Process Safety Management (PSM)

General Awareness Training

By

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This book is intended to provide the reader with a basic general awareness of the Occupational Safety and Health Administration (OSHA) Process Safety Management Standard (PSM).

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Chapter 1 – Why PSM Is Needed?

How did the PSM standard evolve?

The PSM standard started from previous chemical plant incidents that resulted in the deaths of several employees.

The following table illustrates some of the previous incidents that drove the need for OSHA to create the PSM standard.

Year	Location	Brief Description
1984	Bhopal, India	Methyl isocyanate gas leak. 3,800 deaths in local community. **Root Cause:** Process Hazard Analysis.
1989	Pasadena, Texas	Release of ethylene/propylene lead to explosion. 23 deaths and 130 injuries. **Root Cause:** Mechanical Integrity, Training, Hot Work and Contractors
1990	Channelview, Texas	Explosion of storage tank. 21 deaths. **Root Cause:** Mechanical Integrity and Process Hazard Analyses

NOTE: The standard is 29 CFR.1910.119

So, what is Process Safety Management?

Process Safety Management (PSM) is a program that involves managers, employees and contract workers, with the purpose of minimizing

uncontrolled change from design and/or operating intent at their facility or plant.

Therefore, the objective of the PSM standard is to prevent unwanted releases of hazardous chemicals into locations, which could expose employees and others to serious hazards or disaster.

How do you know if your facility requires a PSM program?
If your process involves a chemical at or above the specified threshold quantities listed in Appendix A of 29 CFR 1910.119.

OR

If your process involves a flammable liquid or gas on site in one location, in a quantity of 10,000 pounds (4535.9 kg).

Then a PSM Program is required!

But what is a Process?

A process is 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.

What is involved with a PSM program?

The OSHA PSM standard requires the implementation of 14 elements in a PSM program. OSHA determined from the root causes of previous catastrophic incidents, that the proper implementation of 14 elements would prevent future events.

The Fourteen Elements of PSM are:

1. Employee Participation
2. Process Safety Information
3. Process Hazard Analyses
4. Operating Procedures
5. Training
6. Contractors
7. Pre-Startup Safety Review
8. Mechanical Integrity
9. Hot Work Permits
10. Management of Change
11. Incident Investigations
12. Emergency Planning and Response
13. Compliance Audits
14. Trade Secrets

The following chapters will provide a little insight into these 14 elements of the PSM standard.

Chapter 2 – Employee Participation

For a PSM program to be successful, it must involve managers, hourly employees, contract workers , etc.
This goes along with the saying that "Two Heads Are Better Than One." Plus a facilities engineers and operators have a wealth of knowledge of what can go wrong with a process.

Employers shall develop a written plan to identify the individual responsible for the management of the program, how employees can be informed about it, and how suggestions can be submitted for improvement.

It is extremely important that contractor employees be included in the development of the PSM program. Previous incidents determined that the contractor was the root cause of the accident. In addition, the contractors can provide valuable information of what can go wrong with a process.

The employer must consult with employees on the development of the facilities or plants PSM program.

This communication of the information about the PSM program to employees can be accomplished by:

- Safety or staff meetings
- Emails

- Company newsletters
- Bulletin boards
- Company websites

In addition, information on the PSM program must be easily accessible to the employees.

Chapter 3 – Process Safety Information (PSI)

In order to properly conduct a Process Hazard Analysis on a process, information needs to be gathered concerning that process.

That information is called Process Safety Information and is
compiled about the process so employees can identify and understands its hazards.

This PSI information is broken down into three sections:

- Information pertaining to the hazards of the chemical.
- Information pertaining to the technology of the process.
- Information pertaining to the equipment of the process.

PSI must be compiled before conducting any Process Hazard Analysis.

Information Pertaining to the Hazards of the Chemical includes:

- Toxicity Information, such as:
  - Lethal Dose
  - Threshold Limit Value (TLV)
- Permissible Exposure Limits
- Physical Data, such as:
  - Boiling point
  - Vapor pressure
  - Vapor density
- Reactivity Data – how the it reacts with various other families of materials.
- Corrosivity Data – effect on containment materials.
- Thermal and Chemical Stability Data, such as:
  - Flammability limits
  - Flash point
  - Autoignition temperature
- Hazard Effects of Inadvertent Mixing of Different Materials

Commonly used references for the above information are:

- Safety Data Sheet (SDS)
- Threshold Limit Values and Biological

Exposure Indices published by the American Conference of Governmental Industrial Hygienists (ACGIH)

- National Institute for Occupational Safety And Health (NIOSH)/OSHA Pocket Guide to Chemical Hazards
- Hazardous Chemicals Desk Reference
- American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code
- American National Standards Institute (ANSI), Piping Code for Process Facilities
- American Petroleum Institute (API)

Information Pertaining to the Technology of the Chemical includes:

- Block Flow Diagram – simplified diagrams showing how the major components are connected in the process.
- Process Chemistry – the nature of the intended reactions needed for the process.
- Maximum Intended Inventory – for all storage tanks, reactors, drums and other vessels of the process.
- Safe Upper/Lower Limits – operating range for example:
  - Pressures
  - Temperatures
  - Flow rates
- Evaluation of consequences of deviations from the safe upper/lower limits, including those affecting safety and health of employees.

Information Pertaining to the Equipment and the Chemicals includes:

- Materials of Construction – which materials were used in the construction of the process.
- Piping and Instrument Diagrams that depict information such as:
  - All components
  - All piping
  - Flow directions
  - All valves
  - Symbols of each instrument
- Electrical Classifications – defined by National Fire Protection Association (NFPA) with respect to its potential for causing an electrically generated fire.
- Relief System Design and Design Basis – rationale for providing safety relief valves in certain locations, the selection of the size, establishment of set points, etc.
- Ventilation System Design and Design Basis, such as:
  - Air flow calculations
  - Equipment sizing calculations
- Design Codes and Standards Employed – used to form the design basis of the process.
- Material and Energy Balances for Processes Built after May 26, 1992.
- Safety Systems such as:
  - Lightning protection systems
  - Control interlocks
  - Systems designed to detect toxic or flammable materials

- Equipment complies with recognized and generally good engineering practices.
- Equipment designed/constructed to codes/standards no longer in general use, employer shall determine/document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

Chapter 4 – Process Hazard Analysis (PHA)

The PHA is extremely important since it is an effort to identify and analyze the possible hazard scenarios within a process.

The PHA will basically look for:

- Potential causes and consequences of fires, explosions and toxic releases.
- Equipment failures, human errors and external events that may cause accidents.

OSHAs PSM standard dictate that the following methodologies can be used to identify and analyze the possible hazards:

- **What-If** – Uses "What If" questions, such as "What if water enters the process?"
- **Checklist** – Prepared questions to stimulate discussion about the hazards of the process. A question could be "Where can water enter the process?"
- **What-If/Checklist** – combination of What If/Checklist
- **Hazard and Operability Study (HAZOP)** - Investigates each element of a system for all of the ways in which important parameters can deviate from the intended design conditions to create hazards and operability problems.
- **Failure Modes and Effects Analysis (FMEA)** - looks at all the components of a system to see how it can fail and what would the effect of this failure have on downstream of this system.
- **Fault Tree Analysis** - A graphical, model, which shows an undesired top event and then all the lower level events that have to occur in order to achieve the undesired top event. It uses Boolean logic to combine these lower level events to lead up to the undesired top event.
- Other Methods are Acceptable with OSHA approval.

According to OSHAs PSM standard, the PHA must address the following:

- **Hazards of the process** – examples are fire and explosion, toxic releases, etc.
- **Identification of any previous incidents** – lessons learned from incidents can be analyzed. Could use incidents from similar processes.
- **Engineering controls** – examples could be ventilation, exhausts, etc.
- **Administrative controls** – examples could be minimizing the number of personnel in the vicinity of a hazardous operation.
- **Consequences of failure** of engineering and administrative controls – what happens when these controls fail?
- **Facility siting** – looks at the impacts to structures, equipment, and nearby personnel if a fire and explosion or the release of toxic substances.
- **Human Factors** – looks at operator intervention with the process
- **Qualitative evaluation** of range of the possible safety and health effects of failure of controls on employees in the workplace
    - A severity, likelihood and risk-ranking scheme could be used.

Therefore, the PHA must identify:

- All credible causes and consequences for hazard scenarios
- Include the causes of previous incidents
- All safeguards for the process

OSHA requires that a team approach be used when performing a PHA. For a PHA team:

- One member must have knowledge of the methodology used,
- One member must have experience and knowledge specific to the process,
- One member must have expertise in engineering and process operations.

The PHA team could also generate recommendations to make the process safer. If this happens, then the employer must establish a system to:

- Address and resolve recommendations in a timely manner
- Document resolutions and actions taken
- Written schedule for completion of actions
- Communicate actions to employees whose work may be affected

In order to keep the PHAs current, they must be revalidated every 5 years and will:

- Use same team approach as when PHA was initially completed
- Ensures PHA is still consistent with the current process and that should include modifications.

NOTE: All revisions of the PHA must be kept on file for the entire life of the process.

Chapter 5 – Operating Procedures

Another important element for safe operation of a process is the establishment of operating procedures.

OSHA requires that operating procedures provide clear instructions for safely operating the process. Make sense doesn't it?

Operating procedures must address ten steps for the operating phase of a process. They are:

- Initial startup
- Normal operations
- Temporary operations
- Emergency shutdown
- Emergency operations
- Normal shutdown
- Startup following a turnaround or shutdown
- Operating limits (pressures, flow rates, temperatures)
- Safety and health considerations
- Safety systems and their functions (example: Lightning protection systems, Control interlock, or Systems designed to detect toxic or flammable materials)

Operating procedures must also implement safe work practices:

- Lockout/Tagout (29 CFR 1910.147)
- Confined space entry (29 CFR 1910.146)
- Opening process equipment or piping

- Control over facility entrance for non-essential employees

In order to minimize the risk of operating procedures being the cause of an incident, they must be annually certified that they are current and accurate with the process.

Operating procedures must also be made accessible to employees that work the process.

NOTE: While processing the Space Shuttle for launch, NASA requirements dictated that the operators of the processes have a hard copy of their operating procedures when performing work. This reduced the risk of steps being missed and reduced the likelihood of an incident occurring. There was also a process in place for traceability to identify which operator performed a task that assisted with incident investigations.

Chapter 6 - Training

Employees operating the process must receive initial and refresher training. Employees that are improperly trained a process increases the risk of an incident.

Initial Training - Employees shall be trained in an overview of the process and in the operating procedures, which includes:

- Emphasis on the specific safety and health hazards,
- Emergency operations including shutdown,
- Safe work practices

Refresher Training - Shall be provided at least every three years at the minimum, to assure the employee understands and adheres to the current operating procedures of the process.

The employer shall consult with employees to determine the frequently of refresher training. More frequent training could be needed or requested by employees.

Just like everything else, documentation must be kept to prove the employee received and understood the training. So the documentation shall contain:

- The identity of the employee,
- The date of training,

- The means to verify that the employee understood the training

Chapter 7 – Contractors

This element applies to contractors performing maintenance, repair, turnaround, major renovation or specialty work on or adjacent to a covered process.

It is good practice to screen and hire contractors that perform work safely and have good established safety records.

Contractors should also implement their own safety programs.

For a PSM process, here are OSHAs requirements for employer responsibilities with contractors:

- Obtain and evaluate information regarding the contractor's safety performance programs.
- Inform contractor employees of known potential fire, explosion or toxic release hazards related to their work and process.
- Explain to contractor employees applicable provisions of your emergency action plan.

- Develop and implement safe work practices to control entrance, presence and exit of contractor employees.
- Periodically evaluate the performance of contractor employees.
- Maintain contractor employee injury and illness log.

Here are OSHAs requirements for contractor responsibilities with their employees:

- Assure each employee is trained in practices necessary to safely perform their job.
- Assure each employee is instructed in the known potential fire, explosion, or toxic release hazards and the applicable provisions of the emergency action plan.
- Document that each employee received and understood the training required. Prepare a record, which identifies the employee, date of training and means used to verify employee understood the training.
- Assure employee follows the safety rules of the facility.
- Advise employee of any unique hazards presented by employer's work or of any hazards found by employer's work.

Chapter 8 – Pre-Startup Safety Review (PSSR)

All processes will go through modifications. So when a modification occurs to a process and is significant enough to require a change in PSI, then a PSSR is required.

The PSSR shall confirm that prior to the introduction of highly hazardous chemical into the process:

- Construction and equipment is in accordance to design specifications,
- Safety, operating, maintenance and emergency procedures are in place and adequate,
- For new facilities, a process hazard analysis had been performed and recommendations have been resolved or implemented before startup.

    - Resolved could mean the recommendation is waiting for budget for implementation or the recommended was rejected with rationale.
    - Here's were a priority system to prioritize the highest risk recommendations is helpful.

There are two possible way for a PSSR to be implemented:

- A PSSR procedure could be used, or
- A checklist could be used, or
- A PSSR form could be used

Chapter 9 – Mechanical Integrity

Many incidents occurred because the equipment of the process was not properly maintained.

Therefore, mechanical Integrity strives to ensure all equipment, piping, instrumentation, electrical systems and other items are designed, constructed and maintained to the appropriate standards thus decreasing the probability of failure.

Mechanical integrity applies to:

- Pressure vessels and storage tanks

- Piping systems including valves an other components
- Relief, vent systems and devices
- Emergency shutdown systems
- Controls
- Pumps

Written procedures must be established and implemented to maintain the on-going integrity of the equipment.

Treat mechanical integrity procedures like operating procedures to ensure they are accurate and current. Therefore it is highly recommended that mechanical integrity procedures are annually certified just like operating procedures.

Just like training for the operators of the process, employees involved in maintaining the equipment must also receive training. This training should include:

- The process and its hazards
- Maintenance procedures
- Safe work practices
- Proper use of equipment

Equipment must be inspected and tested and documented to include:

- Date
- Name of person performing the inspection or test
- Identification of equipment
- Test/Inspection description
- Test/Inspection results

There is nothing wrong with providing more data that required per OSHA.

Chapter 10 – Hot Work Permits

Hot work on a process involves:

- Cutting
- Brazing
- Grinding
- Electric or gas welding
- Burning

- Exposure of energized electrical conductors

Basically this means any activity on a process that creates a spark.

Therefore, it is important to determine the individual that will safe the vessel and/or piping prior to any hot work being performed.

So a hot work permit is required to be generated. This permit will ensure:

- Hazards associated with that task are communicated to personnel doing the work
- Safety precautions are taken to prevent fires or injuries to personnel performing the task

Hot work permit will document:

- Fire protection and prevention requirements
- Dates for the authorized work
- Equipment or object the hot work will be performed on

Chapter 11 – Management of Change (MOC)

Managing the changes performed on a process is

also important to reducing the risks of an incident occurring.

Management of change requires the establishment written procedures to manage changes to:

- Process chemicals
- Process technology
- Equipment
- Procedures
- Facilities that affect a covered process
- Drastic personnel changes to a PSM process
    - This could be loosing too many experienced personnel at once

The management of change does not apply to replacements in kind. And these are:

- Are replacements that satisfy the design specifications
- Change in flow rate, material type, valve type, etc have not changed.

The management of change also requires that the process safety information and operating procedures be updated accordingly. This is important during revalidations of the Process Hazard Analyses, as it ensures updated information for identifying hazardous scenarios.

Management of change must address the following information prior to the change:

- Date and originator
- Date for change
- Duration of change if temporary
- Description, location and purpose of change
- Technical basis for change
- Safety and health consideration
- Pre-startup inspection
- Authorization and approvals
- Training completed
- PSI updated

This information could be documented on a MOC form.

Chapter 12 – Incident Investigations

It's unfortunate, but incidents do occur.

Therefore, the employer shall investigate each incident, which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical.

The incident investigation shall be initiated as promptly as possible, but not later than **48 hours** following the incident.

Incident investigation team shall consist of:

- One person knowledgeable in the process
- Contract employee if incident involved their work
- People with knowledge and experience to thoroughly investigate and analyze the incident

The investigation of the incident **should not** place blame. It should find the facts! Employees could remain tight lipped about the facts if they know management is on a mission to terminate someone. But that does not mean termination could happen if the incident was intentional.

The incident investigation should be documented on a report and should include:

- Date of incident
- Date investigation began

- Description of the incident
- Factors that contributed to the incident
- Recommendations from the investigation
- Establish a system to promptly address and resolve incident findings and recommendations
- Document the resolutions and corrective actions

All investigation reports must be retained on file for five years

After the investigation report is completed, it shall be reviewed with all affected employees whose job tasks are relevant to the incident findings including contract if applicable. This provides these employees the opportunity for a lessons learned.

Can this incident occur in other areas of the plant or other plants owned by the company? If so, then inform those areas and other companies. It is important for sister companies to share incident report findings so these incidents will not be repeated at other facilities and plants.

Chapter 13 – Emergency Planning and Response

Employers shall establish and implement an emergency action plan per 29 CFR 1910.38. Therefore, an emergency planning and response plan is required to be developed.

The emergency action and response plan at a minimum, must have procedures for:

- Reporting a fire or other emergency
- Emergency evacuation, including type of evacuation and exit route assignments
- Employees to remain to operate critical plant operations before they evacuate
- Accounting for all employees after evacuation
- Employees performing rescue or medical duties
- The name and job title of every employee who may be contacted by employees who need more information about the plan.

Emergency action plan must be in writing and kept in the workplace and made available to employees for review.

The employer must have and maintain an employee alarm system, which uses a distinctive signal for each purpose and complies with 29 CFR 1910.165.

Employee alarms per 29 CFR 1910.165 states that:

- Distinct signal to provide warning for emergency action or employee escape per emergency action plan
- Alarm shall be perceived above ambient noise or light
- Alarm shall be perceived in all work areas
- Employee must know reporting procedure - pull box, radio, telephone etc.
- Alarm tests every two months at a minimum.
- Back up alarm system should be installed if needed

Like other documentation of a PSM program, an emergency planning and response plan must be reviewed with each employee covered by the plan. It is recommended that the plan be

reviewed annually to ensure the plan is accurate and current.

Chapter 14 – Compliance Audits

To ensure that a PSM program is on track, a compliance audit is required every three years.

This audit will basically verify that the PSM procedures are adequate and being followed. It goes with the old saying, *"Write down what you do and do what you wrote down."*

This compliance audit is geared to ensure that a PSM program is complying with the requirement of OSHAs PSM standard.

In regards to the audit team, one person must have knowledge of the process being audited. And of course one person with extensive knowledge of OSHA PSM program is also important and recommended. That would prevent inaccurate audit findings to be generated.

After the audit is completed, a report should be generated to document the findings of the audit. Later, the audit report should:

- Document appropriate response to each audit finding.
- Document when deficiencies have been corrected.

OSHA requires that an employer retain two most recent compliance audit reports. Most companies keep all audit reports for the life of the PSM process.

Chapter 15 – Trade Secrets

A trade secret could be a formula, device, pattern or compilation of information used in one's business and provides them the opportunity for advantage over competitors.

OSHA requires that employers shall make trade secret information available to:

- Compile PSI
- Assist the development of PHAs
- Developing operating procedures
- Individuals involved with incident investigations, emergency planning and compliance audits

Failure of providing trade secrets could prevent the identification of some possible hazardous scenarios.

Conclusion

As you can see, proper implementation of OSHAs PSM standard is extremely important for the prevention of a catastrophic day.

But proper implementation cannot be accomplished without full upper management support.

Here are some OSHA fines concerning PSM violations during 2012:

Middleton, Mass., manufacturer pays $600,000 in fines, takes corrective steps following legal action by US Labor Department after 2011 explosion.

Labor Department's OSHA cites OPC Polymers in Columbus, Ohio, for process safety management program deficiencies; fines exceed $138,000.

For those of you that desire to become more knowledgeable, conduct an Internet search on "PSM Training" and numerous companies that specialize in more detailed training will show up in the results.

Proposed Changes to the Standard

On August 1, 2013, President Obama signed Executive Order 13659 entitled *Improving Chemical Facility Safety and Security* and this will have some changes to the PSM Standard.

These changes were the result of some recent uncontrolled releases of highly hazardous chemicals, and major incidents since the PSM Standard became effective in 1993. Some of these releases or incidents are:

- On April 23, 2004, an explosion and fire at the Formosa Plastics in Illiopolis, Illinois killed five workers and injured three others.
- On March 23, 2005, 15 workers died and more than 170 other were injured at the BP Refinery in Texas City, Texas.
- On April 2, 2010, seven workers were killed at the Tesoro refinery in Anacortes, Washington.
- On April 17, 2013, 15 people were killed at the West Fertilizer Company in West, Texas.

So because of these incidents, the PSM Standard is in need of being modernized. There are approximately fourteen proposed changes to the PSM Standard:

1. Clarifying the PSM exemption for atmospheric tanks.
2. Clarifying the PSM exemption for Oil and Gas-Well Drilling and Servicing.
3. Clarifying the PSM exemption for Oil and Gas-Production Facilities.
4. Expanding PSM Coverage and requirements for reactivity hazards.
5. Updating the list of highly hazardous chemicals in Appendix A of the PSM Standard.
6. Revising the PSM Standard to require additional management-system elements.
7. Require the evaluation of updates to applicable Recognized and Generally Accepted Good Engineering Practices RAGAGEP.

8. Clarifying the PSM Standard by adding the definition of RAGAGEP.
9. Expanding to cover the mechanical integrity of any safety critical equipment.
10. Clarifying the standard with the explicit requirement that Employers Manage organizational changes.
11. Revising the standard to require coordination of Emergency Planning with Local Emergency-Response authorities.
12. Revise the standard to require third-party compliance audits.
13. Changing enforcement policy of the PSM exemption for retail facilities.
14. Changing enforcement policy of highly hazardous chemicals listed in Appendix A of the PSM Standard without specific concentrations.

These proposed changes could be become effective in the PSM Standard by 2016. This book will be updated to reflect those changes after they become effective.

Test Questions:

(Use a separate piece of paper to write down your answers).

1. What is the objective of PSM?

2. What chemical(s) in your facility or plant requires a PSM program to be in place?

3. Contractor employees do not have to be included in the development of your PSM program. True or False?

4. Name three methods where a PSM program can be communicated to the employees.

5. Information concerning the PSM program must be easily accessible to employees. True or False?

6. Name three good sources of information for the hazards of a chemical?

7. The PSI data does not have to be compiled prior to performing a Process Hazard Analysis. True of False?

8. Name two of the methodologies that can be used during the PHA?

9. Name two of the seven items that a PHA must address.

10. What's the minimum number of members that must be part of a PHA team?

11. Operating procedures do not have to provide clear instructions to employees.

12. Name one of the safe work practices that operating procedures must implement.

13. Operating procedures have to certified every three years. True or False?

14. Name four of the ten steps for the operating phase that an operating procedure must address.

15. Name two items that training documentation must contain.

16. Employees be provided refresher training least every _____ years at the minimum, to assure the employee understands and adheres to the current operating procedures of the process. Fill in the blank.

17. Name two of the responsibilities an employer has with contractors.

18. Name two of the responsibilities a contractor has with their employees.

19. A Pre-Startup Safety Review is required after modifying a process when the Process Safety Information is affected. True or False?

20. Name one of the items that a Pre-Startup Safety Review confirms prior to the introduction of the highly hazardous chemical.

21. Name two of the items that must be documented when inspecting or testing equipment.

22. Written procedures do not have to be written to maintain the integrity of the equipment. True or False?

23. Name one type of training that employees involved in maintaining the equipment must receive.

24. Name three activities that are considered hot work.

25. A Hot work permits does not ensure that the hazards associated with the task are

communicated to personnel performing the work. True or False?

26. Management of Change applies to replacement in kind? True or False?

27. Name two of the items that a MOC must address prior to any change.

28. Process safety information and operating procedures must be updated accordingly for the Management of Change. True or False?

29. The objective of an incident investigation is to place blame. True or False?

30. Name two of the items that an incident investigation report should document.

31. Incident investigation reports should be kept for how long?

32. The incident investigation shall be initiated as promptly as possible, but not later than ____ _____ following the incident. Fill in the two blanks.

33. Name two procedures that the Emergency Response and Action Plan must have:

34. The Emergency Response and Action Plan does not have to be kept in the workplace and made available for employee review. True or False?

35. A compliance audit must be performed every ____ _____. Fill in the two blanks.

36. The compliance audit must be conducted by at least one person knowledgeable in the process. True or False?

37. Copies of all compliance audits must be kept on file. True or False?

38. Trade secrets does not have to be available during the development of a PSM program. True or False?

39. What is a process?

40. Name all 14 elements of the PSM standard.

Test Answers:

1. What is the objective of PSM?

   The objective of PSM is to prevent unwanted releases of hazardous chemicals into locations), which could expose employees and others to serious hazards or disaster.

2. What chemical(s) in your facility or plant requires a PSM program to be in place?

   Check 29 CFR 1910.119(a)(1)(ii) and 29 CFR 1910.119 Appendix A to see if the chemicals used in your processes apply.

3. Contractor employees do not have to be included in the development of your PSM program.

   False! Contractor employees should be included in the development of the PSM program. They can provide valuable information on what can go wrong with a process.

4. Name three methods where a PSM program can be communicated to the employees.

Any of the three would be correct:

- Safety or staff meetings
- Emails
- Company newsletters
- Bulletin boards

5. Information concerning the PSM program must be easily accessible to employees.

True!

6. Name three good sources of information for the hazards of a chemical?

Any of the three will provide a good source for that information:

- Safety Data Sheet (SDS)
- Threshold Limit Values and Biological Exposure Indices published by the American Conference of Governmental Industrial Hygienists (ACGIH)
- National Institute for Occupational Safety And Health (NIOSH)/OSHA Pocket Guide to Chemical Hazards
- Hazardous Chemicals Desk Reference
- American Society of Mechanical Engineers (ASME), Boiler and Pressure Vessel Code
- American National Standards Institute (ANSI), Piping Code for Process Facilities
- American Petroleum Institute (API)

7. The PSI data does not have to be compiled prior to performing a Process Hazard Analysis.

False! The collection of the PSI is extremely important to properly conducting a Process Hazard Analysis.

8. Name two of the methodologies that can be used during the PHA?

Here are the methodologies accepted by OSHA for a PHA:

- What-If
- Checklist
- What-If/Checklist
- Hazard and Operability Study (HAZOP)
- Failure Modes and Effects Analysis (FMEA)
- Fault Tree Analysis
- Other Methods are Acceptable with OSHA approval

9. Name two of the seven items that a PHA must address.

Here are the seven items that a PHA must address:

- Hazards of the process
- Identification of any previous incidents

- Engineering and administrative controls
- Consequences of failure of engineering and administrative controls
- Facility siting
- Human Factors
- Qualitative evaluation of range of the possible safety and health effects of failure of controls on employees in the workplace

10. What's the minimum number of members that must be part of a PHA team? Three!
    - One member must have knowledge of the methodology used,
    - One member must have experience and knowledge specific to the process,
    - One member must have expertise in engineering and process operations.
    - Operating procedures do not have to provide clear instructions to employees.

11. Operating procedures do not have to provide clear instructions to employees.

    False! Operating procedures **MUST** be written to provide clear instructions to

employees. Unclear instructions could lead to confusion thus resulting in an incident.

12. Name one of the safe work practices that operating procedures must implement.

Here are the safe work practices that the operating procedures must implement:

- Lockout/Tagout (29 CFR 1910.147)
- Confined space entry (29 CFR 1910.146)
- Opening process equipment or piping
- Control over facility entrance

13. Operating procedures have to certified every three years.

14. Name four of the ten steps for the operating phase that an operating procedure must address.

Here are the ten steps for the operating phase of an operating procedure:

- Initial startup
- Normal operations
- Temporary operation
- Emergency shutdown
- Emergency operations
- Normal shutdown
- Startup following a turnaround or shutdown

- Operating limits
- Safety and health consideration
- Safety systems and their functions

15. Name two items that training documentation must contain.

Training documentation shall contain:

- The identity of the employee,
- The date of training,
- The means to verify that the employee understood the training

16. Employees be provided refresher training least every _____ years at the minimum, to assure the employee understands and adheres to the current operating procedures of the process.

The fill in the blank answer is **three.**

17. Name two of the responsibilities an employer has with contractors.
Here are the responsibilities an employer has with contractors:

- Obtain and evaluate information regarding the contractor's safety performance programs.
- Inform contractor employees of known potential fire, explosion or toxic release hazards related to their work and process.

- Explain to contractor employees applicable provisions of your emergency action plan.
- Develop and implement safe work practices to control entrance, presence and exit of contractor employees.
- Periodically evaluate the performance of contractor employees.
- Maintain contractor employee injury and illness log.

18. Name two of the responsibilities a contractor has with their employees.

    Here are the responsibilities a contractor has with their employees:

    - Assure each employee is trained in practices necessary to safely perform their job.

- Assure each employee is instructed in the known potential fire, explosion, or toxic release hazards and the applicable provisions of the emergency action plan.
- Document that each employee received and understood the training required. Prepare a record, which identifies the employee, date of training and means used to verify employee understood the training.
- Assure employee follows the safety rules of the facility.

Advise employee of any unique hazards presented by employer's work or of any hazards found by employer's work.

19. A Pre-Startup Safety Review is required after modifying a process when the Process Safety Information is affected.

True!

20. Name one of the items that a Pre-Startup Safety Review confirms prior to the introduction of the highly hazardous chemical.

Here are the items reviewed during a PSSR:

- Construction and equipment is in accordance to design specifications,
- Safety, operating, maintenance and emergency procedures are in place and adequate,
- For new facilities, a process hazard analysis had been performed and recommendations have been resolved or implemented before startup.

21. Name two of the items that must be documented when inspecting or testing equipment.

    Here are the items that must be documented:

    - Date
    - Name of person performing the inspection or test
    - Identification of equipment
    - Test/Inspection description
    - Test/Inspection results

22. Written procedures do not have to be written to maintain the integrity of the equipment.

    False! Written procedures **HAVE** to be written to maintain the integrity of the equipment.

23. Name one type of training that employees involved in maintaining the equipment must receive.

Here's the type of training that must be provided:

- The process and its hazards
- Maintenance procedures
- Safe work practices
- Proper use of equipment

24. Name three activities that are considered hot work.

Here are the activities considered to be hot work:

- Cutting
- Brazing
- Grinding
- Electric or gas welding
- Burning
- Exposure of energized electrical conductors

25. A Hot work permits does not ensure that the hazards associated with the task are communicated to personnel performing the work.

False! A hot work permit **DOES** ensure that the hazards associated with the task are communicated.

True or False?

26. Management of Change applies to replacement in kind? True or False?

False! Management of Change **DOES NOT** apply to replacement in kind.

27. Name two of the items that a MOC must address prior to any change.

Here are the items that a MOC must address:

- Date and originator
- Date for change
- Duration of change if temporary
- Description, location and purpose of change
- Technical basis for change
- Safety and health consideration
- Pre-startup inspection
- Authorization and approvals
- Training completed
- PSI updated

28. Process safety information and operating procedures must be updated accordingly for the Management of Change. True or False?

True!

29. The objective of an incident investigation is to place blame. True or False?

False! The objective is to find the facts of how the incident occurred so that it can be prevented in the future.

30. Name two of the items that an incident investigation report should document.

The incident investigation report should document the following:

- Date of incident
- Date investigation began
- Description of the incident
- Factors that contributed to the incident
- Recommendations from the investigation
- Establish a system to promptly address and resolve incident findings and recommendations
- Document the resolutions and corrective actions

31. Incident investigation reports should be kept for how long?

Five years.

32. The incident investigation shall be initiated as promptly as possible, but not later than ____ _____ following the incident. Fill in the two blanks.

48 hours.

33. Name two procedures that the Emergency Response and Action Plan must have:

Here are the procedures that the Emergency Response and Action Plan at a minimum must have:

- Reporting a fire or other emergency
- Emergency evacuation, including type of evacuation and exit route assignments
- Employees to remain to operate critical plant operations before they evacuate
- Accounting for all employees after evacuation
- Employees performing rescue or medical duties
- The name and job title of every employee who may be contacted by employees who need more information about the plan.

34. The Emergency Response and Action Plan does not have to be kept in the workplace and made available for employee review. True or False?

False! The plan **DOES** have to be kept in the workplace and made available.

35. A compliance audit must be performed every ____ _____. Fill in the two blanks.

Three years.

36. The compliance audit must be conducted by at least one person knowledgeable in the process. True or False?

True! It is also recommended that the audit also include someone knowledgeable about OSHAs PSM standard.

37. Copies of all compliance audits must be kept on file. True or False?

True! The two recent audits must be kept on file.

38. Trade secrets does not have to be available during the development of a PSM program. True or False?

False! Trade secrets must be made available during the development of the PSM program.

39. What is a process?

A process is 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.

40. Here are the 14 elements of the PSM standard:
    1. Employee Participation
    2. Process Safety Information
    3. Process Hazard Analyses
    4. Operating Procedures
    5. Training
    6. Contractors
    7. Pre-Startup Safety Review
    8. Mechanical Integrity
    9. Hot Work Permits
    10. Management of Change
    11. Incident Investigations
    12. Emergency Planning and Response
    13. Compliance Audits
    14. Trade Secrets