WHAT IS A PSM COVERED PROCESS?

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ABSTRACT

This document discusses the criteria and regulatory requirements for determining when a Management of Change (MOC) is necessary, as mandated by OSHA's Process Safety Management (PSM) standards (1910.119). An MOC is required if a proposed activity within a covered process constitutes a change that is not simply a replacement in kind. Understanding whether a process is "covered" is essential, as processes that do not fall under PSM regulations avoid associated compliance costs. Covered processes involve either specified quantities of hazardous chemicals or significant quantities of flammable substances, with exemptions for retail, oil, gas, and remote facilities.

The document examines key terms, including "process," which encompasses any activity involving hazardous chemicals. The PSM standard applies broadly to interconnected and closely located components that could contribute to or exacerbate a hazardous chemical release. OSHA interpretations clarify ambiguities in applying PSM to specific cases, such as differentiating between manufacturing and using explosive devices. Legal interpretations have further refined PSM applications, with a focus on OSHA’s intent to prioritize safety over semantic distinctions, underscoring the importance of correctly defining covered processes for effective safety management.

INTRODUCTION

The logic of when an MOC is needed is as follows:

- Is it a covered process?
- If yes, then is the proposed activity actually a change?
- If yes, then is the proposed activity NOT a replacement in kind?

When all 3 questions can be answered yes, then the proposed activity requires an MOC, according to the PSM regulations.

The Regulations

The first challenge is to define a "covered process". OSHA 1910.119[1] states that the process safety management regulations are applicable under the following circumstances:

(a) ***Application.***

(1) This section applies to the following:

(i) A process which involves a chemical at or above the specified threshold quantities listed in appendix A to this section;

(ii) A process which involves a flammable liquid or gas (as defined in 1910.1200(c) of this part) on site in one location, in a quantity of 10,000 pounds (4535.9 kg) or more except for:

(A) Hydrocarbon fuels used solely for workplace consumption as a fuel (e.g., propane used for comfort heating, gasoline for vehicle refueling), if such fuels are not a part of a process containing another highly hazardous chemical covered by this standard;

(B) Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration.

(2) This section does not apply to:

(i) Retail facilities;

(ii) Oil or gas well drilling or servicing operations; or,

(iii) Normally unoccupied remote facilities.

Certain words in paragraph (a) are augmented with definitions in paragraph (b)[1]:

(b) ***Atmospheric tank*** *means a storage tank which has been designed to operate at pressures from atmospheric through 0.5 p.s.i.g. (pounds per square inch gauge, 3.45 Kpa).*

Facility *means the buildings, containers or equipment which contain a process.*

Highly hazardous chemical *means a substance possessing toxic, reactive, flammable, or explosive properties and specified by paragraph (a)(1) of this section.*

Normally unoccupied remote facility *means a facility which is operated, maintained or serviced by employees who visit the facility only periodically to check its operation and to perform necessary operating or maintenance tasks. No employees are permanently stationed at the facility.*

Facilities meeting this definition are not contiguous with, and must be geographically remote from all other buildings, processes or persons.

Process *means any activity involving a highly hazardous chemical including any use, storage, manufacturing, handling, or the on-site movement of such chemicals, or combination of these activities. For purposes of this definition, any group of vessels which are interconnected and separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process.*

A Venn-diagram interpretation of the applicability of the PSM regulations appears in Figure 1.

The unshaded regions in Figure 1 represent exemptions from the PSM regulations. A process that isn't covered by the PSM regulations is comparatively cheaper to operate since the cost of compliance with the PSM regulations is zero. So, there's an obvious interest in clearly understanding when a process is covered and when it isn't. While Figure 1 appears clear conceptually, whether a process is covered, or not, is often determined by nuances in the meaning of the words describing the regions. Numerous requests were made of OSHA to clarify

[1] This is a list of definitions relevant to the current discussion. There are additional definitions in the regulation.

the meaning of every concept listed in paragraph (a), above. What follows is a comprehensive compilation of comments from various Standards Interpretations issued by OSHA in the years beginning in 1992.

Some Caveats

Some of the following discussions involve results of legal cases and judgments. In many instances OSHA lost its case. But losing a case often has more to do with semantics and legal process issues, than the validity of the underlying regulations. The following discussion emphasizes OSHA's intent as much as possible, since understanding the intent of the PSM regulations is critical to implementing good process safety management.

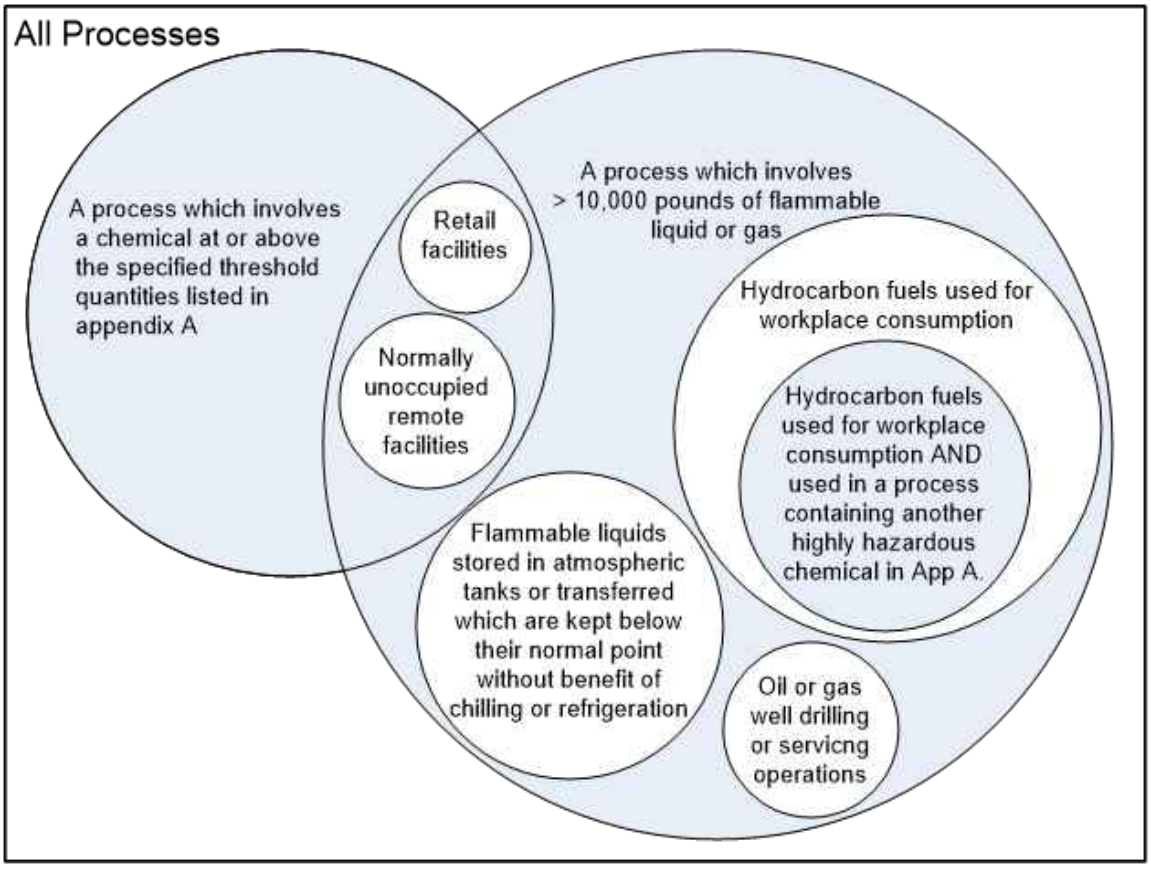

Figure 1. Venn diagram illustrates the meaning of "covered process". The shaded regions are covered processes; the unshaded regions are not covered processes according to OSHA 1910.119.

Interpretations

(b) Process

The notion of "process" is fundamental to any interpretation of the PSM standard.

The definition of "process" in §(b) includes many items: "use, storage, manufacturing, handling, or the on-site movement of such chemicals". This becomes an issue when, for example, when the amount of chemical in storage and the amount of chemical in manufacturing are each less

than the threshold amounts in Appendix A, but the total is greater than the threshold amount. An employer may wish to separate storage from manufacturing in order to avoid the necessity of PSM compliance. While it may be possible to enact sufficient barriers and controls to keep various uses separate, OSHA indicated that the employer has a substantial burden to demonstrate that different uses of the same chemical in a facility do not and cannot interact with each other[2].

Flammable liquids stored in "atmospheric tanks" are exempted by §(a)(1)(ii)(B), provided they are not connected to anything this isn't just storage and transfer. Once tanks are connected to a usage that is beyond storage and transfer, then the tanks are included as part of the process[3]. This is true regardless of the presence of valves or other controls that may be used to separate or direct fluid flows[4].

There may still be confusion regarding the boundaries of a process, for certain applications that are not really the focus of the PSM regulations, but still may be covered by the regulations (e.g. on-site final assembly of explosives immediately prior to use). In these cases, a process hazards analysis can be used to determine the scope of process coverage[5, 6].

(b) Process – "Interconnected"

§(b) continues with the concept of interconnectedness, "any group of vessels which are interconnected…shall be considered a single process."

If several vessels are interconnected, and only one of them has greater than a threshold quantity of an HHC, then there's high probability that all of the interconnected vessels would be considered a single process, and subject to PSM[6].

The connection between vessels need not be rigid piping. OSHA has interpreted each of the following to be a legitimate connection:

- "a closed double block and vent in a pipeline (that is, a pipeline containing two closed valves, between which is a vent which is open to the air)", even though such an arrangement is considered an energy isolating device under lockout/tagout §1910.147(b) [7],
- a temporary flex hose running between two vessels[7],
- a conveyor moving between two pieces of equipment, even if the equipment pieces are separated by a large distance, and even if the conveyed material is neither flammable nor an Appendix A material[7],
- a pipe used to supply a vessel, but which is removed when the process actually occurs[8].

This concept of "interconnected" is critical since utility systems (e.g. steam, plant air), which wouldn't be covered by PSM in isolation, would likely be covered once connected to a covered process[9, 10]. This is reasonable since failure of a utility system may contribute to a catastrophic release[11], or inhibit the mitigation of a release once it occurred[12]. A PHA may be used to determine which aspects of a utility system are to be covered by PSM[12].

It is conceivable that interconnected "aspects" of a process (e.g. downstream of the use of HHCs) do not contain any HHCs, nor could they contribute to a release, nor could they interfere with mitigating the consequences of a release elsewhere. The onus is on the employer to conduct a rigorous analysis demonstrating that an interconnected process aspect is not capable of contributing to a release or its consequences[13]. This analysis does not provide a perpetual

exemption, since changes in the plant may invalidate the analysis, thereby making those process aspects subject to the PSM standard.

(b) Process – Close Proximity

While it's understandable that interconnected vessels may be involved in, or contribute to, a catastrophic release of HHCs, it's also plausible that vessels that are located near each other may participate in a catastrophic release, simply due to their proximity even without being interconnected.

§(b) also includes the concept of close proximity, "separate vessels which are located such that a highly hazardous chemical could be involved in a potential release shall be considered a single process."

Several interpretations supported the view that containers, vessels and piping in close proximity, which can contribute to a release of HHCs, are considered part of a single process[8, 14, 15].

It's clear from this discussion about the meaning of the word "process", that the PSM standard definition of "process" may differ dramatically from local notions of what the boundaries of a particular process are.

(a) Explosives

At the same time (1992) that the PSM regulation appeared in the *Federal Register*, the regulations covering explosives were modified to ensure that explosives manufacturing is covered by the PSM regulations, "The manufacture of explosives…shall also meet the requirements contained in §1910.119" [16].

The purpose of explosives is to…explode! So, it would be nonsensical for the "use" of explosives to be covered by PSM[5]—and the **use** isn't covered, just the manufacture.

Some confusion ensued, since neither 1910.109 nor 1910.119 make any reference to threshold quantities of explosives. OSHA responded that "the synthesis of chemicals to create **any amount** [emphasis mine] of explosives is considered to be explosives manufacturing and is covered by the PSM standard"[17, 18]. Other interpretations agree[19].

Manufacturing of explosive devices, not just explosive chemicals, is also covered by the PSM standard[20]:

> *As a hypothetical example, an employer obtains an explosive device manufactured by another employer. This explosive device is a subassembly for a missile which is manufactured by the employer. Both employers must comply with the PSM standard.*

A less dramatic example is the manufacture of automobile air bag inflation modules. These contain materials which are listed as Class B explosives by the Department of Transport, which are covered by the PSM standards. Consequently manufacture of these modules is subject to PSM standards[21].

In contrast, simply **using** explosive devices in the manufacture of products that are not intended to explode, e.g. automobiles, is not covered by the PSM standard[21]. Similarly, in aircraft manufacture:

> *OSHA did not intend that the PSM standard apply to the **installation** of explosive devices, such as explosive bolts… ejection seat rocket motors … into larger finished products or devices that are not intended to explode. [22]*

Repackaging explosives into, say, different size packages "is considered to be storage and handling activities [of explosives] which are not covered by the PSM standard"[23, 24]. It's important that no further processing, mixing, blending or other changes take place for this exemption to hold[24, 25]. Explosives are handled quite differently than other HHCs since repackaging the latter actually is indeed regulated by the PSM standard[26].

(a)(1)(i) Highly hazardous chemicals

A number of inquiries have been made to OSHA regarding chemicals not on the list in Appendix A. Invariably OSHA's response has been that if it's not on the Appendix A list, then it's not covered by §(a)(1)(i) of the PSM standard[27, 28].

Chemicals that are not listed in Appendix A may still present potential hazards. For instance, neither sodium hydrosulfite (powder) nor aluminum powder are in Appendix A, but a mixture of the two is very reactive with water. A fatal accident, involving this mixture and water that had leaked from a cooling system prompted OSHA to recommend, "A process safety analysis should be done for all materials with a catastrophic potential, even if they are not covered by the Process Safety Standard."[29]

(a)(1)(i) Highly hazardous chemicals – mixtures and solutions

Solutions of nine chemicals in Appendix A become subject to the PSM regulations when they exist in greater than prescribed concentrations. For example, hydrogen peroxide is subject to PSM if the concentration is greater than 52% by weight, and the amount is greater than 7,500 pounds. Below 52% concentration, any amount of hydrogen peroxide is permitted[30].

Many chemicals are procured in aqueous solution form. When the concentration to trigger coverage under PSM is not stated in Appendix A, then the usual commercial concentration or reagent concentration applies, whichever is less.

Also, many of the highly hazardous chemicals listed in Appendix A of the PSM regulation are used in aqueous solution form. Although they may trigger PSM compliance (when used in greater than threshold quantities) in their unmixed form, they may not trigger PSM compliance in solution. Appendix A of the PSM regulation is quite explicit about when solutions of highly hazardous chemicals trigger PSM compliance[30-34]: e.g. "Ammonia solutions (> 44% by weight)". Solutions of related chemicals, not listed in Appendix A, such as ammonium chloride, do not trigger the need for PSM compliance[31].

This effectively creates a "low concentration solution exemption." But note that fluids may become flammable once in solution, in which case the Appendix A criterion (§(a)(1)(i) no longer governs whether the process is covered; instead, the flammable liquid or gas criterion, §(a)(1)(ii), governs whether the process is covered[32, 35].

When an HHC solution is identified in Appendix A, then the entire weight of the solution (including the water) is included when determining whether threshold quantities are exceeded[19].

A further complication arises when the aqueous solutions of HHCs are unstable, in the sense that the HHC will come out of solution (e.g. Chlorine dioxide in water) unless properly

contained. In the event of a breach of the containment system, the HHC may come out of solution, and create a greater than threshold amount of HHC. The employer has an obligation to ensure that controls are in place to prevent this from happening, otherwise the process is subject to PSM regulations[36].

And finally, although an HHC in aqueous solution at concentrations below Appendix A limits and below commercial/reagent concentrations would not trigger PSM compliance due to dilution, it still may trigger PSM compliance if it's a flammable or explosive mixture[32].

(a)(1)(i) Highly hazardous chemicals – threshold quantities

Processes containing highly hazardous chemicals, in amounts greater than the threshold quantity listed in Appendix A, are subject to the PSM regulations. If a process has less than the threshold amount, then it's not a covered process[24, 37]. When tanks are available, which can contain more than the threshold amount, but the employer ensures that there is never more than the threshold amount in the process, then the process continues to be exempt. Obviously, adequate controls would be needed, and convincing records would need to be kept, to demonstrate that the process, at all times, operates below the threshold amounts[38].

A given process may have a number of different flammable liquids or gases. All flammable liquids in a process are aggregated together to determine whether the total is less than the 10,000-pound threshold of §(a)(i)(2). Also, all flammable gases in a process are aggregated together to determine whether the total is less than the 10,000-pound threshold. Interestingly, the flammable liquid weight is not added to the flammable gas weight to determine whether the 10,000-pound threshold is exceeded[39]. In contrast, the HHCs, listed in Appendix A, are each considered separately[9, 39].

When a material is purchased, commonly in "commercial" or "reagent" grade, and diluted in the process, then none of the material is counted into threshold quantities, as previously discussed in the section on solutions and mixtures. However, if the material is a process intermediate (e.g. chlorine dioxide, which is not available commercially), then the entire weight of the material in the process is counted to establish whether the threshold quantity is exceeded[40].

(a)(1)(ii) Flammable liquids or gases

An interesting possibility is a solution of 2 or more components, where some of the components are flammable. Under what conditions is such a solution not considered flammable? The answer is provided by 1910.1200(c):

> *(iii) Liquid, flammable means any liquid having a flashpoint below 100°F (37.8°C), except any mixture having components with flashpoints of 100°F or higher, the total of which make up 99 percent or more of the total volume of the mixture.[41]*

In plain language this means that any liquid with a flashpoint below 100°F, or a mixture containing at least 1% by volume of components with a flashpoint below 100°F, are considered to be a "flammable liquid".

(a)(1)(ii) Flammable liquids or gasses "On site in one location"

A question arises when an employer has many uses for the same chemical, and the chemicals are stored in different locations throughout the plant: how should threshold quantities be calculated?

> *OSHA did not intend that facilities aggregate quantities of covered chemicals. The important factor is the amount of a listed chemical in a plant that could be released at one point in time. [42]*

In regards to flammable liquids, this is expressed using the wording:

> *A process which involves a flammable liquid or gas (as defined in 1910.1200(c) of this part) **on site in one location**, in a quantity of 10,000 pounds (4535.9 kg) or more*

The words "on site in one location" were the crux of a case involving Motiva Corporation. In this case Motiva's "Refining Division" operates a refinery in Delaware City, DE. An affiliated company, the "Commercial Marketing and Distribution Division" operates a distribution terminal, adjacent to the refinery. The refinery and distribution terminal are separated by a fence. More than 10,000 lb. of propane exists in tanks at the refinery which feed the distribution operations in the terminal. Motiva argued that the distribution terminal did not have more than the 10,000 lb. threshold quantity of flammables, and therefore was not subject to PSM. OSHA's position was that the hazards were determined by the quantity of flammables in the tanks and not by the existence of the fence or the corporate structure of the entities on either side of the fence. In other words, OSHA maintained that, as far as the terminal was concerned, the "one location" included the flammables in the tanks [43-45].

(a)(1)(ii)(A) Flammable liquids or gasses – Exceptions – Hydrocarbon fuels

The hydrocarbon fuel exemption was confirmed in an OSHA interpretation regarding the use of gasoline to test run inboard and outboard engines at Marine Corporation. "We agree…gasoline used in the manner described does not fall within the scope of 1910.119 [46]."

Another case involving hydrocarbon fuels concerned the use of natural gas to heat a steam boiler. An OSHA interpretation confirmed that natural gas used just to create steam, would not be covered by the PSM regulations[10]. But, another interpretation cautioned that "the PSM standard applies…if there is any amount of natural gas in any one of these systems when it is part of a process containing a threshold quantity or greater amount of another highly hazardous chemical covered by the PSM Standard.[47]" The same thought was reiterated in regards to black liquor[2] recovery boilers[48]. Although black liquor is used as a hydrocarbon fuel (and therefore exempt from PSM), if the black liquor contains greater than threshold quantities of Appendix A chemicals, then the black liquor recovery boilers are more than likely covered by PSM.

The inquiry by Libbey Glass, Inc., a maker of table glassware, provides an interesting nuance on the use of hydrocarbon fuels. According to their inquiry, molten glass is injected into a mold and a plunger presses the glassware into shape. "To provide lubrication between the glass and steel a [hydrocarbon] fuel mixture… is ignited and injected into the mold. The products of combustion, which are high in carbon content, coat the mold allowing easy release of the freshly formed glassware"[49]. Initially, OSHA rejected this application as being a case where the hydrocarbon fuel exemption applied, since the flammable gas was "not used solely for workplace consumption as a fuel." However, when further data was provided that, indeed the

[2] Black liquor is a by-product of the process of digesting pulpwood into paper pulp. Black liquor is an aqueous solution of lignin residues, hemicelluloses and inorganic chemicals. Once concentrated, and water removed through evaporation, it can be burned in a recovery boiler.

gas is used to heat the molds, OSHA rescinded the earlier interpretation and accepted this application as being subject to the hydrocarbon fuels exemption[50].

(a)(1)(ii)(B) Flammable liquids or gasses – Atmospheric tanks

"Flammable liquids stored in atmospheric tanks or transferred which are kept below their normal boiling point without benefit of chilling or refrigeration" are exempt from the PSM standard. This is often termed the "atmospheric tank exemption".

The American Furniture Manufacturers Association requested an interpretation of "atmospheric tanks". In the furniture, and other industries, it's common to store more than 10,000 pounds of flammable materials in 55-gallon drums. OSHA responded that, "Containers such as 55-gallon drums are considered to be atmospheric tanks…even if the quantity exceeds 10,000 pounds…would not be covered by the standard" [51]. Other interpretations are in agreement with this[52].

Atmospheric tanks need to be isolated and not connected to a process. If connected to a process, say, with rigid or solid piping, then the weight of material in the storage tank is included in the threshold determination[53-57], and the tank itself is part of the process. But, if the process is simply transferring and storing liquids, those activities are considered equivalent to storage in atmospheric tanks, and therefore not covered by PSM[58].

However, the use of additional safety measures, like adding a nitrogen blanket on top of flammable liquids, renders the storage system no longer an atmospheric tank, and therefore the atmospheric tanks exemption from the PSM standard no longer applies[59].

(a)(1)(ii)(B) Flammable liquids or gasses – Atmospheric tanks – The Meer Decision

There is an apparent contradiction between the Atmospheric tanks section (a)(1)(ii)(B) and the definition of Process (b). The latter section contains the wording, "Process means any activity … including any use, storage… or the on-site movement of such chemicals."

So which is it? Are storage and transfer of flammables exempt from PSM as per (a)(1)(ii)(B), or are storage and on-site movement (i.e. a transfer) of flammables part of a process as per (b) and therefore covered by PSM? This was one of the key points in *Secretary of Labor v. Meer Corporation*[60] and Judge DeBenedetto ruled that the PSM wording on this point was "…so vague and uncertain as to be insufficient to warn Meer that it was required to comply with the PSM standard."

OSHA subsequently modified its enforcement practices to comply with the Meer decision. Specifically, the weight of flammable liquids in storage is not counted when determining whether threshold quantities have been exceeded in a process, regardless of what kind of connection exists between the atmospheric storage tanks and the process[61].

(a)(2)(i) Retail facilities

Several interpretations dealt with the definition of "retail establishment". This is of interest since fertilizers are often blended by the supplier (i.e. a process), and are handled in large quantities, yet are sold directly to the end user. The OSHA interpretation indicated that, "a retail facility [where]… more than half of the income is obtained from the direct sales to end users…would be exempt from…1910.119" [62] and this was reiterated in other interpretations[63-65]. So, not all of the income has to come from end users to qualify as a retail facility, only half of it.

An interesting nuance occurs if a company owns several facilities that are close to each other, but not all on the same site. If the percentage, averaged over all the facilities, of income from end users is even slightly greater than 50% the argument could be made that, as a group, these are "retail facilities." That notion was rejected by OSHA who indicated that, "retail facility, means a company name at a specific site (normally with a street address)…thus if [company] operates at several locations, some might be covered…and others not affected [66]." The logic is sound, since, in order to average to 50% end user income, some facilities in the group would have to exceed 50% end user income (exempt) and some facilities would be below that amount (i.e. subject to PSM).

Retail facilities must engage in "retail trade", whereby "retail trade establishments sell merchandise to the general public for personal or household consumption"[67]; a gasoline service station would be a good example. In contrast, "wholesale trade establishments may sell similar merchandise for exclusive use by industry. A worksite where…[items] are sold primarily for use by the oil and gas well drilling, servicing and production industry would be considered a wholesale trade establishment."[67]. A facility for refilling propane bottles (e.g. for home barbecue use), where the bottles are sent to large retail distributors, cannot use the retail facilities exemption, since the sales are not to end users[68].

Interestingly, selling goods, like fertilizer, to farmers is considered retail trade[62].

(a)(2)(ii) Oil or gas well operations

The American Gas Association requested clarification regarding whether the PSM regulations apply to "natural gas distribution and transmission facilities". This is a reasonable question because it appears that natural gas transmission would be covered under the 10,000 pounds of flammable liquid or gas, §(a)(1)(ii), and neither the "hydrocarbon fuels" , §(a)(1)(ii)(A), nor "atmospheric tanks" , §(a)(1)(ii)(B), exemptions apply.

OSHA responded that the then current regulations of the Department of Transport Office of Pipeline Safety "address the hazards of fire and explosion in the gas distribution and transmission process" and that "OSHA…is precluded from enforcing the PSM rule over the working conditions associated with those hazards"[69] .

In 2000, "OSHA decided to perform an economic analysis with respect to the feasibility of compliance at oil and gas production wells."[70, 71] In the meantime, "OSHA will not enforce the PSM standard at oil and gas production facilities."[70, 72]

(a)(2)(iii) Unoccupied remote facilities

The State of Alaska requested clarification of "unoccupied remote facility" as it pertains to water treatment plants, which use greater than threshold amounts of chlorine. The facility in question had neither regular staff nor any facilities like vending machines or bathrooms to suggest regular occupancy. The request was very detailed about the amount of time that staff were present at the site (less than 1 hr/day assuming 2 workers). OSHA determined that this qualified as a normally unoccupied remote facility[72, 73].

Another questioner described a somewhat similar circumstance where an Appendix A chemical was stored in a remote building with the intended use being weed control. But this time the OSHA perspective differed, "The PSM standard applies… when… employees... may be exposed

to the acrolein. The normally unoccupied remote facilities exemption would not apply to the application by employees of acrolein to irrigation canals for weed control."[74]

On the surface, it appears that these two interpretations are contradictory. If one accepts that the second group of workers was at risk of exposure to acrolein, then the first group of workers was similarly at risk to chlorine exposure. However, there is the distinction that the second group of workers handled the acrolein as a regular part of their job, whereas the first group didn't handle the chlorine at all. This may have influenced OSHA's thinking when they issued these interpretations.

In another interpretation, expanded on the notion of "remote". "Remote" isn't intended to be a distant part of the plant. The notion of remote "is meant to apply to a facility that is so far removed from any other facility that it could not contribute to a catastrophic release" [55, 75].

1928.21(b) Agricultural Exemption

Agricultural operations have been granted an exemption from PSM standards, "the standards contained in subparts B through T and subpart Z of part 1910 of this title do not apply to agricultural operations"[76]. Since the PSM standards appear in Subpart H of rule 1910, the PSM standards do not apply to agricultural operations[77].

Jurisdictional Issues

Several interpretation letters touch on jurisdictional issues: that is, whether the activity actually falls under OSHA's jurisdiction, or perhaps the Department of Transport in general, or the DOT's Office of Pipeline Safety[55, 78-81]. These interpretations tend to be less definitive than the interpretations that are entirely within OSHA's purview.

However, just because "other" regulations apply to the workplace (e.g. Electric Power Generation, Transmission and Distribution as discussed in §1910.269), that doesn't automatically pre-empt PSM requirements. Indeed, in the case of §1910.269, both PSM and the §269 regulations apply[12].

Best Practices for Covered Processes

The cost of compliance is always optimized when no compliance is needed at all. In regards to covered processes, this means moving your current state from the shaded region in Figure 1 to an unshaded region. Admittedly, there are few opportunities for this, particularly in a large chemical processing facility. However, those processes which are "just barely" covered by PSM may be reconfigured to not be a covered process. Examples include[82]:

1. Reducing the inventory of a highly hazardous chemical, to below threshold quantity levels. This may require better purchasing coordination so that the chemicals are purchased in smaller quantities.
2. If reducing the total inventory isn't possible, then dispersing the inventory to widely dispersed locations in a facility.

Neither of these suggestions remove the responsibility of the employer conducting their operations safely; these suggestions simply remove the effort associated with the formalisms of PSM.

Appendix A to Sec. 1910.119--List of Highly Hazardous Chemicals, Toxics and Reactives

This appendix contains a listing of toxic and reactive highly hazardous chemicals which present potential for a catastrophic event at or above the threshold quantity.

CHEMICAL name	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Propenal)	107-02-8	150
Acrylyl Chloride	814-68-6	250
Allyl Chloride	107-05-1	1000
Allylamine	107-11-9	1000
Alkylaluminums	Varies	5000
Ammonia, Anhydrous	7664-41-7	10000
Ammonia solutions (> 44% ammonia by weight)	7664-41-7	15000
Ammonium Perchlorate	7790-98-9	7500
Ammonium Permanganate	7787-36-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis(Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637–07–2	250
Bromine	7726-95-6	1500
Bromine Chloride	13863-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100
Butyl Hydroperoxide (Tertiary)	75-91-2	5000
Butyl Perbenzoate (Tertiary)	614-45-9	7500
Carbonyl Chloride (see Phosgene)	75-44-5	100
Carbonyl Fluoride	353-50-4	2500
Cellulose Nitrate (concentration > 12.6% nitrogen)	9004-70-0	2500
Chlorine	7782-50-5	1500
Chlorine Dioxide	10049-04-4	1000
Chlorine Pentafluoride	13637-63-3	1000
Chlorine Trifluoride	7790-91-2	1000
Chlorodiethylaluminum (also called Diethylaluminum Chloride	96-10-6	5000
1-Chloro-2,4-Dinitrobenzene	97-00-7	5000
Chloromethyl Methyl Ether	107-30-2	500
Chloropicrin	76-06-2	500
Chloropicrin and Methyl Bromide mixture	None	1500
Chloropicrin and Methyl Chloride mixture	None	1500
Cumene Hydroperoxide	80-15-9	5000
Cyanogen	460-19-5	2500
Cyanogen Chloride	506-77-4	500
Cyanuric Fluoride	675-14-9	100
Diacetyl Peroxide (Concentration 70%)	110-22-5	5000

Diazomethane	334-88-3	500
Dibenzoyl Peroxide	94-36-0	7500
Diborane	19287-45-7	100
Dibutyl Peroxide (Tertiary)	110-05-4	5000
Dichloro Acetylene	7572-29-4	250
Dichlorosilane	4109-96-0	2500
Diethylzinc	557-20-0	10000
Diisopropyl Peroxydicarbonate	105-64-6	7500
Dilaluroyl Peroxide	105-74-8	7500
Dimethyldichlorosilane	75-78-5	1000
Dimethylhydrazine, 1,1-	57-14-7	1000
Dimethylamine, Anhydrous	124-40-3	2500
2,4-Dinitroaniline	97-02-9	5000
Ethyl Methyl Ketone Peroxide (also Methyl Ethyl Ketone Peroxide; concentration > 60%)	1338-23-4	5000
Ethyl Nitrite	109-95-5	5000
Ethylamine	75-04-7	7500
Ethylene Fluorohydrin	371-62-0	100
Ethylene Oxide	75-21-8	5000
Ethyleneimine	151-56-4	1000
Fluorine	7782-41-4	1000
Formaldehyde (Formalin)	50-00-0	1000
Furan	110-00-9	500
Hexafluoroacetone	684-16-2	5000
Hydrochloric Acid, Anhydrous	7647-01-0	5000
Hydrofluoric Acid, Anhydrous	7664-39-3	1000
Hydrogen Bromide	10035-10-6	5000
Hydrogen Chloride	7647-01-0	5000
Hydrogen Cyanide, Anhydrous	74-90-8	1000
Hydrogen Fluoride	7664-39-3	1000
Hydrogen Peroxide (52% by weight or greater)	7722-84-1	7500
Hydrogen Selenide	7783–07–5	150
Hydrogen Sulfide	7783–06–4	1500
Hydroxylamine	7803-49-8	2500
Iron, Pentacarbonyl	13463-40-6	250
Isopropylamine	75-31-0	5000
Ketene	463-51-4	100
Methacrylaldehyde	78-85-3	1000
Methacryloyl Chloride	920-46-7	150
Methacryloyloxyethyl Isocyanate	30674-80-7	100
Methyl Acrylonitrile	126-98-7	250
Methylamine, Anhydrous	74-89-5	1000
Methyl Bromide	74-83-9	2500
Methyl Chloride	74-87-3	15000
Methyl Chloroformate	79-22-1	500
Methyl Ethyl Ketone Peroxide (concentration > 60%)	1338–23–4	5000

Methyl Fluoroacetate	453-18-9	100
Methyl Fluorosulfate	421-20-5	100
Methyl Hydrazine	60-34-4	100
Methyl Iodide	74-88-4	7500
Methyl Isocyanate	624-83-9	250
Methyl Mercaptan	74-93-1	5000
Methyl Vinyl Ketone	79-84-4	100
Methyltrichlorosilane	75-79-6	500
Nickel Carbonly (Nickel Tetracarbonyl)	13463-39-3	150
Nitric Acid (94.5% by weight or greater)	7697-37-2	500
Nitric Oxide	10102-43-9	250
Nitroaniline (para Nitroaniline	100-01-6	5000
Nitromethane	75-52-5	2500
Nitrogen Dioxide	10102-44-0	250
Nitrogen Oxides (NO; NO2; N204; N203)	10102-44-0	250
Nitrogen Tetroxide (also called Nitrogen Peroxide)	10544-72-6	250
Nitrogen Trifluoride	7783-54-2	5000
Nitrogen Trioxide	10544-73-7	250
Oleum (65% to 80% by weight; also called Fuming Sulfuric Acid)	8014-94-7	1000
Osmium Tetroxide	20816-12-0	100
Oxygen Difluoride (Fluorine Monoxide)	7783-41-7	100
Ozone	10028-15-6	100
Pentaborane	19624-22-7	100
Peracetic Acid (concentration > 60% Acetic Acid; also called Peroxyacetic Acid)	79-21-0	1000
Perchloric Acid (concentration > 60% by weight)	7601-90-3	5000
Perchloromethyl Mercaptan	594-42-3	150
Perchloryl Fluoride	7616-94-6	5000
Peroxyacetic Acid (concentration > 60% Acetic Acid; also called Peracetic Acid)	79-21-0	1000
Phosgene (also called Carbonyl Chloride)	75-44-5	100
Phosphine (Hydrogen Phosphide)	7803-51-2	100
Phosphorus Oxychloride (also called Phosphoryl Chloride)	10025-87-3	1000
Phosphorus Trichloride	7719–12–2	1000
Phosphoryl Chloride (also called Phosphorus Oxychloride)	10025-87-3	1000
Propargyl Bromide	106-96-7	100
Propyl Nitrate	627-3-4	2500
Sarin	107-44-8	100
Selenium Hexafluoride	7783-79-1	1000
Stibine (Antimony Hydride)	7803-52-3	500
Sulfur Dioxide (liquid)	7446–09–5	1000
Sulfur Pentafluoride	5714-22-7	250
Sulfur Tetrafluoride	7783-60-0	250
Sulfur Trioxide (also called Sulfuric Anhydride)	7446–11–9	1000
Sulfuric Anhydride (also called Sulfur Trioxide)	7446–11–9	1000
Tellurium Hexafluoride	7783-80-4	250

Tetrafluoroethylene	116-14-3	5000
Tetrafluorohydrazine	10036-47-2	5000
Tetramethyl Lead	75-74-1	1000
Thionyl Chloride	7719–09–7	250
Trichloro (chloromethyl) Silane	1558-25-4	100
Trichloro (dichlorophenol) Silane	27137-85-5	2500
Trichlorosilane	10025-78-2	5000
Trifluorochloroethylene	79-38-9	10000
Trimethyoxysilane	2487-90-3	1500

*Chemical Abstract Service Number.
**Threshold Quantity in Pounds (Amount necessary to be covered by this standard).

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