

Welcome to the Hard Hat Training Series!



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Welcome to the Hard Hat Training Series. Today we will talk about Process Safety Management. This standard mainly applies to manufacturing industries-particularly, those pertaining to chemicals, transportation equipment, and fabricated metal products.



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PSM TRAINING





Other affected sectors include natural gas liquids; farm product warehousing; electric, gas, and sanitary services; and wholesale trade. It also applies to pyrotechnics and explosives manufacturers covered under other OSHA rules and has special provisions for contractors working in these covered facilities.





No matter what industry you work in, if your job requires the use of highly hazardous chemicals (HHCs), there is potential for an accidental release at any time if they are not properly controlled. This, in turn, creates the possibility of disaster.



The Bhopal Disaster

Let's take a moment and revisit a catastrophic release of HHCs. The Bhopal disaster was a gas leak that occurred in December of 1984. It is generally considered to be the world's worst industrial disaster, with over half a million people in small towns around the union Carbide India Limited pesticide plant in Bhopal, Madhya Pradesh, India being exposed to a toxic methyl isocyanate (MIC) gas cloud.



While injury and death toll estimates vary, the latest numbers indicate that the government paid restitution to just over 558,000 victims. Of those injured, almost 29,000 had temporary or partial injuries and 3,900 were severely or permanently-disabled. Some speculate that as many as 16,000 people have died as a result of the gas leak —about 8,000 at the time of the initial release and the rest from gas-related illnesses over the years.



The cause of the disaster remains under debate. Some argue the disaster was caused by a potent combination of under-maintained and decaying facilities, a weak attitude towards safety, and an undertrained workforce. These issues, activists say, culminated in worker actions that inadvertently enabled water to penetrate the MIC tanks in the absence of properly working safeguards.





The other side of the debate claims that it was physically impossible for water to enter the MIC tanks without a concerted human effort. They argue that sabotage allowed the water into the tank, resulting in the leak. This and other disasters like it are the reason the PSM standard exists today.



What is PSM?

Process Safety Management (PSM) is a proactive process used to identify, evaluate, mitigate, and prevent possible releases of highly hazardous chemicals (HHCs) due to a failure in process, procedures, or equipment. OSHA established PSM standards to address the potentially catastrophic consequences such a release could have on the health and safety of personnel working on site.

IDENTIFY

EVALUATE

MITIGATE

PREVENT

PSM

Chemical safety is also regulated by the Environmental Protection Agency (EPA). While their regulations are similar, there are some differences which we'll note as we go throughout our training.



The OSHA standard is required by the Clean Air Act Amendment, as is the Environmental Protection Agency's Risk Management Plan (RMP). Employers who utilize both standards in their process safety management program (PSM) are more likely to be in full compliance with each, keep their workers safe, and enhance their relationship with the local community.



CHEMICAL	OSHA PSM THRESHOLD
Chlorine	1,500 lbs.
Sulfur Dioxide	1,000 lbs.
Ammonia (Anhydrous)	10,000 lbs.
Aqueous Ammonia	[>44%] 15,000 lbs. (based on solution weight)
Flammable Liquid/Gas (unless used only as fuel)	10,000 lbs.
Propane, Methane, etc.	---

When PSM Doesn't Apply

On the other hand, the PSM standard does not apply to retail facilities; oil or gas well drilling or servicing operations; or remote facilities that are normally unoccupied. Nor does it apply to hydrocarbon fuels being used solely as fuel, such as propane used for heating, unless these fuels are used in another process containing other HHCs.



Furthermore, if there are flammable liquids that are stored in atmospheric tanks or are being transferred, the PSM standard does not apply. However, these must be below their normal boiling point without being chilled or refrigerated, and they cannot be connected to a process.



OSHA doesn't have regulatory authority over facilities that are run by local or state governments, but several states have adopted their own standards that closely resemble the federal regulations. The facility's owner or operator must know which (if any) of these regulations apply and follow them with exactness.



Helpful Terms

Before proceeding any further, let's take the time to define a few more terms that will be helpful as you navigate the course. We may introduce and define other terms throughout the training, but these are key to understanding the training as you go through it.

HHCs

Highly hazardous chemicals (HHCs) can be liquids or gases that are highly reactive, toxic, corrosive, or flammable. Because exposure to these kinds of chemicals can cause serious, long lasting health issues as well as injury or death, the PSM regulations cover all industries that use, store, or move HHCs on site.



Process

OSHA uses the term “process” to mean any activity involving an HHC. This includes using, processing, storing, manufacturing, handling or moving them on site, or any combination of these. For this purpose, any group of interconnected vessels are considered a single process. This also applies to separate vessels located in a way that could involve an HHC in a potential release.





Covered Processes

Simply put, a covered process is any process that is covered by OSHA's PSM standard. For the purposes of today's training, we use this phrase interchangeably with "process" or "processes."

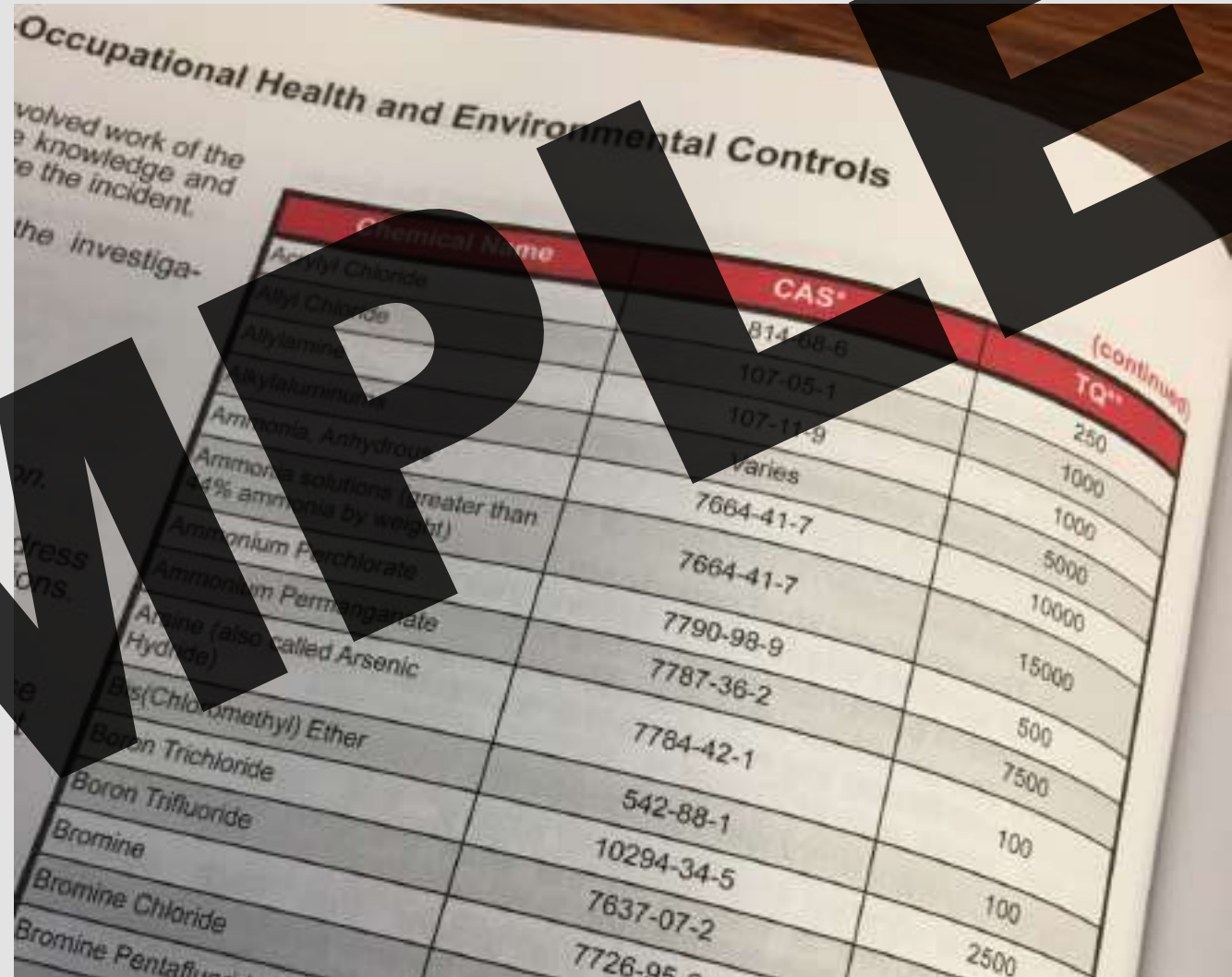
Deviations

Deviations are any actions that do not follow the written operating procedures for a piece of equipment or the process as a whole. For example, if the process calls for workers to wear eye protection but they don't, that's a deviation. Even small, seemingly-insignificant deviations can result in serious consequences when working with HHCs.



Listed Thresholds

OSHA has a limit or thresholds regarding how much of a chemical can be stored on site. Any facility storing quantities above this threshold are regulated by both the EPA and OSHA.



Occupational Health and Environmental Controls

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Chemical Name	CAS*	TQ** (continued)
Acetyl Chloride		
Allyl Chloride	814-68-6	
Allylamine	107-05-1	
Alkylaluminum	107-11-9	
Ammonia, Anhydrous	Varies	250
Ammonia solutions (greater than 4% ammonia by weight)	7664-41-7	1000
Ammonium Perchlorate	7664-41-7	1000
Ammonium Permanganate		5000
Arsine (also called Arsenic Hydride)	7790-98-9	10000
Bis(Chloromethyl) Ether	7787-36-2	15000
Boron Trichloride	7784-42-1	500
Boron Trifluoride	542-88-1	7500
Bromine	10294-34-5	100
Bromine Chloride	7637-07-2	100
Bromine Pentafluoride	7726-95-6	2500

CHEMICAL	OSHA PSM THRESHOLD
Chlorine	1,500 lbs.
Sulfur Dioxide	1,000 lbs.
Ammonia (Anhydrous)	10,000 lbs.
Aqueous Ammonia	[>44%] 15,000 lbs. (based on solution weight)
Flammable Liquid/Gas (unless used only as fuel)	10,000 lbs.
Propane, Methane, etc.	---

These limits or thresholds can be found in Appendix A of the OSHA standard. The chemicals found here are referred to as “listed chemicals.” With over 130 specific toxic and reactive chemicals listed, we cannot even begin to go through the thresholds of all the chemicals here; however, we have provided a few examples of common chemicals here.



Take Note!

Appendix A also includes flammable liquids and gases in quantities of 10,000 pounds (4,535.9 Kg) or more.



The EPA and OSHA have different thresholds for each of these chemicals, as illustrated here. Facilities that fall under the OSHA standard need to be aware of and consult both thresholds when working with and storing HHCs.

CHEMICAL	OSHA PSM THRESHOLD	EPA RMP THRESHOLD
Chlorine	1,500 lbs.	2,500 lbs.
Sulfur Dioxide	1,000 lbs.	5,000 lbs.
Ammonia (Anhydrous)	10,000 lbs.	10,000 lbs.
Aqueous Ammonia	[>44%] 15,000 lbs. (based on solution weight)	[>20%] 20,000 lbs. (based on weight of NH ₃)
Flammable Liquid/Gas (unless used only as fuel)	10,000 lbs.	*
Propane, Methane, etc.	---	10,000 lbs.

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Propane, Methane, etc.	---	10,000 lbs.

Take note that the EPA covers only listed flammables (such as methane and propane), while OSHA covers them as a separate category. Also, the EPA doesn't regulate propane users or retail distributors. Nor do they cover methane that is from anaerobic digesters used as fuel.



Elements of PSM

OSHA's Process Safety Management standard is made up of 14 guidelines or elements, listed here. All these elements are interlinked, and an effective PSM program depends on them being present and in compliance with the standard.



For the sake of clarity, our training will break these elements into four categories: identify, communicate, maintain, and re-evaluate. With that in mind, the goal of today's training is to teach you how to recognize, identify, and analyze hazards in a process.

MAINTAIN SAFETY

- Pre-Startup Review
- Mechanical Integrity
- Non-Routine Work

03

04

RE-EVALUATE

- Management of Change
- Emergency Response
- Incident Investigation

COMMUNICATE HAZARDS

- Operating Procedures
- Contractors
- Training

02

01

IDENTIFY HAZARDS

- Process Safety Information
- Process Hazard Analysis
- Risk Management Program



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- Risk Management Program

01

Next, you will learn how to communicate these hazards through written operating procedures. We will also teach you how and why contractors should be kept apprised of hazards and the importance of proper training for those involved in covered processes.



MAINTAIN SAFETY

- Pre-Startup Review
- Mechanical Integrity
- Non-Routine Work

You will also learn the importance of maintaining safety by performing pre-startup reviews. We will cover how to ensure the integrity of machinery used in covered processes and how to properly keep track of non-routine work so everyone in the workplace stays safe.



Finally, we'll go over when to re-evaluate your process safety management program. You'll learn how to properly manage change and prepare for an accidental release. Finally, we will teach you about incident investigation.

04

RE-EVALUATE

- Management of Change
- Emergency Response
- Incident Investigation



29 CFR 1910.119 – Process Safety Management of Highly Hazardous Chemicals

Clean Air Act Section 112® - Accidental Release Prevention/Risk Management Plan Rule

General Duty Clause 5(a)(1) - *"Each employer shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."*

With all that in mind, these are some of the main standards concerning Process Safety Management. Again, some states have additional standards, as do some industries. We have provided these as a guide, but it's your responsibility to know all federal, state, and local regulations that apply to your job site, as well as any applicable company rules.



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