



Process Safety Management Guidelines for Small Business Compliance

OSHA 3132-DRAFT
2016

This document serves as a companion to the Process Safety Management Guide ([OSHA 3132](#)). This document does not cover the entire Process Safety Management standard, but only focuses on aspects of the standard that may be particularly helpful for small businesses. For a full compliance guide to PSM, please refer to OSHA 3132.¹ The full text of the PSM standard can be found on the OSHA webpage.²

Although all elements of the PSM standard apply to a PSM-covered small business, the following elements of the standard are most relevant to hazards associated with small businesses.

- Process Safety Information (PSI)
- Process Hazards Analysis (PHA)
- Training
- Mechanical Integrity (MI)
- Compliance Audits

Contents

Purpose.....	2
Applicability	3
Process Safety Information.....	4
Process Hazard Analysis.....	6
Training.....	8
Mechanical Integrity	9
Compliance Audit	10
APPENDIX A: Frequently Asked Questions	12
APPENDIX B: Examples of PHA Methodology	16

¹ <https://www.osha.gov/Publications/osha3132.pdf>

² https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760

Purpose

This guidance document is intended to help small businesses comply with OSHA's PSM standard. The PSM standard covers the management of hazards associated with highly hazardous chemicals (HHC) and establishes a comprehensive management program that integrates technologies, procedures, and management practices.

PSM is critically important to small businesses with highly hazardous chemicals. The required safety programs will help prevent fires, explosions, large chemicals spills, toxic gas releases, runaway chemical reactions, and other major incidents. Compliance with the PSM standard will help ensure that employees, contractors, facility visitors, and emergency responders are safe from hazards. Compliance will also benefit employers by minimizing damage to facility equipment and neighboring structures.

Managing HHCs is both required by OSHA standards and a good business practice.³ Catastrophic, chemical emergency events can and do occur among smaller companies. For example, one study estimates that employers with 1-25 employees are 47 times more likely to have a release and 17 times more likely to suffer an injury, per employee, than facilities with 1500 or more employees.⁴ These events can present serious risks of harm to the workers of small companies. In addition, small companies are often located in populated areas, and can pose a risk to the surrounding population and structures.

However, many small companies also have the potential to realize cost efficiencies and savings through improved safety practices, such as adopting more effective work practices, inventory controls, storage practices, and better handling, use and disposal procedures. Instituting targeted PSM training to improve and ensure employee competence, and, where possible and practical, finding alternative materials will help reduce hazards and associated risks. The approaches in this guidance document can help small business meet PSM needs without creating unnecessary, excessive resource burdens, and will help both employees and employers have a better understanding of the standard. However, this guidance document is not intended to be an exhaustive PSM compliance guide. For OSHA's general PSM guidance, see the Process Safety Management Guide ([OSHA 3132](#))⁵ and Appendix C of the PSM Rule.⁶

For additional resources, many industry organizations have materials that may contain guidance for specific industries and processes. Small businesses may find this guidance helpful in developing a PSM program. Such industries include, but are not limited to:

- Refrigeration – International Institute of Ammonia Refrigeration (IIR)
- Compressed Gasses – Compressed Gas Association (CGA)
- Petrochemical and Chemical Manufacturers – American Petroleum Institute (API)
- Chemical Manufacturers – Society of Chemical Manufacturers and Affiliates (SOCMA)

³ See “The Business Case for Process Safety”, downloadable from <http://www.aiche.org/ccps/about/business-case>

⁴ “Process Safety Issues For Small Businesses” M. Sam Mannan, Harry H. West, Nir Keren and T. Michael O'Connor, Mary Kay O'Connor Process Safety Center, 2004. IChemE

⁵ <https://www.osha.gov/Publications/osha3132.pdf>

⁶ https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9763

- Chemical Distribution/Supply-chain - National Association of Chemical Distributors (NACD)
- Agricultural Wholesalers – Agricultural Retailers Association (ARA) & The Fertilizer Institute (TFI)
- Chlorine users (water/wastewater treatment and others) – Chlorine Institute
- Explosives Manufacturing – Institute of Makers of Explosives (IME)
- Pyrotechnics – American Pyrotechnics Association
- Composite Manufacturers – American Composites Manufacturers Association (ACMA)
- Petrochemical Manufacturing – American Fuel and Petrochemical Manufacturers (AFPM)
- Dairy Manufacturing – The International Dairy Foods Association (IDFA)
- Paint Coating - American Coatings Association (ACA)

Applicability

The process safety management standard covers processes which involve a chemical at or above the specified threshold quantity (TQ) listed in Appendix A of the PSM standard.⁷ The PSM standard is also applicable to processes containing a flammable gas (as defined in 1910.1200(c)) or a flammable liquid with a flashpoint below 100 °F (37.8 °C) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more, except for:

- Retail facilities are exempted from PSM coverage.⁸
- 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 (HHC) covered by the PSM standard, or
- Flammable liquids with a flashpoint below 100 °F (37.8 °C) stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration. (Note: Atmospheric tanks are storage tanks designed to operate at pressures from atmospheric through 0.5 psig).
- Oil or gas well drilling or servicing operations
- Normally unoccupied remote facilities⁹

Although OSHA believes PSM will have a positive effect on the safety and health of employees and will offer potential benefits to employers, such as increased productivity, smaller businesses with limited resources might consider alternative approaches to decreasing HHC associated risks at their workplaces. One possible approach is reducing their HHC inventories to below the PSM TQ, by, for example, improving inventory control and accepting smaller deliveries. Inventory reduction may be useful in reducing the consequences of a catastrophic incident. When reduced

⁷ Calculation of TQ for mixtures is explained in an OSHA Letter of Interpretation at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=30848

⁸Process Safety Management of Highly Hazardous Chemicals and Application of the Retail Exemption (29 CFR 1910.119(a)(2)(i)):

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=29528

⁹ Letter of Interpretation:

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=22592

inventory is not feasible, the employer might consider dispersing inventory to several locations onsite such a way that a release in one location will not cause a release in another. However, reducing inventories below the PSM TQs does not relieve employers of their responsibility to provide safe and healthful working conditions for their employees under the OSH Act. Simply reducing inventories has no effect on the properties of the HHCs, which, depending on their use in a process, may still present hazards to workers. OSHA encourages employers handling HHCs who are not subject to the PSM standard to implement safety and health management systems to protect their employees.

Small businesses may contact OSHA's free On-site Consultation services, funded by OSHA, to help further determine their worksite hazards. To obtain free consultation services, go to OSHA's On-site Consultation webpage or call 1-800-321-OSHA (6742) and press number 4.

Examples of Small Business with potential PSM-covered processes

The following list contains examples of businesses potentially impacted by the PSM standard:

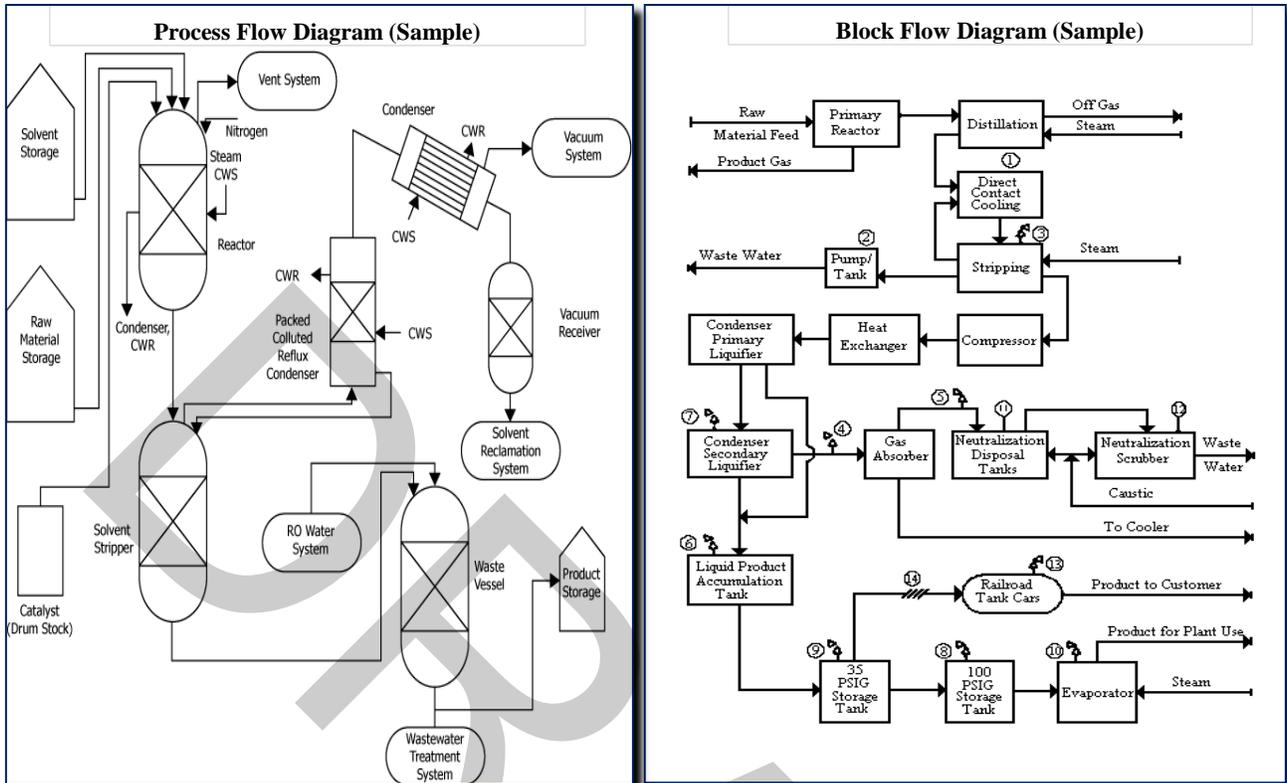
- Agricultural Chemicals (NAICS 1151)
- Asphalt Paving/Roofing Materials (NAICS 32412)
- Chemical and Allied Products (NAICS 4246)
- Chemical Products-Misc (NAICS 42469)
- Drugs (NAICS 4242)
- Fabricated Metal (NAICS 332)
- Fabricated Rubber Products, (NAICS 32521)
- Farm Supplies, Wholesale Trade (NAICS 4245)
- Food and Kindred Products (NAICS 31199)
- Industrial Organic Chemicals (NAICS 32519)
- Inorganic Chemical Manufacturing (NAICS 32518)
- Lumber, Wood Products (NAICS 321)
- Natural Gas Liquids (NAICS 2212)
- Paints, Varnishes, Enamels (NAICS 3255)
- Paper and Allied Products (NAICS 32229)
- Plastics Products-Miscellaneous (NAICS 3261)
- Plastics, Rubber, Cellulosics (NAICS 325211)
- Petroleum & Coal Products-Misc (NAICS 32419)
- Petroleum Refining (NAICS 32411)
- Primary Metals Industries (NAICS 331)
- Stone, Glass & Concrete (NAICS 21232, 3272, 3273)
- Textile Mill Products (NAICS 3131)
- Wholesale Trade (NAICS 42)

Process Safety Information

Employers are required to compile written process safety information (PSI) about highly hazardous chemicals and process equipment for all PSM covered processes. The correct compilation of PSI is critical to the correct implementation of all other aspects of the PSM standard and will help employers and the employees involved in operating the process identify and understand the hazards involved in their processes. PSI must include information on the hazards of the highly hazardous materials used or produced by the process, information on the technology of the process, and information on the equipment used in the process.

The PSI compiled by the employer must allow for an accurate assessment of fire and explosion characteristics, reactivity hazards, intermediate chemical properties, safety and health hazards to workers, and corrosion and erosion effects on the process equipment and monitoring tools.

Facilities are required by OSHA's Hazard communication standard to have Safety Data Sheets (SDSs) for hazardous chemicals in their workplaces, which often contain some of this



information. If an employer does not already have an SDS, it must obtain it from its chemical suppliers. Employers should confirm that the SDSs contain all of the information required under PSM. Employers must also understand reactive hazards, which can include runaway reactions, side reactions, and possible inadvertent interactions. For more information, the [CCPS Reactive Material Hazards Alert¹⁰](#) and the [NOAA/EPA/CCPS Chemical Reactivity Worksheet¹¹](#) are excellent resources on chemical reactivity hazards.

Process technology information must include diagrams (Block, Process Flow, or Piping and Instrument Diagrams (P&IDs) - as shown in Appendices B and C of the PSM standard), which will help users understand the process. For instance, a block flow (simplified) diagram and a process flow diagram (as depicted below) are used to show the major process equipment and interconnecting process flow lines. It also shows flow rates, stream composition, temperatures, and pressures when necessary for clarity. Additionally, an employer must establish maximum inventory level criteria for process chemicals (i.e., limits beyond which would be considered upset conditions) as well as a qualitative estimate of the consequences or results of deviation that could occur if operating beyond the established process limits.

Small businesses may find it easy to compile this information from existing sources and will usually require minimal staff time to compile.

Potential Existing PSI Sources	Potential applicability to PSI requirements
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¹⁰ <http://www.aiche.org/sites/default/files/docs/pages/reactmat.pdf>

¹¹ <http://www.aiche.org/ccps/resources/chemical-reactivity-worksheet-40>

Chemical shipping and receiving manifests, chemical delivery receipts, and associated SDSs	Physical data; Reactivity data; Corrosivity data; Thermal and chemical stability data; Hazardous effects of inadvertent mixing of different materials that could foreseeably occur
Equipment operations manual	Maximum intended inventory; Safe upper and lower limits for such items as temperatures, pressures, flows or compositions;
Manufacturer specifications	Materials of construction; Electrical classification; Relief system design and design basis; Ventilation system design; Safety Systems
Job hazard analyses and associated SDSs.	Toxicity information; Permissible exposure limits; Hazardous effects of inadvertent mixing of different materials that could foreseeably occur; An evaluation of the consequences of deviations, including those affecting the safety and health of employees;
Emergency planning information including assessments from, insurance audits, Fire Marshall inspections, local fire departments, or emergency responders	An evaluation of the consequences of deviations, including those affecting the safety and health of employees; Safety Systems
Related process documents	Electrical classification; Design codes and standards employed; Material and energy balances

Employers must also document that equipment complies with recognized and generally accepted good engineering (RAGAGEP). For more information on OSHA's interpretation of RAGAGEP see OSHA Memorandum, [RAGAGEP in Process Safety Management Enforcement](#).¹² Below is a non-exhaustive list of institutions that publish standards that may contain applicable RAGAGEP:

- American National Standards Institute (ANSI),
- American Petroleum Institution (API),
- American Society for Testing and Materials (ASTM)
- American Society of Mechanical Engineers (ASME),
- American Welding Society (AWS)

¹² https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=30785

- Center for Chemical Process Safety (CCPS),
- Compressed Gas Association (CGA),
- International Code Council (ICC),
- International Organization for Standardization (ISO),
- National Association of Corrosion Engineers (NACE), and
- National Fire Protection Association (NFPA).

Process Hazard Analysis

A process hazard analysis is an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing and handling of highly hazardous chemicals. A PHA team must be comprised of personnel that are knowledgeable in engineering and process operations, and have at least one person familiar with the process being evaluated and at least one person knowledgeable in the specific process hazard analysis methodology being used. The team analyzes potential causes and consequences of fires, explosions, releases of toxic or flammable chemicals, and major spills of hazardous chemicals. Following the conclusion of the PHA, the team may make recommendations for additional safeguards to adequately control identified hazards or to mitigate their effects. Safeguards may include inherently safer or passive approaches to hazard control, or suggesting new engineering controls (e.g., improved fire detection and suppression systems at facilities that store heat-sensitive chemicals) or administrative controls (e.g., new operating procedures, inventory control measures, separation of highly hazardous chemicals into different storage areas).

Small businesses will often have processes that have less storage volume, less capacity and may be less complicated than processes at a large facility. Therefore, OSHA anticipates that often less complex methodologies could be used to meet the process hazard analysis requirement in the standard. These process hazard analyses methodologies can be applied in less time than more complex approaches. For example, a less complex process could mean that less process data, fewer P&IDs, and less equipment information are needed to perform a process hazard analysis. As a result, simpler methodologies, such as What-if/Checklist, or similar may be appropriate for these processes.

However, some small businesses utilize complex processes. In these instances, employers must use a PHA methodology appropriate to the process, such as a Hazard Operability Study (HAZOP), or Failure Mode and Effects Analysis (FMEA). In such instances, small businesses may find that PHA contractor assistance is beneficial.

OSHA has provided examples of two different PHA methodologies that small businesses can review for information and potential use. These two PHA examples are contained in an OSHA [February 1, 2005 letter of interpretation](#)¹³ and in APPENDIX B of this document.

Many small businesses have processes that are not unique, such as ammonia refrigeration systems or water treatment facilities. Industry associations have developed template PHAs for common processes used by their membership which can be customized for a particular facility's process. It is important to note, however, that any template PHA must be customized appropriately.

¹³ https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=25051

Moreover, small employers who use batch processes may be able to use a generic approach for the PHA which may help to further reduce the cost of compliance. For example, a generic PHA based on a representative batch might be used for other similar batches where there are only small changes in the process chemistry and this is documented for the range of batch processes. Specifically, a paint mixing batch process may only differ in pigment being used or slight variations in solvents used for each pigment. In this case, the employer may not need a separate PHA for every different pigment/color batch, but one generic PHA that considers the overall paint mixing process, including all the potential amounts of solvent used, and potential chemical hazards of the different pigments (which may be similar, if not the same). However, if the batch processes are dissimilar, or utilize chemicals with substantially different hazards, a separate PHA would be required.

PHAs must be reviewed every five years to ensure that they are still consistent with the current process.

PHA Development Team

In order to conduct an effective, comprehensive process hazard analysis, the analysis must be performed by competent persons, knowledgeable in engineering and process operations, and those persons must be familiar with the process being evaluated. Some employers may have a staff with the expertise needed to perform an effective process hazard analysis. However the employer should ensure that its staff not only has the necessary engineering and process operations expertise, but also of the PHA methodology used.

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 and augment 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.

Training

Employers must provide initial and refresher training to every employee involved in operating a PSM-covered process. Training must cover process-specific safety and health hazards, operating procedures, safe work practices, and emergency shutdown procedures. The level of training may vary for each employee. For example, those who work in the area or operate the equipment will receive more extensive training than other employees who are in the general area, who would require awareness training. Employers must also train contractors or temporary employees on known potential fire, explosion, or toxic release hazards associated with their work and the processes. Training must also be conducted in compliance with 1910.1200, the Hazard Communication standard, which will help employees to become more knowledgeable about the chemicals they work with and better able to read and understand SDSs. 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 must be covered by an employer's training program.

As most small business owners already regularly train their employees, OSHA does not expect that employers will usually need substantial additional effort to come into compliance with the

training requirements of PSM. All employers (both operator and contract) are required to document the training given to their employees and document that each employee has completed and understood that training.

In the training program documentation, employers should clearly define the employees to be trained and what subjects are to be covered in their training. Employers in setting up their training program should 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 should 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.

Employers should periodically evaluate their training programs to see if the necessary skills, knowledge, and routines are being properly understood and implemented by their trained employees. 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.

Mechanical Integrity

Mechanical Integrity requires employers to implement rigorous and systematic written procedures to ensure that all critical process components are properly designed, tested, inspected, repaired, and maintained. Mechanical integrity programs must address pressure vessels, tanks, piping systems (including underground piping, valves, and other components), pumps, relief or venting systems, emergency shutdown systems, and safety controls (including interlocks, alarms, and sensors). While large chemical manufacturing facilities and petroleum refineries sometimes have hundreds—or even thousands—of such components, small businesses with PSM-covered processes typically have less equipment to maintain, making compliance easier.

For some small businesses, the mechanical integrity section of the PSM standard may appear complicated. MI is often the most resource intensive PSM element once the PSM program is up and running, as elements of a successful MI program may include tracking inspections, tests, repairs, and training and controlling spare parts and materials. In some cases, a small employer may already have a maintenance/inspection program for PSM covered equipment. These employers will simply need to ensure that their existing maintenance program and inspection frequencies are appropriate under PSM. Employers who do not have a mechanical integrity program will first need to identify all equipment that is part of the covered process. This list would include pressure vessels, storage tanks, process piping, relief and vent systems controls, interlocks, pumps, alarms, emergency shutdown systems, and loss of containment equipment, such as fire protection system components. Furthermore, some utility piping and equipment, such as but not limited to cooling required to prevent run-away reactions, may be subject to MI

requirements, and some of the equipment types specified in (j)(1) may be quite extensive, e.g., piping and process instrumentation and controls.

In many cases, the equipment that is part of the process will have inspection and testing recommendations from the manufacturer. If the covered equipment does not have any mechanical integrity related manufacturers recommendations, employers should look for applicable codes/standards or industry best practices.

Inspections and tests must follow RAGAGEP, and inspection and test frequency must be consistent with manufacturer's recommendations and good engineering practices, or more frequently if indicated by operating experience. Applicable codes and standards such as those from the American Society for Testing and Materials, 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.

Appropriate training must 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.

Equipment deficiencies outside the acceptable limits defined by the PSI must be corrected before further use. In some cases, it may not be necessary that deficiencies be corrected before further use, as long as the deficiencies are corrected in a safe and timely manner, when other necessary steps are taken to ensure safe operation. A quality assurance system is needed to help ensure that the proper materials of construction are used and fabrication and inspection procedures are proper. The quality assurance program is an essential part of the mechanical integrity program and will help prevent unwanted chemical releases 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 for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job. Any changes in equipment that may become necessary will need to go through the management of change procedures.

Compliance Audit

An audit is a technique used to gather sufficient facts and information, including statistical information, to verify compliance with the procedures and practices the employer has adopted under PSM. A compliance audit must be conducted every three years.

Employers must select at least one individual that is knowledgeable about the process to be audited. For some complex and/or larger processes, OSHA believes a team of individuals would be beneficial for conducting an audit. However, for less complex and/or smaller processes an employer may need only one knowledgeable person to conduct an audit.

The audit must include an evaluation of the effectiveness of the PSM program by verifying compliance with the provisions of PSM and that the procedures and practices developed are adequate and are being followed. 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. It is helpful to establish the format, staffing, scheduling and audit 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 PSM standard. The checklist, if properly designed, could provide the auditor with the necessary information to expedite the review and assure that no requirements of the standard are omitted. This checklist could also identify PSM elements that will require evaluation or a response to correct deficiencies. This checklist could also be used for developing the follow-up and documentation requirements.

An effective audit includes a review of the relevant documentation and process safety information, inspection of the process, and interviews with employees. Utilizing the audit procedure and checklist developed in the preplanning stage, the auditor can systematically analyze compliance with the provisions of the PSM standard. For example, the auditor will review operator training as part of the overall audit. The auditor will typically review the employer's 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. Through interviews, the auditor can determine the operator's knowledge and awareness of the safety procedures, duties, rules, emergency response assignments. During the inspection, the auditor can observe operator's actual implementation of practices such as safety and health policies, procedures, and work authorization practices. This approach enables the auditor to identify deficiencies and determine where corrective actions or improvements are necessary.

The auditor must document the areas that require corrective action. 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. 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 must be used, when required, even for what may seem to be a minor change. There may be instances where no action is necessary and this can be a valid resolution to an audit finding. However, all findings and corrective actions taken, including an explanation where no action is taken, must be documented. Many employers have found that establishing a common system for addressing findings and recommendations from PHAs, Incident Investigations, and Compliance Audits is a cost-effective approach.

APPENDIX A: Frequently Asked Questions

This appendix documents many PSM-related questions that small businesses commonly ask of OSHA. These questions are meant to provide small business owners with helpful responses that can be used in your workplace.

“What is the Process Safety Management Standard?” OSHA issued the Process Safety Management of Highly Hazardous Chemicals standard (29 CFR 1910.119), which contains requirements for the management of hazards associated with processes using highly hazardous chemicals. The standard is intended to help prevent unexpected releases of toxic, reactive, or flammable liquids and gases associated with these processes by emphasizing the establishment of a comprehensive management program that integrates technologies, procedures, and best management practices.

“Why is the PSM standard necessary?” Regardless of the industry using highly hazardous chemicals, there is a potential for a release of these chemicals any time they are not properly controlled. Properties of these chemicals may be toxic, reactive, flammable, or explosive, or they may exhibit a combination of these properties. These releases have the potential to cause significant damage to property and severely or fatally injure individuals in the workplace.

“How do I know if my worksite is covered by the PSM standard?” You are required to comply with the PSM if you use, manufacture/produce, store, handle, or are involved in the on-site movement of chemicals that are on the List of Highly Hazardous Chemicals (29 CFR 1910.119 [Appendix A](#)) at or above the threshold quantity set by OSHA; have a process which involves a flammable liquid or gas in a quantity of 10,000 pounds or more; or manufacture explosives or pyrotechnics in any quantity. However, OSHA exempts three types of facilities from the PSM standard: retail facilities; oil or gas well drilling or servicing, and normally unoccupied remote facilities. Additionally, hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling); and flammable liquids with a flashpoint below 100 °F (37.8 °C) stored in atmospheric tanks or transferred and kept below their normal boiling point without benefit of chilling or refrigeration, are also exempt from PSM if such fuels are not a part of a process containing another highly hazardous chemical (HHC) covered by the PSM standard.

“What industries does the rule cover?” OSHA’s standard applies to a very wide range of industries—particularly those pertaining to chemicals, transportation equipment, and fabricated metal products. Other affected sectors include those involved with natural gas liquids, chemical warehousing, food processing, electric, gas, sanitary services, and wholesale trade. The standard also applies to pyrotechnics and explosives manufacturers.

“Does PSM apply to non-manufacturing facilities?” Yes, the PSM standard can apply to non-manufacturing processes such refrigeration industry, and services industries such as food and sanitation, and chemical warehousing and distribution industries. In fact, many PSM-covered processes involve a non-manufacturing application of HHCs.

“What does the PSM standard require?” The PSM standard starts with a compilation of process safety information, followed by a process hazard analysis (PHA). A PHA consists of a careful and thorough review of what could go wrong and what safeguards must be implemented to prevent releases of highly hazardous chemicals. In addition to the PHA, the standard also

mandates development of written operating procedures, completion of relevant employee training, encouraging and ensuring employee participation (according to a written plan), pre-startup safety reviews, evaluation of the mechanical integrity of critical equipment, contractor requirements, and a written management of change process. It also requires a permit system for hot work, investigation of incidents involving releases of covered chemicals or “near-misses,” emergency action plans, compliance audits at least every 3 years, and allows for trade secret protection as long as the relevant information remains available to applicable parties.

“Why do I need a written Process Safety Management program?” A written PSM program assists employers and their workers in the development and uniform implementation of PSM activities across their organization. Additionally, EPA’s Risk Management Program rule mandates that covered employers submit a “Risk Management Plan” to their agency. Additionally OSHA’s PSM standard requires written documentation for a number of elements, including , the employee participation, process safety information, process hazards analysis, operating procedures, operator training, contractor training, hot work permits, mechanical integrity, management of change, incident investigations, emergency planning and response, and compliance audit elements.

“What are the design and maintenance standards I will have to follow at my facility?” The PSM standard references Recognized and Generally Acceptable Good Engineering Practices (RAGAGEP). Businesses must be able to demonstrate that their PSM-covered processes are designed and constructed to meet requirements of the applicable engineering standards (e.g., ASME, API, ANSI). The facility is responsible for selecting the RAGAGEP, and demonstrating its processes are built to the appropriate design standards and have been maintained in accordance with those standards. [See OSHA’s Regional Administrators Memorandum on RAGAGEP enforcement.](#)¹⁴

“Who should receive PSM training?” The PSM standard requires specific training for all employees involved with a PSM-covered process. Operating employees must complete initial training followed by refresher training at least every three years. Training of operators and contract employees must be documented to demonstrate the employee has received and understood the applicable information. Maintenance personnel and contractors also must receive training under the standard.

“I am a contractor on a PSM-covered worksite. Do I need PSM training?” Yes. Contract employees and their employers must meet the applicable requirements under the PSM standard, including training. The standard specifically outlines specific responsibilities for both the Employer and Contract Employer to ensure the safety of the contract employees and the proper operation of the process.

“Can small businesses receive help developing, initiating and instituting a PSM program?” Yes. The OSHA funded On-site Consultation Program offers free and confidential safety and occupational health advice to small and medium-sized businesses with priority given to high-hazard worksites. These state-run Consultation services are separate from OSHA enforcement and do not result in penalties or citations. Consultants from state agencies or universities work

¹⁴ https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=29414

with employers to identify workplace hazards (including those involving HHCs), provide advice on compliance with OSHA standards, and assist in establishing injury and illness prevention programs. Small businesses can obtain assistance and materials from the organizations listed in this Guidebook, and employers should visit the OSHA Web site (<https://www.osha.gov/dcsp/smallbusiness/consult.html>) to find contact information for their local On-site Consultation provider to obtain assistance.

“Where can I learn more about the PSM standard and its requirements?” In addition to this publication, you may refer to 29 CFR 1910.119 for specific requirements of the PSM standard, which is available on the OSHA website (osha.gov). In addition to this Guidebook, OSHA has two publications that provide information about the PSM standard and its application: Process Safety Management ([OSHA 3132](#)) and Process Safety Management–Guidelines for Compliance ([OSHA 3133](#)); both are available online, on the OSHA web site. Small businesses may contact OSHA's free On-site Consultation services funded by OSHA to help further determine hazards at their worksites. To contact free consultation services, go to OSHA's [On-site Consultation](#) webpage (<https://www.osha.gov/dcsp/smallbusiness/consult.html>) or call 1-800-321-OSHA (6742) and press number 4.

“What are a few key PSM elements all employees should know?” All employees should know the hazards related to storing, mixing or processing chemicals. They should know how each of their processes work. They should also know when equipment is operating improperly or outside safe limits. If equipment is not operating properly or an emergency occurs, they should know what response actions to take and who to contact.

“What is the EPA Risk Management Plan (RMP)?” EPA regulations and guidance for chemical accident prevention at facilities that use certain hazardous substances are contained in the RMP rule ([40 CFR Part 68](#)). The information required from facilities under RMP helps local fire, police, and emergency response personnel prepare for and respond to chemical emergencies. Making RMPs available to the public also fosters communication and awareness to improve accident prevention and emergency response practices at the local level.

“Who must submit an RMP and how often?” Facilities utilizing more than a threshold quantity of any chemical found in the List of Regulated Substances ([40 CFR 68.130](#)) in a process are required to comply with EPA's Risk Management Plan regulations. The regulations require owners or operators of covered facilities to implement a risk management program and to submit an RMP to EPA. RMPs are revised and resubmitted to EPA every five years.

“How is RMP different from PSM?” The requirement for development of RMPs is established by the Clean Air Act (as is the requirement for PSM), and is primarily intended to protect the population outside a facility. PSM is intended to protect employees at the facility. The RMP rule is administered and enforced by the EPA, while PSM is administered and enforced by OSHA. The RMP rule requires facilities to submit plans to the EPA and local emergency responders so that they are aware of potential environmental and exposure risks when responding to an incident. Otherwise, the standards are nearly identical.

“What chemicals must be reported under RMP?” Any chemical identified by EPA's RMP List of Regulated Substances ([40 CFR 68.130](#)) that is present in more than a threshold quantity must

be reported under RMP. Many of the chemicals on this list are also found on OSHA's List of Highly Hazardous Chemicals.

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APPENDIX B: Examples of PHA Methodology

2/1/2005 Letter of Interpretation to Mr. Roygene Harmon

Appendix

Example Application of 1910.119(e)(3)(vii)

Below are excerpts from two different PHA methodologies [What-If Checklist (Figure 1) and HAZOP (Figure 2)]. Each PHA excerpt identifies one hazard/deviation as well as its corresponding engineering and administrative controls, safeguards, recommendation/actions and a quantitative description of consequence, likelihood and the risk priority for the identified hazard. An example (e.g. ③) of the application of the specific OSHA 1910.119(e)(3) "consequence" requirements are identified on the example PHA worksheets. After the PHA worksheet examples, other examples are provided to illustrate how some employers utilize a risk matrix to comply with the "qualitative evaluation" requirement (1910.119(e)(3)(vii)). As noted earlier, PSM is performance standard, and that these examples may or may not be applicable to your specific situation.

The following is an example of the development and use of a risk matrix. First, a qualitative description of consequence and likelihood/frequency of the hazard based on a failure of engineering and/or administrative controls is established. Figure 3 is the Consequence Table. It is a qualitative description of the range of degrees of consequences related to the identified hazard and its associated failure of controls. These consequences range from 1 – 4, with 4 being the most severe Consequence Class. Figure 4 is the Likelihood Table, it is a qualitative description of the range of likelihood/frequency that an identified engineering or administrative control might fail. The likelihood ranges from 1 – 4, with 4 being the most likely to fail.

Using the Consequence and Likelihood Class numbers a Risk Priority Matrix (Figure 5) can be constructed. The Risk Priority Matrix is used to identify the Risk Class. Once the Risk Class (e.g. C) is determined from the Risk Priority Matrix, the Risk Class can be correlated to the Risk Priority Legend (Figure 6) which prioritizes the hazard as identified by the PHA team. In this case, the PHA team enters the evaluated Consequence Class, Likelihood Class, and Risk Class on the PHA worksheets, Figures 1 and 2.

In the following example PHA worksheets the abbreviations and symbols mean:

C = Consequences Class
L = Likelihood Class
R = Risk Priority Class

- ① - 1910.119(e)(3)(i): address the hazards of the process
- ② - 1910.119(e)(3)(iii): address engineering and administrative controls applicable to the hazards...
- ③ - 1910.119(e)(3)(iv): address consequence of failure of engineering and administrative controls
- ④ - 1910.119(e)(3)(vii): address a qualitative evaluation of a range of possible safety and health effects of failure of controls...

2/1/2005 Letter of Interpretation to Mr. Roygene Harmon

Figure 1 - Example Worksheet Excerpt from What If/Checklist PHA Methodology
C= Consequence Class, L= Likelihood Class, R = Risk Class

What If...	Consequences/ Hazard	Safeguards	C	L	R	Recommendations/ Action
Emergency Shutdown Valve 23 (ESD - 23) fails to close when needed? (This can occur due to extremely cold weather, reliability due to inspection/testing/maintenance or design problems)	Release of highly flammable materials in the operating area. Potential for fire/explosion with employee injuries/fatalities 1 3	1. Specific Inspection/testing/maintenance program for ESDs 2. Valve actuator sizing 3. ESD-23 is fail closed design 2	4 4	2 4	B 4	1. Due to cold weather modify MI procedures to increase ESD valve testing to 1/2wks. 2. Inspection records for ESD 23 not in file, follow-up to assure ESD-23 inspected as required by MI procedures 3. No equipment data sheet was found for actuator for ESD-23, follow-up with engineering to assure design is correct. 4. Consider over sizing valve actuator

Figure 2 - Example Excerpt from HAZOP PHA Methodology
C= Consequence Class, L= Likelihood Class, R = Risk Class

Deviation	Causes	Consequences	Safeguards	Recommendations/ Actions	C	L	R
Loss of Agitation 1	Agitator motor fails Electrical utility lost Agitator mechanical linkage fails Operator fails to activate agitator 1 2	Un-reacted HHC in the reactor carried over to Storage Tank 3 (ST-3) and is released to the enclosed work area. Probable injuries or fatalities to workers due to highly acute toxic material hazard 3	HHC detector and alarm 2	1. Consider adding alarm/shutdown of the system for loss of agitation to the reactor 2. Ensure adequate ventilation exists for enclosed work area and/or use an enclosed ST-3 3. Update PSI file and Op. Procedure HHC-39 to include consequence of deviation, engineering controls including safety system information, e.g. SIS and emergency ventilation	4 4	2 4	B 4

2/1/2005 Letter of Interpretation to Mr. Roygene Harmon

Figure 3 - Consequence Table

Consequence Class	Qualitative Employee Safety Consequence Criteria
1	No employee injuries
2	One Loss Time Injury or Illness
3	Multiple Lost Time Injuries or Illnesses
4	Multiple Lost Time Injuries or Illnesses w/one or more fatalities

Figure 4 - Likelihood Table

Likelihood Class	Qualitative Likelihood Criteria
1	Not expected to occur during the lifetime of the process. Examples – Simultaneous failures of two or more independent instrument or mechanical systems
2	Expected to occur only a few times during the life of the process. Examples – Rupture of product piping, trained employees w/procedures injured during LOTO operation
3	Expected to occur several times during the life of the process. Examples – hose rupture, pipe leaks, pump seal failure
4	Expected to occur yearly. Examples - instrument component failures, valve failure, human error, hose leaks

Figure 5 - Example Risk Priority Matrix

Consequences ↑	4	C	B	A	A
	3	C	B	B	A
	2	D	C	B	B
	1	D	D	C	C
		1	2	3	4
Likelihood →					

Figure 6 - Example Risk Priority Legend

Priority ↑	Risk Class	Explanation of Risk
	A	Risk intolerable - needs to be mitigated within 2 weeks to at least a Class C, if that cannot be accomplished, process needs to be shutdown
	B	Risk undesirable - needs to be mitigated within 6 months to at least a Class C
	C	Risk tolerable with controls (engineering and administrative)
	D	Risk acceptable – no further action required

This draft guidance document is not a standard or regulation, and it creates no new legal obligations. It contains recommendations as well as descriptions of mandatory safety and health standards. The recommendations are advisory in nature, informational in content, and are intended to assist employers in providing a safe and healthful workplace. The Occupational Safety and Health Act requires employers to comply with safety and health standards and regulations promulgated by OSHA or by a state with an OSHA-approved state plan. In addition, the Act's General Duty Clause, Section 5(a)(1), requires employers to provide their employees with a workplace free from recognized hazards likely to cause death or serious physical harm.