Process Safety Management Compliance Guidelines for Explosives and Pyrotechnics Manufacturing

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 most relevant to explosives and pyrotechnic manufacturers. 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 explosives and pyrotechnics manufacturer, the following elements of the standard are particularly relevant to hazards associated with explosives and pyrotechnics manufacturers:

- Process Safety Information (PSI)
- Process Hazards Analysis (PHA)
- Operating Procedures
- Training
- Mechanical Integrity (MI)

Contents

[1] https://www.osha.gov/Publications/osha3132.pdf
[2] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9760

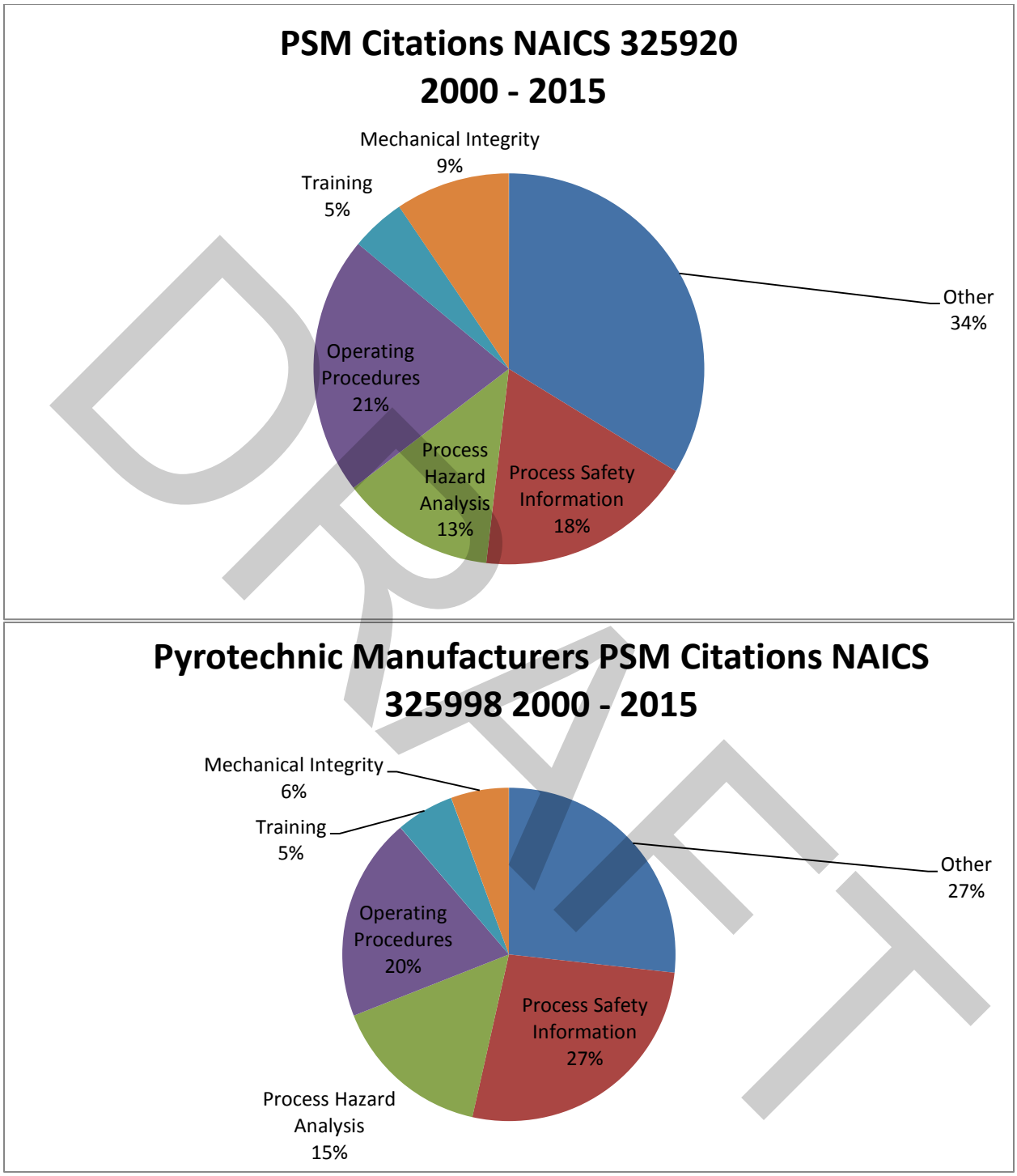
Purpose

This guidance document is intended to help explosives and pyrotechnics manufacturing employers comply with the OSHA PSM standard. OSHA's 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. OSHA's standard on Explosives and Blasting Agents, 29 CFR 1910.109, provides a definition of explosives and pyrotechnics.

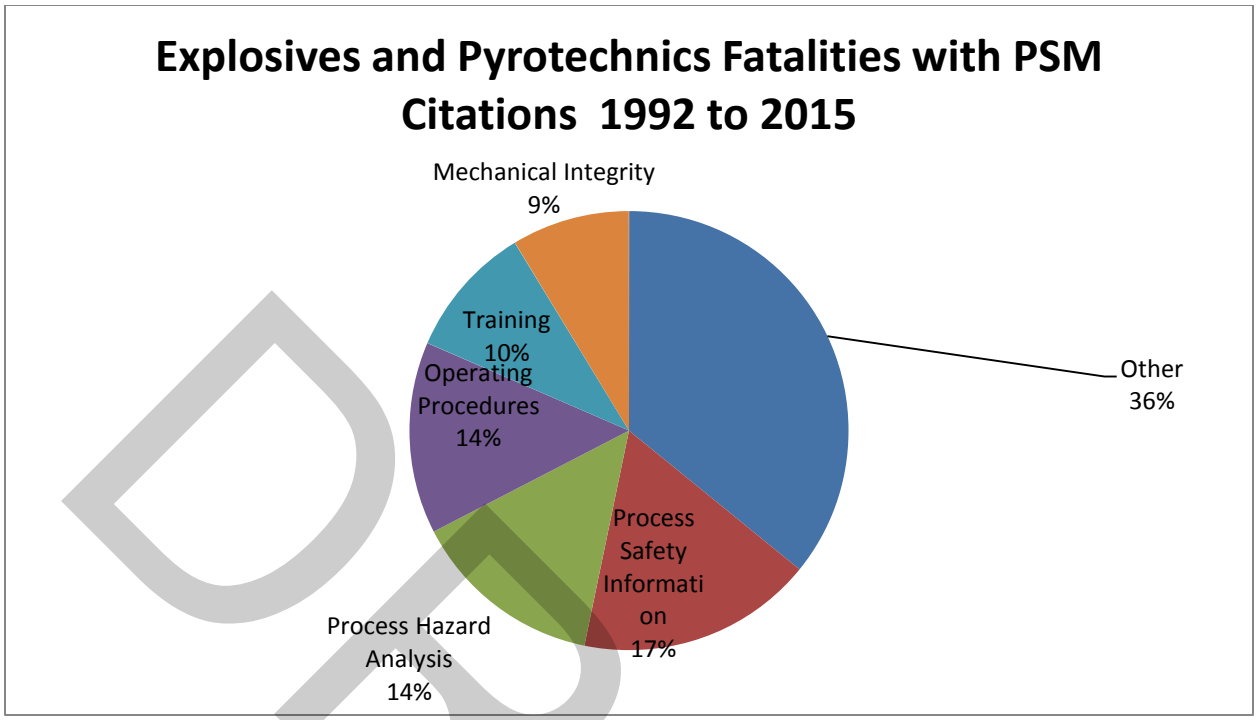
PSM is critically important to facilities that manufacture explosives and pyrotechnics. The required safety programs will help prevent fires, explosions, and other major incidents. Compliance with the PSM standard will help ensure that employees, contractors, facility visitors, and emergency responders are safe from hazards. Compliance will also benefit employers by minimizing damage to facility equipment and neighboring structures. All explosives should be handled with care.

Explosives are chemicals compounds, mixtures or devices, the common function or purpose of which is to explode and, when supplied with sufficient initiating energy, will do so. Furthermore, explosives do not distinguish between initiating energy supplied accidentally or deliberately. Those who handle and use the explosives in the manufacturing process must prevent the explosives from accidental sources of initiating energy.

The graphs shown below represent citations recorded as the result of OSHA PSM inspections conducted from 2000 to 2015 for Explosives Manufacturers under the North American Industry Classification System (NAICS) code 325920 and Pyrotechnics Manufacturing information extracted from NAICS code 325998. The graphs illustrate the percentages of citations for specific PSM elements as they appear in the Department of Labor Enforcement database.



Between 1992 and 2015, OSHA issued citations in 10 fatality cases (associated with a total of 19 fatalities).The following graph shows percentages of citations for specific PSM elements. The data, was taken from OSHA's IMIS (or OIS) database.



Comparison of the graphs illustrates the similarity in percentages of the PSM elements cited as a result of OSHA inspections whether the inspections were programmed or unprogrammed or performed as a result of a reported fatality. OSHA believes that this comparison implies that a better understanding of the major elements of PSM, particularly those elements most frequently cited, would improve compliance and prevent fatalities in explosives and pyrotechnics manufacturing.

PSM elements complement the **cardinal principle for explosive safety: expose the minimum number of people to the smallest quantity of explosives for the shortest period consistent with the operation being conducted.** This principle is stated in many industry explosives safety standards and referenced in government publications such as: DoD Instruction 4145.26; NASA Standard 8719.12; AFMAN 91-2015; Army Pamphlet p385-64; and in commercially-available explosives safety training. Successfully implementing this principle means establishing personnel limits and devising methods to reduce the number of people exposed, the time of exposure, and the quantity of material subject to a single incident. This can be achieved by applying PSM.

Explosives and pyrotechnics manufacturing is an inherently hazardous process. Failure to properly recognize unsafe conditions and to take steps to mitigate the hazards can result in unexpected circumstances that can, and do, result in injury or death. Below are some examples of incidents that resulted from PSM non-compliance.

Ultratec Fireworks Manufacturing (02/06/15): 2 Fatalities

> An explosion occurred at a fireworks manufacturing facility, which resulted in two fatalities. The investigation identified several problems including housekeeping of

hazardous materials (that were susceptible to friction heat and pressure), structural failure, and a failure to have code-required separation distances between buildings. Inspectors also found that employees had no formal fireworks safety training and no annual refresher training.

Kilgore Flares Company LLC (02/25/14): 1 Fatality

On February 22, 2014, an employee was working in a Mix Room. He was cleaning a residual composition that had adhered to surfaces of the mix bowl and mix wheel. As the employee removed the residual, the composition ignited and exploded. The investigation identified noncompliance in process safety information, process hazard analysis and operating procedures. The employee suffered severe burns on multiple areas of his body and was transported to a hospital, where he received medical treatment and burn therapy, but died from his injuries.

Black Mag (05/14/10): 2 Fatalities

On May 14, 2010, an explosion occurred at a synthetic gunpowder manufacturing facility. Instead of implementing existing engineering and administrative controls, two employees and the plant supervisor hand fed a gunpowder substitute (Black Mag powder) into operating equipment. Additionally, the employer did not implement remote starting procedures, safe distancing, isolated stations, and barriers or shielding for the process of manufacturing explosive powder. The two employees died of injuries from the explosion.

Olin Corporation, Winchester Division (11/24/2008): 1 Injury

On November 24, 2008, an employee at an explosives manufacturing facility was sweeping up primers (small metal cups of explosive) into a dustpan. As the employee started to lift the dustpan, a few primers dropped and exploded upward. The employee's face, torso, shoulders, neck and head were injured, burned, and she was hospitalized. A safe job procedure was developed for the job but not for cleanup. The job involved a PSM -covered process, but no PHA was developed for the cleanup task.

American Ordnance LLC, Iowa Army Ammunition Plant (6/12/2006): 2 Fatalities

On June 12, 2006, two employees were handling a shaped charge of high explosives on a cart. These employees were conducting a wet density test involving a shaped charge. During the test an explosion occurred, killing both employees. The investigation determined that violations of PSM requirements for process hazard analysis, operating procedures, training, pre-startup safety review and performance of compliance audits contributed to the fatalities.

Sierra Chemical Co. (01/07/98): 4 Fatalities

On January 7, 1998, four employees were about to begin work in the production room at Sierra Chemical's Kean Canyon explosives manufacturing facility when two large blasts involving over 40,000 lbs. of explosives devastated the facility. All four employees were killed. The facility melted, mixed, and poured cast boosters in two separate production areas using large heated stainless steel melting and mixing kettles. The production room had been in service for less than four months and had several substantial changes compared to the old production area, including kettles heated by steam as opposed to hot water and direct drive mechanical agitation instead of hydraulic agitation. Possible causes of the explosions included raw material contamination, a cold start, or static ignition. The investigation resulted in citations for violations of Employee Participation, Process Safety Information, Process Hazard Analysis, Operating Procedures, Training, Pre-startup Safety Review, Mechanical Integrity, and Management of Change.

Applicability

Employers who manufacture explosives[3] and pyrotechnics, [4] must comply with PSM (see 29 CFR 1910.109(k)).

OSHA considers the manufacturing of explosives to mean: mixing, blending, extruding, synthesizing, assembling, disassembling and other activities involved in the making of a

[3] The term "explosive" is defined in 29 CFR 1910.109, Explosives and Blasting Agents, paragraph (a)(3):

> Explosive -- any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat, unless such compound, mixture, or device is otherwise specifically classified by the U.S. Department of Transportation; see 49 CFR Chapter I. The term "explosives" shall include all material which is classified as Class A, Class B, and Class C explosives by the U.S. Department of Transportation, and includes, but is not limited to dynamite, black powder, pellet powders, initiating explosives, blasting caps, electric blasting caps, safety fuse, fuse lighters, fuse igniters, squibs, cordeau detonant fuse, instantaneous fuse, igniter cord, igniters, small arms ammunition, small arms ammunition primers, smokeless propellant, cartridges for propellant-actuated power devices, and cartridges for industrial guns. Commercial explosives are those explosives which are intended to be used in commercial or industrial operations.

[4] Pyrotechnics are defined in 29 CFR 1910.109(a)(10):

> Pyrotechnics--any combustible or explosive compositions or manufactured articles designed and prepared for the purpose of producing audible or visible effects, and are commonly referred to as fireworks.

chemical compound, mixture or device which is intended to explode. Unlike other highly hazardous chemicals (HHC) covered by PSM, explosive materials do not have a listed threshold quantity. If any quantity of explosives is manufactured as discussed above, then the manufacturing process is covered by the PSM standard.[5]

Activities that are conducted in a separate, non-production research or test area or facility and do not have the potential to cause or contribute to a release or interfere with mitigating the consequences of a catastrophic release from the explosive manufacturing process are not covered by the PSM standard, but are still covered by §1910.109. These include:

- product testing and analysis which is not part of any in-production sampling and testing of the explosive manufacturing process;
- chemical and physical property analysis of explosives and propellants and pyrotechnics formulations;
- scale-up research chemical formulations to develop production quantity formulations;
- analysis of age tests conducted on finished products;
- failure analysis tests conducted on pre-manufactured or finished products;
- x-raying;
- quality assurance testing (not including the extraction of samples from an active explosive manufacturing [production] process);
- evaluating environmental effects, such as hot, cold, jolt, jumble, drop, vibration, high altitude, salt, and fog; and
- assembly of engineering research and development models.

The Department of Transportation (DOT) maintains a classification scheme for explosive materials. Prior to October 1, 1991, DOT's classifications were designated as Explosives A, B, C, or Blasting Agents. These designations are still used in OSHA's current definition of explosives.[6] After October 1991, DOT re-designated its explosives categories, and now listed as Hazard Class 1 materials, which are divided into six divisions to note the principal hazard of the explosive. The definition of each division can be found in 49 CFR 173.50.[7] The chart below illustrates the comparison between the old and new DOT classification system, which may be used in determining whether an explosive classified under DOT's current scheme falls within OSHA's definition of explosive:

[5] The information from this paragraph and the next come from the February 4, 1998 Letter to Frank A. White, Vice President, Organization Resources Counselors, Inc., https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=22524

[6] See footnote 5 above.

[7] https://www.gpo.gov/fdsys/granule/CFR-2011-title49-vol2/CFR-2011-title49-vol2-sec173-52/content-detail.html.

Current Classification	Prior DOT Classification
Division 1.1	Class A Explosives
Division 1.2	Class A or Class B Explosives
Division 1.3	Class B Explosives
Division 1.4	Class C Explosives
Division 1.5	Blasting Agents
Division 1.6	No Applicable Hazard Class

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. Process Safety Information (PSI) is the information necessary for implementation of all other aspects of PSM. The compilation of written process safety information will help the employer and the workers involved in operating the process to identify and understand the hazards involved in their processes. Process safety information 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.

Information on Highly Hazardous Chemicals

PSM requires that explosives and pyrotechnics manufacturers compile information on toxicity, permissible exposure limits, physical data, reactivity data, corrosivity data, thermal and chemical stability data, and hazardous effects associated with inadvertent mixing of materials that may occur. Unlike other highly hazardous chemicals (HHC) covered by PSM, explosive materials do not have a listed threshold quantity. If any quantity of explosives is manufactured as discussed above, then the manufacturing process is covered by the PSM standard.

OSHA's Hazard Communication Standard (HCS), 29 CFR 1910.1200 requires manufacturers to provide chemical information on their products in safety data sheets (SDS). SDSs must provide information on a number of specific characteristics which may be used to identify and understand the hazards posed by hazardous chemicals used in the explosives manufacturing process. It should be noted that the SDS may not contain specific important explosives material handling information such as minimum humidity needed, and minimum ignition energy, etc.

Information on Process Technology

Information on the technology of the process must include at least the following:

- Diagrams (Block, Process Flow) – an example of which is shown in non-mandatory Appendix B of the PSM standard
- Process chemistry
- Maximum intended inventory

- Safe upper and lower process limits for such items as temperatures, pressures, flows or compositions, and
- An evaluation of the consequences of deviations, including those affecting the safety and health of employees that could occur if operating beyond the established process limits.

Even though there is no threshold quantity requirement applicable for explosive material in a PSM-covered manufacturing process, employers should still consider minimizing the volume of explosive material on site to minimize the hazard during the manufacturing process. For example, NASA Standard 8719.12, *Safety Standard for Explosives, Propellants, and Pyrotechnics*,[8] recommends that the determination of the limits for explosive materials operations be the result of a careful analysis of all facts, including operation timing; transportation methods; size of the items; explosive, chemical and physical characteristics of the materials; building layout; and facilities design. The standard further recommends that limits should be established for each operation, rather than one building or total workplace capacity.

Information on the Process Equipment

For some explosives or pyrotechnics manufacturing facilities, the amount of process equipment that exists in the facility may be minimal. OSHA recognizes that the complexity of processes within the explosives and pyrotechnics manufacturing industry vary, and range from pure chemical processes to simplified mechanical processes. Nevertheless, facilities must collect information on covered process equipment. Employers are required to collect equipment information on materials of construction, applicable piping and instrument diagrams (P&IDs), electrical classifications, relief system design and design basis, ventilation system designs, and safety systems. Facilities in which the processes are purely mechanical (not chemical) without piping, typically will not have P&IDs. However, all facilities with a fire suppression system must have a P&ID for that system. For facilities using "off-the-shelf" or customized "in-house" designs, the manufacturer of the components will provide most, if not all, of this information. Components or equipment of unknown origin, cannot satisfy the Quality Assurance provision of 1910.119(j)(6)(iii) and are prohibited in explosives or pyrotechnic manufacturing processes. Questions on applicability of specific PSM requirements pertaining to unique situations should be referred to OSHA's Directorate of Enforcement Programs or the appropriate OSHA Consultation Program Office.

Employers must also document that equipment complies with recognized and generally accepted good engineering practices (RAGAGEP). For more information on OSHA's interpretation of RAGAGEP, see OSHA's Memorandum, RAGAGEP in Process Safety Management.[9] There are many potential sources of RAGAGEP pertaining to explosives and pyrotechnics manufacturing, some of which are provided here.

One example, the *Department of Defense (DoD) Standard for Ammunition and Explosives Safety*, *DoD 6055.09-STD*, (DoD 6055.09-STD)[10] provides guidance for employers to consider when developing internal standards that can be applied to engineering design criteria for

[8] http://www.hq.nasa.gov/office/codeq/doctree/NASASTD871912.pdf

[9] hhttps://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=30785

[10] http://uxoinfo.com/blogcfc/client/enclosures/DOD6055-09-STD_21Aug_09.pdf

facilities and operations conducted within those facilities. The criteria are then used to select equipment, shielding, engineering controls, and protective clothing for personnel.

Another example is *National Fire Protection Association (NFPA) 495, Explosive Materials Code* . It provides a table showing the minimum intraline (intraplant) (ILD or ILP) separation distances for Division 1.1 or 1.2 explosives. This code is intended to provide reasonable safety in the manufacture, storage, transportation, and use of explosive materials. NFPA 1124, *Code for the Manufacture, Transportation, and Storage, of Fireworks and Pyrotechnic Articles* establishes reasonable minimum fire and life safety requirements for the manufacture, transportation, and storage of fireworks, pyrotechnic articles, and any component(s) thereof containing pyrotechnic or explosive compositions. This code also addresses process building, construction, and working surfaces.

Other examples of potential sources of RAGAGEP for explosive and pyrotechnic manufacturing include:

- NFPA 70, *National Electrical Code*

  This code is intended to be used for the design and use of heating, lighting and electrical equipment in any area where fireworks, fireworks components, or flammable liquids are or can be present.

- NFPA 77, *Recommended Practice on Static Electricity*

  This recommended practice offers guidance on identifying, evaluating, and controlling static electric hazards for purposes of preventing fires and explosions.

- NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*

  This recommended practice presents criteria to determine ignitability hazards in chemical process areas where combustible dusts are produced, processed, or handled to assist in the selection of electrical systems and equipment for safe use in Class II hazardous (classified) locations.

- Institute of the Makers of Explosives, IME SLP-3, *Suggested Code of Regulations for the Manufacture, Transportation, Storage, Sale, Possession and Use of Explosive Materials*

  Among other topics, this code focuses on the purity of raw materials obtained for the purpose of manufacturing explosives. These include: foreign objects in raw materials; use of substitute raw materials; specific handling requirements for raw materials; impact by tools or equipment; impingement; friction; sparking; and static discharge. The document further states that the raw materials may contain impurities that could create an impact or friction hazard and lists recommended procedures that could be used to prevent these hazardous foreign objects from entering the manufacturing process.

- American Pyrotechnics Association (APA) Standard 87-1. American Pyrotechnics Standard 87-1, *Standard for Construction and Approval for Transportation of Fireworks, Novelties, and Theatrical Pyrotechnics.*

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 shall be comprised of personnel that are knowledgeable in engineering and process operations, and 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 and explosions. The team conducting the PHA 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 or administrative controls.

Failure to properly perform a PHA, or failing to address findings and recommendations, can have catastrophic consequences as evidenced by the fatalities and injuries cited in the incidents described at the beginning of this document. The PHA relating to explosives and pyrotechnics must include such topics as: inherent chemical and physical properties of specific explosives and/or explosive compounds, quantity-distance requirements, building design, human factors, and prior incident reports.

An example of a hazard analysis technique, again citing DoD 6055.09-STD, describes a risk assessment process that is performed on new or modified operations and facilities within the U.S. DoD. The assessment takes into consideration factors of explosives initiation sensitivity, quantity of materials, heat output, rate of burn, potential ignition and initiation sources, protection capabilities of shields, various types of clothing, fire protection systems and personnel exposure.

Small businesses may contact OSHA's On-site Consultation services to help further determine their worksite hazards. To obtain free consultation services, go to OSHA's On-site Consultation webpage at: https://www.osha.gov/dcsp/smallbusiness/consult.html or call 1-800-321-OSHA (6742) and press number 4.

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

Operating Procedures

Employers are required to develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information. Operating procedures must provide clear instructions not only to specify the steps for normal operations, but also for upset conditions, temporary operations, start-up, and emergency shutdown. Important safety information that includes the basic hazards encountered or that could be encountered in the process must also be addressed in the operating procedures. Identification of hazard areas and limitations on the number of authorized personnel in the hazard area will ensure that the minimum numbers of personnel are exposed to the hazard. The procedures must be available to all operators, and be accurate and

current. Although the PSM standard requires the employer to annually certify that operating procedures are current and adequate, it is recommended that the operating procedures be reviewed prior to each use to verify that only the most current version of the operating procedure is being used before proceeding.

The importance of thorough written procedures cannot be overstressed. During inspections, OSHA Compliance Officers have discovered that some employers did not have written procedures available for a process. Some employers also did not have emergency shutdown procedures, normal shutdown procedures, emergency operations, quality control for raw materials and the control of hazardous chemical inventory levels, or accessibility to procedures for employees working in or maintaining the process, all of which are potential violations of the standard.

Quality control must also be included in the operating procedures. This entails verifying that the raw materials comply with approved and documented material specifications for manufacturing explosives that enter into the process from external suppliers. An example of this concept is found in IME SLP-3 which states: "Raw materials, demilitarized explosives, and reworked materials used in the manufacturing processes shall not contain foreign objects that might create an impact or friction hazard."

NFPA 495 lists specific topics for explosives manufacturers to consider when developing explosives manufacturing procedures such as when to empty waste containers, and how to manage the collection of spilled materials, disposal, storage, and/or open burning of contaminated materials or explosive waste (in accordance with Federal/State/Local authority having jurisdiction). Manufacturers should also consider how to dispose of contaminated materials, reuse of shipping containers, and establish when non-routine maintenance and repair work may be performed. Ignition source control (smoking, flame-producing devices, portable electrical and electronic equipment, static electricity control, hazards of electromagnetic radiation to both ordnance and personnel), clothing care, prohibited accessories, and housekeeping should also be considered. Specifics on the approach to be used for these individual topics should be addressed in the PHA using appropriately approved standards and analyses.

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. All employees, including maintenance and contractor employees involved with explosives and pyrotechnics manufacturing, need to fully understand the safety and health hazards of the materials and processes they work with so they can protect themselves, their fellow employees, and the citizens of nearby communities. Proper training ensures adequate understanding of standard procedures, operational parameters, care and maintenance of equipment, and emergency procedures, including detection methods for the presence or release of hazardous material in the work area, familiarity with emergency warning signals and actions to take in the event that the warning signal is activated.

NFPA 495 contains examples of minimum training requirements. It states that persons handling explosive materials or working in operating buildings shall be trained in the following areas:

1. The physical and health hazards of the explosive materials to be manufactured
2. The operational activities involved in processing explosive materials, and these activities include instructions for emergencies that are anticipated in the manufacturing process
3. The operating rules applicable to the materials in the manufacturing process
4. Plans for emergency procedures in the event of a fire or explosion

Another example, contained in IME SLP-25, *Explosives Manufacturing and Processing Guideline to Safety Training*, recommends a set of topics that should be covered in the training plan. These recommendations include instruction on:

1. safety requirements
2. control and emergency procedures
3. personal protective clothing and equipment
4. personnel and explosives limits
5. equipment design, inspection and maintenance
6. location and sequence of operations
7. housekeeping procedures
8. other topics that employees or management believe should be covered

Mechanical Integrity

Mechanical Integrity requires explosives and pyrotechnic manufacturers to implement rigorous and systematic written procedures that ensure that all critical process components are properly designed, tested, inspected, repaired, and maintained. OSHA currently requires that employers have a mechanical integrity program for pressure vessels and storage tanks, piping systems (including components such as valves), relief and venting systems, emergency shutdown systems, controls, and pumps. However, OSHA recommends that employers include all safety critical equipment used in the process in the mechanical integrity program, and not just those items currently required by PSM standard

A starting point for mechanical integrity programs is listing all equipment, instruments, and components that must be considered. For each type of equipment, written procedures must identify what inspections and tests will be performed and how often. In addition, the PSM standard requires that inspection and testing protocols follow RAGAGEP, which may include manufacturer's recommendations. Employers should identify the subset of RAGAGEP most appropriate for their process equipment, document in the mechanical integrity program which protocols are to be followed, and ensure that inspection and testing is performed accordingly.

If employers and employees are completely unfamiliar with these RAGAGEP references, consultation with a professional engineer is advised. Local fire officials may also be used as a point of reference for appropriate fire codes.

Each inspection and test that has been performed must be documented to verify current equipment integrity. Aspects of the mechanical integrity program include identifying applicable equipment, training of maintenance personnel, inspection and testing, and maintenance of

systems including controls (such as interlocks, alarms, sensors and monitoring devices), vessels, tanks, piping, relief and vent system devices, safety systems, and emergency shutdown systems. Additionally, transfer equipment, visual and electrical inspections of the lightning protection system, response time tests of the deluge system, area warning system tests, and building grounding system checks are a few of the many items that the maintenance program should address to verify the "mechanical integrity" of the explosives manufacturing systems and facilities.

An example of actions needed for a mechanical integrity program are noted in IME SLP-3, which recommends that a daily visual inspection be made of the mixing, conveying and electrical equipment to determine that such equipment is in good operating condition. This inspection could include checks of current equipment maintenance or integrity (if equipment is tagged with that information), any noted damage, or a review of the maintenance records if there is uncertainty about the specific equipment. Instructions for actions to be taken in the event that equipment is found to be out of compliance with operational specifications should be provided. The standard requires employers to correct deficiencies in equipment that are outside acceptable limits (defined by the PSI) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

APPENDIX A: Related Publications

Explosives and Blasting Agents Standard, Title 29, Code of Federal Regulations (CFR) Part 1910.109, 36 FR 10553-10562). This contains the actual text of the rule. (A single free copy of the above materials can be obtained from the OSHA Publications Office, Room N3101, Washington, DC 20210, (202) 523-9667).

U.S. Government Publications. U.S. Government Publishing Office, Washington, DC 20402.[?]

Publication ATF P 5400.7 (9/07), *Federal Explosive Law and Regulations*, U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives.

Title 18, United States Code, Chapter 40, "*Importation, Manufacture, Distribution and Storage of Explosive Materials*."

Title 27, Code of Federal Regulations, Part 555, "*Table of Distances for Low Explosives*," U.S. Bureau of Alcohol, Tobacco, Firearms, and Explosives.

Title 49, Code of Federal Regulations, Parts 100–199, "*Hazardous Materials Regulations*," U.S. Department of Transportation.

Department of Defense, DoD 6055.09-STD, *DOD Ammunition and Explosives Safety Standards*, latest edition.

Department of Defense, DoD 4145.26-M, *DOD Contractors Safety Manual for Ammunition and Explosives*

OSHA Instruction CPL 02-01-053, *Compliance Policy for Manufacture, Storage, Sale, Handling, Use and Display of Pyrotechnics*.

National Aeronautics and Space Administration, NASA-STD-8719.12, *Safety Standard for Explosives, Propellants, and Pyrotechnics*, latest edition.

NFPA 70, *National Electrical Code*, latest edition.

NFPA 77, *Recommended Practice on Static Electricity*

NFPA 101, *Life Safety Code*, latest edition.

NFPA 495, *Explosive Materials Code*, latest edition.

NFPA 499, *Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas*

NFPA 1124, *Code for the Manufacture, Transportation, and Storage, of Fireworks and Pyrotechnic Articles*, latest edition.

NFPA 5000, *Building Construction and Safety Code*, latest edition.

IME Publication. Institute of Makers of Explosives, 1120 19th St., NW, Suite 310, Washington, DC 20036-3605.

IME Safety Library Publication No. 3, "*Suggested Code of Regulations for the Manufacture, Transportation, Storage, Sale, Possession and Use of Explosive Materials."*

IME Safety Library Publication No. 25, "Explosives Manufacturing and Processing Guideline to Safety Training."

APA Standard 87-1. American Pyrotechnics Standard 87-1, *Standard for Construction and Approval for Transportation of Fireworks, Novelties, and Theatrical Pyrotechnics.*

APPENDIX B: Frequently Asked Questions

This appendix documents a PSM-related question that explosives and pyrotechnics manufacturers commonly ask of OSHA. This question is meant to provide a helpful response that will help with PSM Compliance.

What are OSHA's requirements for fireworks? OSHA Instruction CPL 02-01-53[11] provides compliance policy for manufacture, storage, safe handling, use and display of fireworks. Because the Bureau of Alcohol, Tobacco and Firearms has regulations addressing working conditions associated with the storage of explosives, OSHA's storage requirements for explosives at §1910.109(c) are preempted under section 4(b)(1) of the OSH Act.

OSHA's PSM standard applies to the manufacture of fireworks, and CPL 02-01-53 sets out OSHA's other applicable requirements. Explosive materials that are staged for active use in the manufacturing or assembly process are not considered to be in "storage", and may be covered by the PSM standard.

[11] https://www.osha.gov/OshDoc/Directive_pdf/CPL_02-01-053.pdf

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.