in an annual impact on the economy of \$100 million or more, have a major increase in cost or prices for consumers, individual industries, Federal, state or local government agencies, or geographic regions, or have significant adverse effects on competition, employment, investment, productivity, innovation, or the ability of United States-based enterprises to compete with foreign-based enterprises in domestic or export markets. In addition, the Regulatory Flexibility Act (5 U.S.C. 601, *et seq.*) requires analysis of whether a regulation will have a significant economic impact on a substantial number of small entities.

Consistent with these requirements, OSHA has prepared this Regulatory Impact and Regulatory Flexibility Analysis for § 1910.119, Process Safety Management of Highly Hazardous Chemicals. The Regulatory Impact Analysis is a critical part of OSHA reasoning both on issues arising under the OSH Act and under the Executive Order. OSHA has explicitly relied on the RIA to support this final Process Safety Management rule. As a result of this analysis OSHA has determined that promulgation of § 1910.119 will constitute a major rule.

Affected Industries and Current Compliance

Based on a report prepared by Kearney/Centaur [Ex. 5] and a follow-up review of national chemical databases, OSHA has determined that 24,939 establishments in 127 industry subgroups will be affected by the PSM standard. The population at risk is an estimated 3.0 million workers (2.37 million plant employees and 653,000 contract employees) and is found throughout manufacturing, particularly in Standard Industrial Classification (SIC) code 28, Chemicals and Allied Products, SIC 37, Transportation Equipment, and SIC 34, Fabricated Metal Products, Except Machinery and Transportation Equipment. In addition to manufacturing, natural gas liquids (SIC 1321), farm product warehousing (SIC 4221), electric, gas, and sanitary services (SIC 49) and wholesale trade

(SICs 50 and 51) contain workers at risk. The extent of the impact will vary by industry depending on current practice, the number of processes, and the quantities of highly hazardous materials on site.

OSHA excluded from this final impact analysis establishments in California, Delaware and New Jersey, where process safety management statutes have already been enacted. In these three states the compliance burden is unaffected by the federal rule.

OSHA estimated current practices with the provisions of the process safety management rule using OSHA survey data, survey data compiled by a major chemical engineering magazine, and data in the rulemaking record. For all industries affected by the proposed rule, none are currently in full compliance, although compliance is greater than 75 percent among some establishments for some specific provisions. Generally, larger firms have a higher current compliance rate than smaller firms, but for many industries the compliance-rate differences by establishment size are not substantial.

Nonregulatory Environment

The primary objective of OSHA's process safety management standard is to reduce the number of employee fatalities and injuries associated with catastrophic releases of hazardous substances. OSHA believes that the PSM standard will eliminate to a considerable degree the risks which workers experience in the establishments falling within the scope of the rule.

The Agency examined the nonregulatory approaches for promoting the implementation of safety management programs, including (1) economic forces generated by the private market system, (2) incentives created by workers' compensation programs or the threat of private suits, and (3) related activities of private agencies. Following this review, OSHA determined that the need for government regulation arises from the significant risk of job-related injury or death caused by inadequate practices for preventing catastrophic accidents which currently exist in the industry. Private markets fail to provide enough safety and health resources due to the lack of information on risk, immobility of labor, and externalization of part of the social costs of worker injuries and deaths. Workers' compensation systems do not offer an adequate remedy because premiums do not reflect specific workplace risk and liability claims are restricted by statutes preventing employees from suing their employers.

While certain voluntary standards exist, their scope and approach fail to provide adequate protection for all workers. Thus, OSHA has determined that a federal standard is necessary.

Technological Feasibility and Costs of Compliance

OSHA reviewed the process safety management practices currently in place across industry as well as the recommended practices of industry trade associations and standards-setting organizations. On the basis of substantial current compliance found by OSHA and its consultants, widespread familiarity with the concepts and procedures of PSM, and the availability of technical consultation within and outside the affected sectors, OSHA has determined that the final rule for managing process hazards is technologically feasible.

OSHA estimated the costs of compliance with the PSM standard using information from the rulemaking record and from a report prepared under contract by Kearney/Centaur in 1990 [Ex. 5]. Most of the activities required by the PSM standard involve personnel time to develop programs and procedures, train employees, and carry out inspection activities. Capital costs will be incurred by firms when process hazard analyses and pre-startup safety reviews uncover the need to redesign processes and/or change equipment in order to reduce risks.

Consistent with the implementation schedule for completing initial process hazard analyses under Paragraph (e) of the standard, OSHA estimated compliance costs for two five-year periods. OSHA estimates that \$888.7 million in direct annualized costs will be required to comply with the standard during each of the first five years following implementation of the rule. Of this annual cost, \$470.8 million (53 percent) are attributed to Paragraph (e), Process Hazard Analysis, and \$179.1 million (20 percent) to Paragraph (1), Management of Change. Annualized compliance costs during Years 6-10 will be \$405.8 million. The decline in costs is largely related to the completion of process hazard analyses for existing operations.

Implementation of process safety management should generate cost savings in the forms of improved worker productivity, reduced incidence of property damage, diminished probability of lost production, and reduced employee turnover. Based upon an analysis by Kearney/Centaur, OSHA estimates that the value of annual PSM-related cost savings will be \$719.9

million in Years 1-5 and \$1.44 billion in Years 6-10. Subtracting the value of the cost savings from the annualized direct costs gives adjusted compliance costs of \$160.8 million in Years 1-5. Cost savings are expected to exceed direct costs for most industry groups in Years 6-10. OSHA believes the true economic cost of the standard is best reflected by the adjusted costs. Furthermore, the estimate may understate the true cost savings, in that insurance, administrative, and societal cost savings associated with accident prevention are not included in the assessment.

Benefits

OSHA anticipates that full compliance with the PSM standard will lead to fewer catastrophic fires, explosions, releases of hazardous substances and other types of serious accidents. It is expected that many minor incidents will be prevented as well. Using data from the OSHA Integrated Management Information System database and applying an adjustment based upon the analysis of Charles River Associates [Ex. 10] and Kearney/Centaur [Ex. 5], OSHA estimated the baseline number of fatalities and injuries/illnesses linked to the PSM standard for the period 1983-90. For the eight-year period, an average of 330 fatalities and 1,918 injuries/illnesses per year were associated with major accidents involving hazardous materials (these totals exclude fatalities and injuries in California, New Jersey and Delaware). Using an average risk-reduction estimate of 40 percent for Years 1-5 implementation phase, OSHA estimates that 132 fatalities and 767 catastrophic injuries/illnesses (including 250 lost-workday injuries) will be avoided annually through compliance with the standard. In Years 6-10, a risk reduction of 80 percent is projected, with 264 fatalities and 1,534 injuries/illnesses (including 500 catastrophic lost-workday injuries) avoided, annually.

In addition to the health and safety benefits from preventing catastrophic incidents, reductions in injuries and illnesses related to minor process disruptions are anticipated, as well as reductions in the long-run risks posed by occasional releases of toxic vapors and gases and by the physical hazards of poor process design.

Economic Impact and Regulatory Flexibility Analysis

OSHA assessed the potential economic impact of the PSM standard separately on large and small establishments and has determined that none of the major industry groups would experience a significant economic

burden as a result of the standard. If affected large establishments added the entire cost of compliance to the price of their final good, OSHA estimates that the average price increase would not exceed 0.07 percent during the ten-year period of analysis, based on the ratio of gross compliance costs to average establishment revenue. The maximum price increase in any major industry sector would be 0.7 percent. On the other hand, if all direct compliance costs were absorbed internally (and not passed forward to final customers), OSHA estimates that the average reduction in profits among large firms (20 or more employees) would approximate 1.2 percent.

While a few industry groups might experience profit reductions above 5 percent under the no-cost-pass-through scenario, the large-firm impact on the majority of affected major industry groups would be less than 3 percent of profit.

As required by the Regulatory Flexibility Act of 1980, OSHA assessed the economic burden faced by small establishments. For Years 1 through 5, the average ratio of direct cost to revenue for firms with fewer than twenty employees would be 0.23 percent. If small firms were to absorb the direct cost of regulation in full, profit reductions would average 3.4 percent for the first five years of implementation. Since profit impacts of less than 6 percent would be felt by the majority of small establishments under this scenario (zero cost offsets), OSHA has determined that the standard is economically feasible for small firms.

International Trade

OSHA is aware that the European and East Asian economic communities are introducing the concept of process safety management among their member countries. In time, European and Asian firms adopting PSM programs will experience the range of implementation costs estimated in this RIA for American firms. OSHA anticipates that as PSM becomes widespread throughout American industry, the productivity benefits and other cost-savings resulting from the rule could improve the competitiveness of American businesses.

During the implementation schedule, the standard is not likely to have a significant adverse effect on international trade because of the small magnitude of any price increase that would be required for passing forward compliance costs. As indicated above, the maximum price increases generated from the standard would be less than 0.3 percent for the majority of affected

establishments. Thus, no measurable impact on foreign trade is expected.

Environmental Assessment

The PSM standard has been reviewed in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 *et seq.*), the regulations of the Council on Environmental Quality (CEQ) (40 CFR part 1500), and DOL NEPA Procedures (29 CFR part 11). The provisions of the standard focus on the reduction and avoidance of incidents involving toxic releases, fires and explosions. Consequently, no major negative impact is foreseen on air, water or soil quality, plant or animal life, the use of land or other aspects of the environment. OSHA believes that compliance with the standard will result in positive environmental effects in the form of fewer releases of toxic liquids, solids and gases into the air, soil and water.

VI. Federalism

This regulation has been reviewed in accordance with Executive Order 12612 (52 FR 41685, October 30, 1987) regarding Federalism. This Order requires that agencies, to the extent possible, refrain from limiting state policy options, consult with states prior to taking any actions which would restrict state policy options, and take such actions only when there is clear constitutional authority and the presence of a problem of national scope. The Order provides for preemption of state law only if there is a clear Congressional intent for the Agency to do so. Any such preemption is to be limited to the extent possible.

Section 18 of the Occupational Safety and Health Act (OSH Act) expresses Congress' clear intent to preempt state laws relating to issues on which Federal OSHA has promulgated safety and health standards. Under the OSHA Act, a state can avoid preemption only if it submits, and obtains Federal approval of a plan for the development of such standards and their enforcement. Occupational Safety and health standards developed by such State Plan States must, among other things, be at least as effective in providing safe and healthful employment and places of employment as the Federal standards. Where such standards are applicable to products distributed or used in interstate commerce, they may not unduly burden commerce and must be justified by compelling local conditions (see section 28(c)(2) of the OSH Act).

The Federal final standard on process safety management of highly hazardous chemicals addresses hazards that are not unique to any one state or region of

the country. Nonetheless, states with occupational safety and health plans approved under section 18 of the OSHA Act will be able to develop their own state standards to deal with any special problems which might be encountered in a particular state. Moreover, because this standard is written in general, performance-oriented terms, there is considerable flexibility for state plans to require, and for affected employers to use, methods of compliance which are appropriate to the working conditions covered by the standard.

In brief, this proposed rule addresses a clear national problem related to occupational safety and health in general industry. Those states which have elected to participate under section 18 of the OSHA Act are not preempted by this standard, and will be able to address any special conditions within the framework of the Federal Act while ensuring that the state standards are at least as effective as that standard. State comments were considered prior to promulgation of this final rule.

VII. State Plan States

The 25 States and Territories with their own OSHA approved occupational safety and health plans must adopt a comparable standard within six months of the publication date of this final standard. These 25 States and Territories are: Alaska, Arizona, California, Connecticut (for State and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York (for State and local government employee only), North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington, and Wyoming. Until such time a state standard is promulgated, Federal OSHA will provide interim enforcement assistance, as appropriate, in these states.

List of Subjects in 29 CFR Part 1910

Explosive, Flammable liquids and gases, Hazard analysis, highly hazardous chemicals, Hazardous materials, Occupational safety and health, Safety, Process hazard analysis, Pyrotechnics.

Authority

This document has been prepared under the direction of Dorothy L. Strunk, Acting Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington DC 20210.

Accordingly, pursuant to sections 4, 6, and 8 of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655,

657); Section 304, Clean Air Act Amendments of 1990 (Pub. L. 101-549, Nov. 15, 1990, reprinted at 29 U.S.C. 655 Note (Supp. 1991)); Secretary of Labor's Order No. 1-90 (55 FR 9033); and 29 CFR part 1911, 29 CFR part 1910 is amended as set forth below.

Signed at Washington, DC, this 14th day of February, 1992.

Dorothy L. Strunk,

Acting Assistant Secretary of Labor.

PART 1910—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for Subpart H of Part 1910 is revised to read as follows:

Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736) or 1-90 (55 FR 9033), as applicable.

Sections 1910.103, 1911.106, 1910.107, 1910.108, 1910.109, 1910.110, 1910.111 and 1910.119 are also issued under 29 CFR part 1911.

Section 1910.119 is also issued under Sec. 304, Clean Air Act Amendments of 1990 (Public Law 101-549, Nov. 15, 1990, reprinted at 29 U.S.C. 655 Note (Supp. 1991)).

Section 1910.120 is also issued under Sec. 126, Superfund Amendments and Reauthorization Act of 1980 as amended (29 U.S.C. 655 note), 5 U.S.C. 553, and 29 CFR part 1911.

2. Section 1910.109 is amended by revising paragraph (k) to read as follows:

§ 1910.109 Explosives and blasting agents.

* * * * *

(k) *Scope.* (1) This section applies to the manufacture, keeping, having, storage, sale, transportation, and use of explosives, blasting agents, and pyrotechnics. The section does not apply to the sale and use (public display) of pyrotechnics, commonly known as fireworks, nor the use of explosives in the form prescribed by the official U.S. Pharmacopeia.

(2) The manufacture of explosives as defined in paragraph (a)(3) of this section shall also meet the requirements contained in § 1910.119.

(3) The manufacture of pyrotechnics as defined in paragraph (a)(10) of this section shall also meet the requirements contained in § 1910.119.

3. A new § 1910.119 and appendices A through D to § 1910.119 are added to read as follows:

§ 1910.119 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 CFR 1910.1200(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 built after May 26, 1992; 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 conducted as soon as possible, but not later than the following schedule:

(i) No less than 25 percent of the initial process hazards analyses shall be completed by May 26, 1994;

(ii) No less than 50 percent of the initial process hazards analyses shall be completed by May 26, 1995;

(iii) No less than 75 percent of the initial process hazards analyses shall be completed by May 26, 1996;

(iv) All initial process hazards analyses shall be completed by May 26, 1997.

(v) Process hazards analyses completed after May 26, 1987 which meet the requirements of this paragraph are acceptable as initial process hazards analyses. These process hazard analyses shall be updated and revalidated, based on their completion date, in accordance with paragraph (e)(6) of this section.

(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 on May 26, 1992, 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 (I).

(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(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).

(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.

Appendix A to § 1910.119—List of Highly Hazardous Chemicals, Toxics and Reactives (Mandatory)

This Appendix contains a listing of toxic and reactive highly hazardous chemicals which present a potential for a catastrophic event at or above the threshold quantity.

CHEMICAL name	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Propenal)	107-02-8	150
Acrylyl Chloride	814-60-6	250
Allyl Chloride	107-05-1	1000
Ailylamine	107-11-9	1000
Alkylaluminums	Varies	5000
Ammonia, Anhydrous	7664-41-7	10000
Ammonia solutions (>44% ammonia by weight)	7664-41-7	15000
Ammonium Perchlorate	7790-98-9	7500
Ammonium Permanganate	7787-36-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis(Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637-07-2	250
Bromine	7728-95-8	1500
Bromine Chloride	12863-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100
Butyl Hydroperoxide (Tertiary)	75-91-2	5000
Butyl Perbenzoate (Tertiary)	614-45-9	7500
Carbonyl Chloride (see Phosgene)	75-44-5	100
Carbonyl Fluoride	353-50-4	2500
Cellulose Nitrate (concentration > 12.6% nitrogen)	9004-70-0	2500
Chlorine	7782-50-5	1500
Chlorine Dioxide	10049-04-4	1000
Chlorine Pentafluoride	13637-63-3	1000
Chlorine Trifluoride	7790-91-2	1000
Chlorodiethylaluminum (also called Diethylaluminum Chloride)	88-10-8	5000
1-Chloro-2,4-Dinitrobenzene	67-00-7	5000
Chloromethyl Methyl Ether	107-30-2	500
Chloropicrin	76-06-2	500
Chloropicrin and Methyl Bromide mixture	None	1500
Chloropicrin and Methyl Chloride mixture	None	1500
Cumene Hydroperoxide	60-15-9	5000
Cyanogen	460-19-5	2500
Cyanogen Chloride	506-77-4	500
Cyanuric Fluoride	675-14-9	100
Diacetyl Peroxide (Concentration > 70%)	110-22-5	5000
Diazomethane	334-88-3	500
Dibenzoyl Peroxide	94-38-0	7500
Diborane	19287-45-7	100
Dibutyl Peroxide (Tertiary)	110-05-4	5000
Dichloro Acetylene	7572-29-4	250
Dichlorosilane	4109-96-0	2500
Diethylzinc	557-20-0	10000
Diisopropyl Peroxydicarbonate	105-64-6	7500
Dilauroyl Peroxide	105-74-8	7500
Dimethyldichlorosilane	75-78-5	1000
Dimethylhydrazine, 1,1-	57-14-7	1000
Dimethylamine, Anhydrous	124-40-3	2500
2,4-Dinitroaniline	97-02-9	5000
Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Ketone Peroxide; concentration > 60%)	1338-23-4	5000
Ethyl Nitrite	109-95-5	5000
Ethylamine	75-04-7	7500
Ethylene Fluorohydrin	371-62-0	100
Ethylene Oxide	75-21-8	5000
Ethyleneimine	151-56-4	1000
Fluorine	7782-41-4	1000
Formaldehyde (Formalin)	50-00-0	1000
Furan	110-00-9	500
Hexafluoroacetone	684-16-2	5000
Hydrochloric Acid, Anhydrous	7647-01-0	5000
Hydrofluoric Acid, Anhydrous	7664-39-3	1000
Hydrogen Bromide	10035-10-6	5000
Hydrogen Chloride	7647-01-0	5000
Hydrogen Cyanide, Anhydrous	74-90-8	1000
Hydrogen Fluoride	7664-39-3	1000
Hydrogen Peroxide (52% by weight or greater)	7722-84-1	7500
Hydrogen Selenide	7783-07-5	150
Hydrogen Sulfide	7783-06-4	1500
Hydroxylamine	7803-49-8	2500
Iron, Pentacarbonyl	13463-40-6	250
Isopropylamine	75-31-0	5000
Ketene	463-51-4	100
Methacrylaldehyde	78-85-3	1000
Methacryloyl Chloride	920-46-7	150
Methacryloyloxyethyl Isocyanate	30674-80-7	100
Methyl Acrylonitrile	126-98-7	250
Methylamine, Anhydrous	74-89-5	1000
Methyl Bromide	74-83-9	2500
Methyl Chloride	74-87-3	15000
Methyl Chloroformate	79-22-1	500
Methyl Ethyl Ketone Peroxide (concentration > 60%)	1338-23-4	5000
Methyl Fluoroacetate	453-18-9	100
Methyl Fluorosulfate	421-20-5	100
Methyl Hydrazine	60-34-4	100
Methyl Iodide	74-88-4	7500
Methyl Isocyanate	624-83-9	250
Methyl Mercaptan	74-93-1	5000
Methyl Vinyl Ketone	79-84-4	100
Methyltrichlorosilane	75-79-6	500
Nickel Carbonyl (Nickel Tetracarbonyl)	13463-39-3	150

CHEMICAL name	CAS*	TO**	CHEMICAL name	CAS*	TQ**	CHEMICAL name	CAS*	TO**
Nitric Acid (94.5% by weight or greater).....	7697-37-2	500	Perchloryl Fluoride.....	7616-94-6	5000	Sulfuric Anhydride (also called Sulfur Trioxide).....	7446-11-9	1000
Nitric Oxide.....	10102-43-9	250	Peroxyacetic Acid (concentration >60% Acetic Acid; also called Peracetic Acid).....	79-21-0	1000	Tellurium Hexafluoride.....	7783-80-4	250
Nitroaniline (para Nitroaniline).....	100-01-6	5000	Phosgene (also called Carbonyl Chloride).....	75-44-5	100	Tetrafluoroethylene.....	116-14-3	5000
Nitromethane.....	75-52-5	2500	Phosphine (Hydrogen Phosphide).....	7803-51-2	100	Tetrafluorohydrazine.....	10036-47-2	5000
Nitrogen Dioxide.....	10102-44-0	250	Phosphorus Oxychloride (also called Phosphoryl Chloride).....	10025-87-3	1000	Tetramethyl Lead.....	75-74-1	1000
Nitrogen Oxides (NO; NO ₂ ; N ₂ O ₄ ; N ₂ O ₃).....	10102-44-0	250	Phosphorus Trichloride.....	7719-12-2	1000	Thionyl Chloride.....	7719-09-7	250
Nitrogen Tetroxide (also called Nitrogen Peroxide).....	10544-72-6	250	Phosphoryl Chloride (also called Phosphorus Oxychloride).....	10025-87-3	1000	Trichloro (chloromethyl) Silane.....	1558-25-4	100
Nitrogen Trifluoride.....	7783-54-2	5000	Propargyl Bromide.....	106-96-7	100	Trichloro (dichlorophenyl) Silane.....	27137-85-5	2500
Nitrogen Trioxide.....	10544-73-7	250	Propyl Nitrate.....	627-3-4	2500	Trichlorosilane.....	10025-78-2	5000
Oleum (65% to 80% by weight; also called Fuming Sulfuric Acid).....	8014-94-7	1000	Sarin.....	107-44-8	100	Trifluorochloroethylene.....	79-38-9	10000
Osmium Tetroxide.....	20816-12-0	100	Selenium Hexafluoride.....	7783-79-1	1000	Trimethoxysilane.....	2487-90-3	1500
Oxygen Difluoride (Fluorine Monoxide).....	7783-41-7	100	Stibine (Antimony Hydride).....	7803-52-3	500			
Ozone.....	10028-15-6	100	Sulfur Dioxide (liquid).....	7446-09-5	1000			
Pentaborane.....	19624-22-7	100	Sulfur Pentafluoride.....	5714-22-7	250			
Peracetic Acid (concentration >60% Acetic Acid; also called Peroxyacetic Acid).....	79-21-0	1000	Sulfur Tetrafluoride.....	7783-60-0	250			
Perchloric Acid (concentration >60% by weight).....	7601-90-3	5000	Sulfur Trioxide (also called Sulfuric Anhydride).....	7446-11-9	1000			
Perchloromethyl Mercaptan.....	594-42-3	150						

*Chemical Abstract Service Number.

**Threshold Quantity in Pounds (Amount necessary to be covered by this standard).

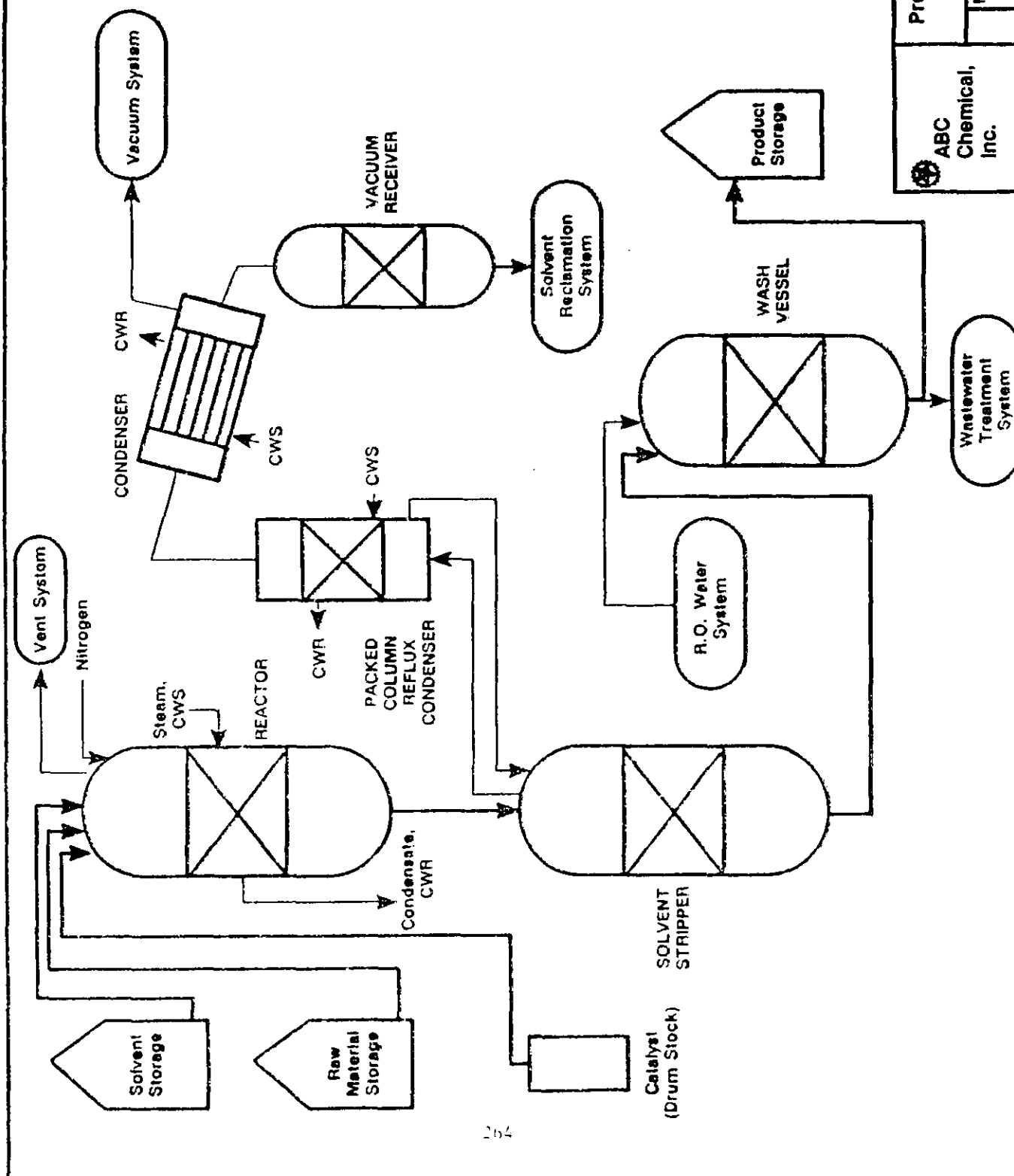
Appendix B to § 1910.119—Block Flow Diagram and Simplified Process Flow Diagram (Nonmandatory)

BILLING CODE 4310-26-M

The diagram illustrates a chemical process flow with the following components and streams:

- Raw Material Feed** enters the **Primary Reactor**.
- Product Gas** exits the **Primary Reactor**.
- Off Gas** and **Steam** are exchanged with the **Distillation** unit.
- Distillation** feeds into **Direct Contact Cooling** (labeled 1).
- Direct Contact Cooling** feeds into **Stripping**.
- Steam** enters the **Stripping** unit (labeled 3).
- Waste Water** exits the **Stripping** unit and goes to a **Pump/Tank** (labeled 2).
- Stripping** feeds into a **Compressor**.
- The **Compressor** feeds into a **Heat Exchanger**.
- The **Heat Exchanger** feeds into a **Condenser Primary Liquifier**.
- The **Condenser Primary Liquifier** feeds into a **Condenser Secondary Liquifier** (labeled 7).
- Waste Water** enters the **Condenser Secondary Liquifier**.
- The **Condenser Secondary Liquifier** feeds into a **Liquid Product Accumulation Tank** (labeled 6).
- The **Liquid Product Accumulation Tank** feeds into a **35 PSIG Storage Tank** (labeled 9).
- The **35 PSIG Storage Tank** feeds into a **100 PSIG Storage Tank** (labeled 8).
- The **100 PSIG Storage Tank** feeds into an **Evaporator** (labeled 10).
- Steam** enters the **Evaporator**.
- The **Evaporator** feeds into **Neutralization Disposal Tanks** (labeled 11).
- Gas Absorber** (labeled 5) feeds into the **Neutralization Disposal Tanks**.
- The **Neutralization Disposal Tanks** feed into a **Neutralization Scrubber** (labeled 12).
- Caustic** enters the **Neutralization Scrubber**.
- Waste Water** exits the **Neutralization Scrubber**.
- The **Neutralization Scrubber** feeds into **To Cooler**.
- The **Neutralization Disposal Tanks** also feed into **To Cooler**.
- To Cooler** feeds into the **Railroad Tank Cars** (labeled 13).
- The **Railroad Tank Cars** feed into **Product to Customer**.
- The **Railroad Tank Cars** also feed into **Product for Plant Use**.

EXAMPLE OF A PROCESS FLOW DIAGRAM



264

Appendix C to § 1910.119—Compliance Guidelines and Recommendations for Process Safety Management (Nonmandatory)

This appendix serves as a nonmandatory guideline to assist employers and employees in complying with the requirements of this section, as well as provides other helpful recommendations and information. Examples presented in this appendix are not the only means of achieving the performance goals in the standard. This appendix neither adds nor detracts from the requirements of the standard.

1. Introduction to Process Safety Management. The major objective of process safety management of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations which could expose employees and others to serious hazards. An effective process safety management program requires a systematic approach to evaluating the whole process. Using this approach the process design, process technology, operational and maintenance activities and procedures, nonroutine activities and procedures, emergency preparedness plans and procedures, training programs, and other elements which impact the process are all considered in the evaluation. The various lines of defense that have been incorporated into the design and operation of the process to prevent or mitigate the release of hazardous chemicals need to be evaluated and strengthened to assure their effectiveness at each level. Process safety management is the proactive identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failures in process, procedures or equipment.

The process safety management standard targets highly hazardous chemicals that have the potential to cause a catastrophic incident. This standard as a whole is to aid employers in their efforts to prevent or mitigate episodic chemical releases that could lead to a catastrophe in the workplace and possibly to the surrounding community. To control these types of hazards, employers need to develop the necessary expertise, experiences, judgement and proactive initiative within their workforce to properly implement and maintain an effective process safety management program as envisioned in the OSHA standard. This OSHA standard is required by the Clean Air Act Amendments as is the Environmental Protection Agency's Risk Management Plan. Employers, who merge the two sets of requirements into their process safety management program, will better assure full compliance with each as well as enhancing their relationship with the local community.

While OSHA believes process safety management will have a positive effect on the safety of employees in workplaces and also offers other potential benefits to employers (increased productivity), smaller businesses which may have limited resources available to them at this time, might consider alternative avenues of decreasing the risks associated with highly hazardous chemicals at their workplaces. One method which might be considered is the reduction in the

inventory of the highly hazardous chemical. This reduction in inventory will result in a reduction of the risk or potential for a catastrophic incident. Also, employers including small employers may be able to establish more efficient inventory control by reducing the quantities of highly hazardous chemicals on site below the established threshold quantities. This reduction can be accomplished by ordering smaller shipments and maintaining the minimum inventory necessary for efficient and safe operation. When reduced inventory is not feasible, then the employer might consider dispersing inventory to several locations on site. Dispersing storage into locations where a release in one location will not cause a release in another location is a practical method to also reduce the risk or potential for catastrophic incidents.

2. Employee Involvement in Process Safety Management. Section 304 of the Clean Air Act Amendments states that employers are to consult with their employees and their representatives regarding the employers efforts in the development and implementation of the process safety management program elements and hazard assessments. Section 304 also requires employers to train and educate their employees and to inform affected employees of the findings from incident investigations required by the process safety management program. Many employers, under their safety and health programs, have already established means and methods to keep employees and their representatives informed about relevant safety and health issues and employers may be able to adapt these practices and procedures to meet their obligations under this standard. Employers who have not implemented an occupational safety and health program may wish to form a safety and health committee of employees and management representatives to help the employer meet the obligations specified by this standard. These committees can become a significant ally in helping the employer to implement and maintain an effective process safety management program for all employees.

3. Process Safety Information. Complete and accurate written information concerning process chemicals, process technology, and process equipment is essential to an effective process safety management program and to a process hazards analysis. The compiled information will be a necessary resource to a variety of users including the team that will perform the process hazards analysis as required under paragraph (e); those developing the training programs and the operating procedures; contractors whose employees will be working with the process; those conducting the pre-startup reviews; local emergency preparedness planners; and insurance and enforcement officials.

The information to be compiled about the chemicals, including process intermediates, needs to be comprehensive enough for an accurate assessment of the fire and explosion characteristics, reactivity hazards, the safety and health hazards to workers, and the corrosion and erosion effects on the process equipment and monitoring tools. Current material safety data sheet (MSDS) information can be used to help meet this

requirement which must be supplemented with process chemistry information including runaway reaction and over pressure hazards if applicable.

Process technology information will be a part of the process safety information package and it is expected that it will include diagrams of the type shown in Appendix B of this section as well as employer established criteria for maximum inventory levels for process chemicals; limits beyond which would be considered upset conditions; and a qualitative estimate of the consequences or results of deviation that could occur if operating beyond the established process limits. Employers are encouraged to use diagrams which will help users understand the process.

A block flow diagram is used to show the major process equipment and interconnecting process flow lines and show flow rates, stream composition, temperatures, and pressures when necessary for clarity. The block flow diagram is a simplified diagram.

Process flow diagrams are more complex and will show all main flow streams including valves to enhance the understanding of the process, as well as pressures and temperatures on all feed and product lines within all major vessels, in and out of headers and heat exchangers, and points of pressure and temperature control. Also, materials of construction information, pump capacities and pressure heads, compressor horsepower and vessel design pressures and temperatures are shown when necessary for clarity. In addition, major components of control loops are usually shown along with key utilities on process flow diagrams.

Piping and instrument diagrams (P&IDs) may be the more appropriate type of diagrams to show some of the above details and to display the information for the piping designer and engineering staff. The P&IDs are to be used to describe the relationships between equipment and instrumentation as well as other relevant information that will enhance clarity. Computer software programs which do P&IDs or other diagrams useful to the information package, may be used to help meet this requirement.

The information pertaining to process equipment design must be documented. In other words, what were the codes and standards relied on to establish good engineering practice. These codes and standards are published by such organizations as the American Society of Mechanical Engineers, American Petroleum Institute, American National Standards Institute, National Fire Protection Association, American Society for Testing and Materials, National Board of Boiler and Pressure Vessel Inspectors, National Association of Corrosion Engineers, American Society of Exchange Manufacturers Association, and model building code groups.

In addition, various engineering societies issue technical reports which impact process design. For example, the American Institute of Chemical Engineers has published technical reports on topics such as two phase flow for venting devices. This type of

technically recognized report would constitute good engineering practice.

For existing equipment designed and constructed many years ago in accordance with the codes and standards available at that time and no longer in general use today, the employer must document which codes and standards were used and that the design and construction along with the testing, inspection and operation are still suitable for the intended use. Where the process technology requires a design which departs from the applicable codes and standards, the employer must document that the design and construction is suitable for the intended purpose.

4. Process Hazard Analysis. A process hazard analysis (PHA), sometimes called a process hazard evaluation, is one of the most important elements of the process safety management program. A PHA is an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing or handling of highly hazardous chemicals. A PHA provides information which will assist employers and employees in making decisions for improving safety and reducing the consequences of unwanted or unplanned releases of hazardous chemicals. A PHA is directed toward analyzing potential causes and consequences of fires, explosions, releases of toxic or flammable chemicals and major spills of hazardous chemicals. The PHA focuses on equipment, instrumentation, utilities, human actions (routine and nonroutine), and external factors that might impact the process. These considerations assist in determining the hazards and potential failure points or failure modes in a process.

The selection of a PHA methodology or technique will be influenced by many factors including the amount of existing knowledge about the process. Is it a process that has been operated for a long period of time with little or no innovation and extensive experience has been generated with its use? Or, is it a new process or one which has been changed frequently by the inclusion of innovative features? Also, the size and complexity of the process will influence the decision as to the appropriate PHA methodology to use. All PHA methodologies are subject to certain limitations. For example, the checklist methodology works well when the process is very stable and no changes are made, but it is not as effective when the process has undergone extensive change. The checklist may miss the most recent changes and consequently the changes would not be evaluated. Another limitation to be considered concerns the assumptions made by the team or analyst. The PHA is dependent on good judgement and the assumptions made during the study need to be documented and understood by the team and reviewer and kept for a future PHA.

The team conducting the PHA need to understand the methodology that is going to be used. A PHA team can vary in size from two people to a number of people with varied operational and technical backgrounds. Some team members may only be a part of the team for a limited time. The team leader needs to be fully knowledgeable in the proper

implementation of the PHA methodology that is to be used and should be impartial in the evaluation. The other full or part time team members need to provide the team with expertise in areas such as process technology, process design, operating procedures and practices, including how the work is actually performed, alarms, emergency procedures, instrumentation, maintenance procedures, both routine and nonroutine tasks, including how the tasks are authorized, procurement of parts and supplies, safety and health, and any other relevant subject as the need dictates. At least one team member must be familiar with the process.

The ideal team will have an intimate knowledge of the standards, codes, specifications and regulations applicable to the process being studied. The selected team members need to be compatible and the team leader needs to be able to manage the team, and the PHA study. The team needs to be able to work together while benefiting from the expertise of others on the team or outside the team, to resolve issues, and to forge a consensus on the findings of the study and recommendations.

The application of a PHA to a process may involve the use of different methodologies for various parts of the process. For example, a process involving a series of unit operations of varying sizes, complexities, and ages may use different methodologies and team members for each operation. Then the conclusions can be integrated into one final study and evaluation. A more specific example is the use of a checklist PHA for a standard boiler or heat exchanger and the use of a Hazard and Operability PHA for the overall process. Also, for batch type processes like custom batch operations, a generic PHA of a representative batch may be used where there are only small changes of monomer or other ingredient ratios and the chemistry is documented for the full range and ratio of batch ingredients. Another process that might consider using a generic type of PHA is a gas plant. Often these plants are simply moved from site to site and therefore, a generic PHA may be used for these movable plants. Also, when an employer has several similar size gas plants and no sour gas is being processed at the site, then a generic PHA is feasible as long as the variations of the individual sites are accounted for in the PHA. Finally, when an employer has a large continuous process which has several control rooms for different portions of the process such as for a distillation tower and a blending operation, the employer may wish to do each segment separately and then integrate the final results.

Additionally, small businesses which are covered by this rule, will often have processes that have less storage volume, less capacity, and less complicated than processes at a large facility. Therefore, OSHA would anticipate that the less complex methodologies would be used to meet the process hazard analysis criteria in the standard. These process hazard analyses can be done in less time and with a few people being involved. A less complex process generally means that less data, P&IDs, and

process information is needed to perform a process hazard analysis.

Many small businesses have processes that are not unique, such as cold storage lockers or water treatment facilities. Where employer associations have a number of members with such facilities, a generic PHA, evolved from a checklist or what-if questions, could be developed and used by each employer effectively to reflect his/her particular process; this would simplify compliance for them.

When the employer has a number of processes which require a PHA, the employer must set up a priority system of which PHAs to conduct first. A preliminary or gross hazard analysis may be useful in prioritizing the processes that the employer has determined are subject to coverage by the process safety management standard. Consideration should first be given to those processes with the potential of adversely affecting the largest number of employees. This prioritizing should consider the potential severity of a chemical release, the number of potentially affected employees, the operating history of the process such as the frequency of chemical releases, the age of the process and any other relevant factors. These factors would suggest a ranking order and would suggest either using a weighing factor system or a systematic ranking method. The use of a preliminary hazard analysis would assist an employer in determining which process should be of the highest priority and thereby the employer would obtain the greatest improvement in safety at the facility.

Detailed guidance on the content and application of process hazard analysis methodologies is available from the American Institute of Chemical Engineers' Center for Chemical Process Safety (see appendix D).

5. Operating Procedures and Practices. Operating procedures describe tasks to be performed, data to be recorded, operating conditions to be maintained, samples to be collected, and safety and health precautions to be taken. The procedures need to be technically accurate, understandable to employees, and revised periodically to ensure that they reflect current operations. The process safety information package is to be used as a resource to better assure that the operating procedures and practices are consistent with the known hazards of the chemicals in the process and that the operating parameters are accurate. Operating procedures should be reviewed by engineering staff and operating personnel to ensure that they are accurate and provide practical instructions on how to actually carry out job duties safely.

Operating procedures will include specific instructions or details on what steps are to be taken or followed in carrying out the stated procedures. These operating instructions for each procedure should include the applicable safety precautions and should contain appropriate information on safety implications. For example, the operating procedures addressing operating parameters will contain operating instructions about pressure limits, temperature ranges, flow rates, what to do when an upset condition

occurs, what alarms and instruments are pertinent if an upset condition occurs, and other subjects. Another example of using operating instructions to properly implement operating procedures is in starting up or shutting down the process. In these cases, different parameters will be required from those of normal operation. These operating instructions need to clearly indicate the distinctions between startup and normal operations such as the appropriate allowances for heating up a unit to reach the normal operating parameters. Also the operating instructions need to describe the proper method for increasing the temperature of the unit until the normal operating temperature parameters are achieved.

Computerized process control systems add complexity to operating instructions. These operating instructions need to describe the logic of the software as well as the relationship between the equipment and the control system; otherwise, it may not be apparent to the operator.

Operating procedures and instructions are important for training operating personnel. The operating procedures are often viewed as the standard operating practices (SOPs) for operations. Control room personnel and operating staff, in general, need to have a full understanding of operating procedures. If workers are not fluent in English then procedures and instructions need to be prepared in a second language understood by the workers. In addition, operating procedures need to be changed when there is a change in the process as a result of the management of change procedures. The consequences of operating procedure changes need to be fully evaluated and the information conveyed to the personnel. For example, mechanical changes to the process made by the maintenance department (like changing a valve from steel to brass or other subtle changes) need to be evaluated to determine if operating procedures and practices also need to be changed. All management of change actions must be coordinated and integrated with current operating procedures and operating personnel must be oriented to the changes in procedures before the change is made. When the process is shut down in order to make a change, then the operating procedures must be updated before startup of the process.

Training in how to handle upset conditions must be accomplished as well as what operating personnel are to do in emergencies such as when a pump seal fails or a pipeline ruptures. Communication between operating personnel and workers performing work within the process area, such as nonroutine tasks, also must be maintained. The hazards of the tasks are to be conveyed to operating personnel in accordance with established procedures and to those performing the actual tasks. When the work is completed, operating personnel should be informed to provide closure on the job.

6. Employee Training. All employees, including maintenance and contractor employees, involved with highly hazardous chemicals need to fully understand the safety and health hazards of the chemicals and processes they work with for the protection of themselves, their fellow employees and the

citizens of nearby communities. Training conducted in compliance with § 1910.1200, the Hazard Communication standard, will help employees to be more knowledgeable about the chemicals they work with as well as familiarize them with reading and understanding MSDS. However, additional training in subjects such as operating procedures and safety work practices, emergency evacuation and response, safety procedures, routine and nonroutine work authorization activities, and other areas pertinent to process safety and health will need to be covered by an employer's training program.

In establishing their training programs, employers must clearly define the employees to be trained and what subjects are to be covered in their training. Employers in setting up their training program will need to clearly establish the goals and objectives they wish to achieve with the training that they provide to their employees. The learning goals or objectives should be written in clear measurable terms before the training begins. These goals and objectives need to be tailored to each of the specific training modules or segments. Employers should describe the important actions and conditions under which the employee will demonstrate competence or knowledge as well as what is acceptable performance.

Hands-on training where employees are able to use their senses beyond listening, will enhance learning. For example, operating personnel, who will work in a control room or at control panels, would benefit by being trained at a simulated control panel or panels. Upset conditions of various types could be displayed on the simulator, and then the employee could go through the proper operating procedures to bring the simulator panel back to the normal operating parameters. A training environment could be created to help the trainee feel the full reality of the situation but, of course, under controlled conditions. This realistic type of training can be very effective in teaching employees correct procedures while allowing them to also see the consequences of what might happen if they do not follow established operating procedures. Other training techniques using videos or on-the-job training can also be very effective for teaching other job tasks, duties, or other important information. An effective training program will allow the employee to fully participate in the training process and to practice their skill or knowledge.

Employers need to periodically evaluate their training programs to see if the necessary skills, knowledge, and routines are being properly understood and implemented by their trained employees. The means or methods for evaluating the training should be developed along with the training program goals and objectives. Training program evaluation will help employers to determine the amount of training their employees understood, and whether the desired results were obtained. If, after the evaluation, it appears that the trained employees are not at the level of knowledge and skill that was expected, the employer will need to revise the training program, provide retraining, or provide more frequent refresher training

sessions until the deficiency is resolved. Those who conducted the training and those who received the training should also be consulted as to how best to improve the training process. If there is a language barrier, the language known to the trainees should be used to reinforce the training messages and information.

Careful consideration must be given to assure that employees including maintenance and contract employees receive current and updated training. For example, if changes are made to a process, impacted employees must be trained in the changes and understand the effects of the changes on their job tasks (e.g., any new operating procedures pertinent to their tasks). Additionally, as already discussed the evaluation of the employee's absorption of training will certainly influence the need for training.

7 Contractors. Employers who use contractors to perform work in and around processes that involve highly hazardous chemicals, will need to establish a screening process so that they hire and use contractors who accomplish the desired job tasks without compromising the safety and health of employees at a facility. For contractors, whose safety performance on the job is not known to the hiring employer, the employer will need to obtain information on injury and illness rates and experience and should obtain contractor references. Additionally, the employer must assure that the contractor has the appropriate job skills, knowledge and certifications (such as for pressure vessel welders). Contractor work methods and experiences should be evaluated. For example, does the contractor conducting demolition work swing loads over operating processes or does the contractor avoid such hazards?

Maintaining a site injury and illness log for contractors is another method employers must use to track and maintain current knowledge of work activities involving contract employees working on or adjacent to covered processes. Injury and illness logs of both the employer's employees and contract employees allow an employer to have full knowledge of process injury and illness experience. This log will also contain information which will be of use to those auditing process safety management compliance and those involved in incident investigations.

Contract employees must perform their work safely. Considering that contractors often perform very specialized and potentially hazardous tasks such as confined space entry activities and nonroutine repair activities it is quite important that their activities be controlled while they are working on or near a covered process. A permit system or work authorization system for these activities would also be helpful to all affected employers. The use of a work authorization system keeps an employer informed of contract employee activities, and as a benefit the employer will have better coordination and more management control over the work being performed in the process area. A well run and well maintained process where employee safety is fully recognized will benefit all of those who work in the

facility whether they be contract employees or employees of the owner.

8. *Pre-Startup Safety.* For new processes, the employer will find a PHA helpful in improving the design and construction of the process from a reliability and quality point of view. The safe operation of the new process will be enhanced by making use of the PHA recommendations before final installations are completed. P&IDs are to be completed along with having the operating procedures in place and the operating staff trained to run the process before startup. The initial startup procedures and normal operating procedures need to be fully evaluated as part of the pre-startup review to assure a safe transfer into the normal operating mode for meeting the process parameters.

For existing processes that have been shutdown for turnaround, or modification, etc., the employer must assure that any changes other than "replacement in kind" made to the process during shutdown go through the management of change procedures. P&IDs will need to be updated as necessary, as well as operating procedures and instructions. If the changes made to the process during shutdown are significant and impact the training program, then operating personnel as well as employees engaged in routine and nonroutine work in the process area may need some refresher or additional training in light of the changes. Any incident investigation recommendations, compliance audits or PHA recommendations need to be reviewed as well to see what impacts they may have on the process before beginning the startup.

9. *Mechanical Integrity.* Employers will need to review their maintenance programs and schedules to see if there are areas where "breakdown" maintenance is used rather than an on-going mechanical integrity program. Equipment used to process, store, or handle highly hazardous chemicals needs to be designed, constructed, installed and maintained to minimize the risk of releases of such chemicals. This requires that a mechanical integrity program be in place to assure the continued integrity of process equipment. Elements of a mechanical integrity program include the identification and categorization of equipment and instrumentation, inspections and tests, testing and inspection frequencies, development of maintenance procedures, training of maintenance personnel, the establishment of criteria for acceptable test results, documentation of test and inspection results, and documentation of manufacturer recommendations as to meantime to failure for equipment and instrumentation.

The first line of defense an employer has available is to operate and maintain the process as designed, and to keep the chemicals contained. This line of defense is backed up by the next line of defense which is the controlled release of chemicals through venting to scrubbers or flares, or to surge or overflow tanks which are designed to receive such chemicals, etc. These lines of defense are the primary lines of defense or means to prevent unwanted releases. The secondary lines of defense would include fixed fire protection systems like sprinklers, water spray, or deluge systems, monitor guns, etc.,

dikes, designed drainage systems, and other systems which would control or mitigate hazardous chemicals once an unwanted release occurs. These primary and secondary lines of defense are what the mechanical integrity program needs to protect and strengthen these primary and secondary lines of defenses where appropriate.

The first step of an effective mechanical integrity program is to compile and categorize a list of process equipment and instrumentation for inclusion in the program. This list would include pressure vessels, storage tanks, process piping, relief and vent systems, fire protection system components, emergency shutdown systems and alarms and interlocks and pumps. For the categorization of instrumentation and the listed equipment the employer would prioritize which pieces of equipment require closer scrutiny than others. Meantime to failure of various instrumentation and equipment parts would be known from the manufacturers data or the employer's experience with the parts, which would then influence the inspection and testing frequency and associated procedures. Also, applicable codes and standards such as the National Board Inspection Code, or those from the American Society for Testing and Material, American Petroleum Institute, National Fire Protection Association, American National Standards Institute, American Society of Mechanical Engineers, and other groups, provide information to help establish an effective testing and inspection frequency, as well as appropriate methodologies.

The applicable codes and standards provide criteria for external inspections for such items as foundation and supports, anchor bolts, concrete or steel supports, guy wires, nozzles and sprinklers, pipe hangers, grounding connections, protective coatings and insulation, and external metal surfaces of piping and vessels, etc. These codes and standards also provide information on methodologies for internal inspection, and a frequency formula based on the corrosion rate of the materials of construction. Also, erosion both internal and external needs to be considered along with corrosion effects for piping and valves. Where the corrosion rate is not known, a maximum inspection frequency is recommended, and methods of developing the corrosion rate are available in the codes. Internal inspections need to cover items such as vessel shell, bottom and head; metallic linings; nonmetallic linings; thickness measurements for vessels and piping; inspection for erosion, corrosion, cracking and bulges; internal equipment like trays, baffles, sensors and screens for erosion, corrosion or cracking and other deficiencies. Some of these inspections may be performed by state or local government inspectors under state and local statutes. However, each employer needs to develop procedures to ensure that tests and inspections are conducted properly and that consistency is maintained even where different employees may be involved. Appropriate training is to be provided to maintenance personnel to ensure that they understand the preventive maintenance program procedures, safe practices, and the

proper use and application of special equipment or unique tools that may be required. This training is part of the overall training program called for in the standard.

A quality assurance system is needed to help ensure that the proper materials of construction are used, that fabrication and inspection procedures are proper, and that installation procedures recognize field installation concerns. The quality assurance program is an essential part of the mechanical integrity program and will help to maintain the primary and secondary lines of defense that have been designed into the process to prevent unwanted chemical releases or those which control or mitigate a release. "As built" drawings, together with certifications of coded vessels and other equipment, and materials of construction need to be verified and retained in the quality assurance documentation. Equipment installation jobs need to be properly inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job. The use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods need to be verified in the field. Also procedures for installation of safety devices need to be verified, such as the torque on the bolts on ruptured disc installations, uniform torque on flange bolts, proper installation of pump seals, etc. If the quality of parts is a problem, it may be appropriate to conduct audits of the equipment supplier's facilities to better assure proper purchases of required equipment which is suitable for its intended service. Any changes in equipment that may become necessary will need to go through the management of change procedures.

10. *Nonroutine Work Authorizations.* Nonroutine work which is conducted in process areas needs to be controlled by the employer in a consistent manner. The hazards identified involving the work that is to be accomplished must be communicated to those doing the work, but also to those operating personnel whose work could affect the safety of the process. A work authorization notice or permit must have a procedure that describes the steps the maintenance supervisor, contractor representative or other person needs to follow to obtain the necessary clearance to get the job started. The work authorization procedures need to reference and coordinate, as applicable, lockout/tagout procedures, line breaking procedures, confined space entry procedures and hot work authorizations. This procedure also needs to provide clear steps to follow once the job is completed in order to provide closure for those that need to know the job is now completed and equipment can be returned to normal.

11. *Managing Change.* To properly manage changes to process chemicals, technology, equipment and facilities, one must define what is meant by change. In this process safety management standard, change includes all modifications to equipment, procedures, raw materials and processing conditions other than "replacement in kind". These changes need to be properly managed by identifying and reviewing them prior to implementation of the change. For example,

the operating procedures contain the operating parameters (pressure limits, temperature ranges, flow rates, etc.) and the importance of operating within these limits. While the operator must have the flexibility to maintain safe operation within the established parameters, any operation outside of these parameters requires review and approval by a written management of change procedure.

Management of change covers such as changes in process technology and changes to equipment and instrumentation. Changes in process technology can result from changes in production rates, raw materials, experimentation, equipment unavailability, new equipment, new product development, change in catalyst and changes in operating conditions to improve yield or quality. Equipment changes include among others change in materials of construction, equipment specifications, piping pre-arrangements, experimental equipment, computer program revisions and changes in alarms and interlocks. Employers need to establish means and methods to detect both technical changes and mechanical changes.

Temporary changes have caused a number of catastrophes over the years, and employers need to establish ways to detect temporary changes as well as those that are permanent. It is important that a time limit for temporary changes be established and monitored since, without control, these changes may tend to become permanent. Temporary changes are subject to the management of change provisions. In addition, the management of change procedures are used to insure that the equipment and procedures are returned to their original or designed conditions at the end of the temporary change. Proper documentation and review of these changes is invaluable in assuring that the safety and health considerations are being incorporated into the operating procedures and the process.

Employers may wish to develop a form or clearance sheet to facilitate the processing of changes through the management of change procedures. A typical change form may include a description and the purpose of the change, the technical basis for the change, safety and health considerations, documentation of changes for the operating procedures, maintenance procedures, inspection and testing, P&IDs, electrical classification, training and communications, pre-startup inspection, duration if a temporary change, approvals and authorization. Where the impact of the change is minor and well understood, a check list reviewed by an authorized person with proper communication to others who are affected may be sufficient. However, for a more complex or significant design change, a hazard evaluation procedure with approvals by operations, maintenance, and safety departments may be appropriate. Changes in documents such as P&IDs, raw materials, operating procedures, mechanical integrity programs, electrical classifications, etc., need to be noted so that these revisions can be made permanent when the drawings and procedure manuals are updated. Copies of process changes need to be kept in an

accessible location to ensure that design changes are available to operating personnel as well as to PHA team members when a PHA is being done or one is being updated.

12. Investigation of Incidents. Incident investigation is the process of identifying the underlying causes of incidents and implementing steps to prevent similar events from occurring. The intent of an incident investigation is for employers to learn from past experiences and thus avoid repeating past mistakes. The incidents for which OSHA expects employers to become aware and to investigate are the types of events which result in or could reasonably have resulted in a catastrophic release. Some of the events are sometimes referred to as "near misses," meaning that a serious consequence did not occur, but could have.

Employers need to develop in-house capability to investigate incidents that occur in their facilities. A team needs to be assembled by the employer and trained in the techniques of investigation including how to conduct interviews of witnesses, needed documentation and report writing. A multidisciplinary team is better able to gather the facts of the event and to analyze them and develop plausible scenarios as to what happened, and why. Team members should be selected on the basis of their training, knowledge and ability to contribute to a team effort to fully investigate the incident. Employees in the process area where the incident occurred should be consulted, interviewed or made a member of the team. Their knowledge of the events form a significant set of facts about the incident which occurred. The report, its findings and recommendations are to be shared with those who can benefit from the information. The cooperation of employees is essential to an effective incident investigation. The focus of the investigation should be to obtain facts, and not to place blame. The team and the investigation process should clearly deal with all involved individuals in a fair, open and consistent manner.

13. Emergency Preparedness. Each employer must address what actions employees are to take when there is an unwanted release of highly hazardous chemicals. Emergency preparedness or the employer's tertiary (third) lines of defense are those that will be relied on along with the secondary lines of defense when the primary lines of defense which are used to prevent an unwanted release fail to stop the release. Employers will need to decide if they want employees to handle and stop small or minor incidental releases. Whether they wish to mobilize the available resources at the plant and have them brought to bear on a more significant release. Or whether employers want their employees to evacuate the danger area and promptly escape to a preplanned safe zone area, and allow the local community emergency response organizations to handle the release. Or whether the employer wants to use some combination of these actions. Employers will need to select how many different emergency preparedness or tertiary lines of defense they plan to have and then develop the necessary plans and procedures, and appropriately train employees in their emergency duties and

responsibilities and then implement these lines of defense.

Employers at a minimum must have an emergency action plan which will facilitate the prompt evacuation of employees due to an unwanted release of a highly hazardous chemical. This means that the employer will have a plan that will be activated by an alarm system to alert employees when to evacuate and, that employees who are physically impaired, will have the necessary support and assistance to get them to the safe zone as well. The intent of these requirements is to alert and move employees to a safe zone quickly. Delaying alarms or confusing alarms are to be avoided. The use of process control centers or similar process buildings in the process area as safe areas is discouraged. Recent catastrophes have shown that a large life loss has occurred in these structures because of where they have been sited and because they are not necessarily designed to withstand overpressures from shockwaves resulting from explosions in the process area.

Unwanted incidental releases of highly hazardous chemicals in the process area must be addressed by the employer as to what actions employees are to take. If the employer wants employees to evacuate the area, then the emergency action plan will be activated. For outdoor processes where wind direction is important for selecting the safe route to a refuge area, the employer should place a wind direction indicator such as a wind sock or pennant at the highest point that can be seen throughout the process area. Employees can move in the direction of cross wind to upwind to gain safe access to the refuge area by knowing the wind direction.

If the employer wants specific employees in the release area to control or stop the minor emergency or incidental release, these actions must be planned for in advance and procedures developed and implemented. Preplanning for handling incidental releases for minor emergencies in the process area needs to be done, appropriate equipment for the hazards must be provided, and training conducted for those employees who will perform the emergency work before they respond to handle an actual release. The employer's training program, including the Hazard Communication standard training is to address the training needs for employees who are expected to handle incidental or minor releases.

Preplanning for releases that are more serious than incidental releases is another important line of defense to be used by the employer. When a serious release of a highly hazardous chemical occurs, the employer through preplanning will have determined in advance what actions employees are to take. The evacuation of the immediate release area and other areas as necessary would be accomplished under the emergency action plan. If the employer wishes to use plant personnel such as a fire brigade, spill control team, a hazardous materials team, or use employees to render aid to those in the immediate release area and control or mitigate the incident, these actions are covered by § 1910.120, the Hazardous Waste Operations and Emergency Response

(HAZWOPER) standard. If outside assistance is necessary, such as through mutual aid agreements between employers or local government emergency response organizations, these emergency responders are also covered by HAZWOPER. The safety and health protections required for emergency responders are the responsibility of their employers and of the on-scene incident commander.

Responders may be working under very hazardous conditions and therefore the objective is to have them competently led by an on-scene incident commander and the commander's staff, properly equipped to do their assigned work safely, and fully trained to carry out their duties safely before they respond to an emergency. Drills, training exercises, or simulations with the local community emergency response planners and responder organizations is one means to obtain better preparedness. This close cooperation and coordination between plant and local community emergency preparedness managers will also aid the employer in complying with the Environmental Protection Agency's Risk Management Plan criteria.

One effective way for medium to large facilities to enhance coordination and communication during emergencies for on plant operations and with local community organizations is for employers to establish and equip an emergency control center. The emergency control center would be sited in a safe zone area so that it could be occupied throughout the duration of an emergency. The center would serve as the major communication link between the on-scene incident commander and plant or corporate management as well as with the local community officials. The communication equipment in the emergency control center should include a network to receive and transmit information by telephone, radio or other means. It is important to have a backup communication network in case of power failure or one communication means fails. The center should also be equipped with the plant layout and community maps, utility drawings including fire water, emergency lighting, appropriate reference materials such as a government agency notification list, company personnel phone list, SARA Title III reports and material safety data sheets, emergency plans and procedures manual, a listing with the location of emergency response equipment, mutual aid information, and access to meteorological or weather condition data and any dispersion modeling data.

14. Compliance Audits. Employers need to select a trained individual or assemble a trained team of people to audit the process safety management system and program. A small process or plant may need only one knowledgeable person to conduct an audit. The audit is to include an evaluation of the design and effectiveness of the process safety management system and a field inspection of the safety and health conditions and practices to verify that the employer's systems are effectively implemented. The audit should be conducted or lead by a person knowledgeable in audit techniques and who is impartial towards the facility or

area being audited. The essential elements of an audit program include planning, staffing, conducting the audit, evaluation and corrective action, follow-up and documentation.

Planning in advance is essential to the success of the auditing process. Each employer needs to establish the format, staffing, scheduling and verification methods prior to conducting the audit. The format should be designed to provide the lead auditor with a procedure or checklist which details the requirements of each section of the standard. The names of the audit team members should be listed as part of the format as well. The checklist, if properly designed, could serve as the verification sheet which provides the auditor with the necessary information to expedite the review and assure that no requirements of the standard are omitted. This verification sheet format could also identify those elements that will require evaluation or a response to correct deficiencies. This sheet could also be used for developing the follow-up and documentation requirements.

The selection of effective audit team members is critical to the success of the program. Team members should be chosen for their experience, knowledge, and training and should be familiar with the processes and with auditing techniques, practices and procedures. The size of the team will vary depending on the size and complexity of the process under consideration. For a large, complex, highly instrumented plant, it may be desirable to have team members with expertise in process engineering and design, process chemistry, instrumentation and computer controls, electrical hazards and classifications, safety and health disciplines, maintenance, emergency preparedness, warehousing or shipping, and process safety auditing. The team may use part-time members to provide for the depth of expertise required as well as for what is actually done or followed, compared to what is written.

An effective audit includes a review of the relevant documentation and process safety information, inspection of the physical facilities, and interviews with all levels of plant personnel. Utilizing the audit procedure and checklist developed in the preplanning stage, the audit team can systematically analyze compliance with the provisions of the standard and any other corporate policies that are relevant. For example, the audit team will review all aspects of the training program as part of the overall audit. The team will review the written training program for adequacy of content, frequency of training, effectiveness of training in terms of its goals and objectives as well as to how it fits into meeting the standard's requirements, documentation, etc. Through interviews, the team can determine the employee's knowledge and awareness of the safety procedures, duties, rules, emergency response assignments, etc. During the inspection, the team can observe actual practices such as safety and health policies, procedures, and work authorization practices. This approach enables the team to identify deficiencies and determine where corrective actions or improvements are necessary.

An audit is a technique used to gather sufficient facts and information, including

statistical information, to verify compliance with standards. Auditors should select as part of their preplanning a sample size sufficient to give a degree of confidence that the audit reflects the level of compliance with the standard. The audit team, through this systematic analysis, should document areas which require corrective action as well as those areas where the process safety management system is effective and working in an effective manner. This provides a record of the audit procedures and findings, and serves as a baseline of operation data for future audits. It will assist future auditors in determining changes or trends from previous audits.

Corrective action is one of the most important parts of the audit. It includes not only addressing the identified deficiencies, but also planning, followup, and documentation. The corrective action process normally begins with a management review of the audit findings. The purpose of this review is to determine what actions are appropriate, and to establish priorities, timetables, resource allocations and requirements and responsibilities. In some cases, corrective action may involve a simple change in procedure or minor maintenance effort to remedy the concern. Management of change procedures need to be used, as appropriate, even for what may seem to be a minor change. Many of the deficiencies can be acted on promptly, while some may require engineering studies or in-depth review of actual procedures and practices. There may be instances where no action is necessary and this is a valid response to an audit finding. All actions taken, including an explanation where no action is taken on a finding, needs to be documented as to what was done and why.

It is important to assure that each deficiency identified is addressed, the corrective action to be taken noted, and the audit person or team responsible be properly documented by the employer. To control the corrective action process, the employer should consider the use of a tracking system. This tracking system might include periodic status reports shared with affected levels of management, specific reports such as completion of an engineering study, and a final implementation report to provide closure for audit findings that have been through management of change, if appropriate, and then shared with affected employees and management. This type of tracking system provides the employer with the status of the corrective action. It also provides the documentation required to verify that appropriate corrective actions were taken on deficiencies identified in the audit.

Appendix D to § 1910.119—Sources of Further Information (Nonmandatory)

1. Center for Chemical Process Safety, American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017, (212) 705-7319.
2. "Guidelines for Hazard Evaluation Procedures," American Institute of Chemical Engineers, 345 East 47th Street, New York, NY 10017.

3. "Guidelines for Technical Management of Chemical Process Safety," Center for Chemical Process Safety of the American Institute of Chemical Engineers; 345 East 47th Street, New York, NY 10017.

4. "Evaluating Process Safety in the Chemical Industry," Chemical Manufacturers Association; 2501 M Street NW, Washington, DC 20037.

5. "Safe Warehousing of Chemicals," Chemical Manufacturers Association; 2501 M Street NW, Washington, DC 20037.

6. "Management of Process Hazards," American Petroleum Institute (API Recommended Practice 750); 1220 L Street, N.W., Washington, D.C. 20005.

7. "Improving Owner and Contractor Safety Performance," American Petroleum Institute (API Recommended Practice 2220); API, 1220 L Street N.W., Washington, D.C. 20005.

8. Chemical Manufacturers Association (CMA's Manager Guide), First Edition, September 1991; CMA, 2501 M Street, N.W., Washington, D.C. 20037.

9. "Improving Construction Safety Performance," Report A-3, The Business

Roundtable; The Business Roundtable, 200 Park Avenue, New York, NY 10166. (Report includes criteria to evaluate contractor safety performance and criteria to enhance contractor safety performance).

10. "Recommended Guidelines for Contractor Safety and Health," Texas Chemical Council; Texas Chemical Council, 1402 Nueces Street, Austin, TX 78701-1534.

11. "Loss Prevention in the Process Industries," Volumes I and II; Frank P. Lees, Butterworth; London 1983.

12. "Safety and Health Program Management Guidelines," 1989; U.S. Department of Labor, Occupational Safety and Health Administration.

13. "Safety and Health Guide for the Chemical Industry," 1986, (OSHA 3091); U.S. Department of Labor, Occupational Safety and Health Administration; 200 Constitution Avenue, N.W., Washington, D.C. 20210.

14. "Review of Emergency Systems," June 1989; U.S. Environmental Protection Agency (EPA), Office of Solid Waste and Emergency Response, Washington, DC 20460.

15. "Technical Guidance for Hazards Analysis, Emergency Planning for Extremely

Hazardous Substances," December 1987; U.S. Environmental Protection Agency (EPA), Federal Emergency Management Administration (FEMA) and U.S. Department of Transportation (DOT), Washington, DC 20460.

16. "Accident Investigation * * * A New Approach," 1983, National Safety Council; 444 North Michigan Avenue, Chicago, IL 60611-3991.

17. "Fire & Explosion Index Hazard Classification Guide," 6th Edition, May 1987, Dow Chemical Company; Midland, Michigan 48674.

18. "Chemical Exposure Index," May 1988, Dow Chemical Company; Midland, Michigan 48674.

Editorial Note: This reprint incorporates a correction document published in the *Federal Register* on March 4, 1992.

[FR Doc. 92-3917 Filed 2-21-92; 8:45 am]

BILLING CODE 4510-26-M