DOLI *Virginia Occupational Safety and Health* VOSH

VOSH PROGRAM DIRECTIVE: 02-054A **ISSUED: August 1, 1999**

SUBJECT: Process Safety Management of Highly Hazardous Chemicals, 1910.119 – Inspection Procedures and Interpretive Guidance

A. Purpose.

This Directive establishes policies, provides clarifications and compliance guidance for to ensure that uniform procedures will be followed when conducting inspections to enforce the process safety management of highly hazardous chemicals standard.

This Program Directive is an internal guideline not a statutory or regulatory rule and is intended to provide instructions to VOSH personnel regarding internal operation of the Virginia Occupational Safety and Health Program and is solely for the benefit of the program. This document is not subject to the Virginia Register Act or the Administrative Process Act; it does not have general application and is not being enforced as having the force of law.

B. Scope.

This directive applies VOSH-wide and especially to all VOSH Safety Compliance and On-site Consultation personnel.

C. References.

OSHA Instruction CPL 2-2.45A (September 28, 1992); and
OSHA Instruction CPL 2-2.45A, CH-1 (September 13, 1994)

D. Cancellation.

VOSH Program Directive 02-054 (August 1, 1993)

E. Action.

The Deputy Commissioner, Program and Regional Directors and Compliance Managers shall ensure that the policies and procedures established in this directive are adhered to in conducting inspections.

F. Effective Date.

August 1, 1999

G. Expiration Date.

Not Applicable.

H. Enforcement Activity Related to the PSM Standard - Types of Inspections.

Section 1910.119 has broad applicability to potentially hazardous processes that may exist in a wide variety of industries. Accordingly, compliance activities related to the PSM standard–either to determine if an employer is covered by the standard or to assess the employer's compliance with it–may take place in any of the inspection types described below. The following guidelines shall apply to PSM-related compliance activity:

1. PROGRAM-QUALITY -VERIFICATION (PQV) INSPECTIONS.

The primary compliance model for the PSM standard shall be the PQV inspection, as described at sections I. and J. of this directive.

2. OTHER PROGRAMMED INSPECTIONS:

Screening for PSM Coverage. In all programmed safety and health inspections in general industry, a determination shall be made as to whether the establishment is covered by the PSM standard.

a. This determination shall follow the criteria presented at § 1910.119(a), including appropriate reference to Appendix A of § 1910.119. The determination may be made in conjunction with an assessment of the employer's Hazard Communication program.

b. If the establishment is found to be covered by the standard:

(1) It shall be further determined if the establishment is included in the universe of affected establishments from which PQV inspections may be scheduled.

(2) The employer shall be provided:

(a) A copy of this program directive (VOSH PD 02-054A) and

(b) A letter notifying the employer that the subject establishment is covered by the PSM standard and may be inspected under the standard. The letter shall also emphasize the employer's obligation to comply with the standard. An example of such a letter is provided as Supplement F of this directive.

3. UNPROGRAMMED PSM-RELATED INSPECTIONS.

In all unprogrammed inspection activity relating to the PSM standard, a determination shall be made as to whether the establishment is covered by § 1910.119.

a. If a formal complaint or referral relating to the PSM standard is received regarding any workplace classified in one of the SIC codes listed at Supplement C of this directive, the complaint or referral item(s) shall be investigated and:

(1) All programs required by the PSM standard shall be screened for obvious violations; and

(2) A CSHO referral for a PQV inspection shall be considered if major deficiencies are indicated. This determination shall be documented in the case file.

b. Investigations of formal, PSM-related complaints and referrals in establishments in all other SIC codes shall normally be limited to the complaint item(s) only, unless violations related to the complaint or referral items are found.

4. RESPONSES TO ACCIDENTS AND CATASTROPHES.

Responses to accidents and catastrophes involving PSM shall follow the guidelines contained in Chapter II of the VOSH FOM and–where appropriate–in VOSH Program Directive 02-020, VOSH Response to Significant Events of Potentially Catastrophic Consequence, in addition to the guidelines of this directive. If the workplace is classified in one of the SIC codes listed at Supplement C of this directive, a PQV inspection shall be considered; the reasons for the determination shall be documented in the case file.

5. ALL OTHER INSPECTIONS.

Normally, there shall be no PSM-related activity on any inspection other than those described at H.1. through H.4., above.

I. <u>Scope of PQV Inspection</u>.

Comprehensive inspections under the PSM standard shall evaluate the procedures used by the employer and the process-related contract employers to manage the hazards associated with processes using highly hazardous chemicals. Normally, these inspections will embody a three-fold approach, which for reference is termed **PROGRAM-QUALITY-VERIFICATION (PQV)**.

1. First, the employer's and the contract employers' **<u>PROGRAM</u>** for complying with each of the listed elements of the PSM standard shall be evaluated in accordance with the PSM Audit Guidelines contained in Supplement A of this directive. (See also section K. of this directive.)

2. Second, the **QUALITY** of the employer's and the contract employers' procedures shall be compared to acceptable industry practices as described in the standard to determine compliance.

3. Third, **VERIFICATION** of the employer's and the contract employers' effective implementation of the program can be made through review of written programs and records of activity, interviews with employees at different levels, and observation of site conditions. The team leader shall select one or more processes as described at J.7. of this directive to perform the verification portion of the inspection.

J. PQV Inspection Procedures.

The procedures given in the VOSH FOM, Chapter II, shall be followed except as modified in the following sections:

1. OPENING CONFERENCE.

Where appropriate, the facility safety and health director, Process Safety Manager, or other person capable of explaining the company's Process Safety Management Program shall be included in the opening conference.

a. During the opening conference, CSHOs shall familiarize themselves with the establishment's emergency response procedures and emergency alarms.

b. CSHOs shall also request that the management representative(s) provide them with a reasonably detailed overview of the chemical and, where applicable, explosives) process and/or manufacturing operations at the facility, including block flow and/or process flow diagrams indicating chemicals and processes involved.

2. PSM OVERVIEW.

Prior to beginning the walkaround inspection, the CSHOs shall request an explanation of the company's Process Safety Management Program including, at a minimum:

a. How the elements of the standard are implemented;

b. Personnel designated as responsible for implementation of the various elements of the standard; and

c. A description of company records used to verify compliance with the standard.

3. INITIAL WALKAROUND.

After this familiarization, the inspection may begin with a brief walkaround inspection of those portions of the facility within the scope of the standard. Additional walkaround activity may be necessary after selection of the process unit(s). The purpose of the initial walkaround is to:

a. Give CSHOs a basic overview of the facility operations;

b. Allow CSHOs to observe potential hazards such as pipework in risk of impact, corroded or leaking equipment, unit or control room siting, and location of relief devices; and

c. Solicit input from the employee representative concerning potential PSM program deficiencies.

4. PERSONAL PROTECTIVE EQUIPMENT.

In addition to normal inspection protective equipment, CSHOs conducting these inspections shall be provided with flame retardant coveralls for protection from flash fires and with NIOSH-approved emergency escape respirators for use during any emergency conditions. PPE shall be appropriate to the environment at the workplace. Special equipment will be necessary in environments containing explosive materials.

a. CSHOs shall wear flame-retardant coveralls in all flash fires and as may be required by company policy.

NOTE: *Clothing made of hazardous synthetic fabrics should not be worn underneath flame-retardant coveralls.*

b. CSHOs shall carry emergency escape respirators, when necessary, during the walkaround portion(s) of the inspection. CSHOs conducting these inspections shall have received proper training in the use of emergency escape respirators.

c. CSHOs shall be provided with appropriate alert monitors approved for the environment where they will be used (e.g., HCN, Cl_2) where such devices are necessary.

d. CSHOs shall ensure that any still cameras and/or video cameras are intrinsically safe for use in the process areas being inspected.

NOTE: *CSHOs may use video cameras equipped with a telephoto lens from outside classified areas and/or still cameras without batteries.*

5. DOCUMENTATION TO BE REQUESTED–GENERAL AND PROCESS-RELATED.

At the conclusion of the opening conference, the CSHO shall request access to or copies of the documents listed at J.5.m., below. Initially, to expedite the inspection process, only access to documents should be requested. During the inspection, as potential violations of the standard are observed, copies of the written documentation described below shall be requested to substantiate citations.

a. OSHA 200 Logs for the past 3 years for both the employer and all process-related contractor employer(s).

b. Employer's written plan of action regarding the implementation of employee participation.

c. Written process safety information for the unit(s) selected (see J.7.), if available, such as flow diagrams, piping and instrumentation diagrams (P&ID's), and process narrative descriptions.

NOTE: *The employer is required to compile process safety information on a schedule consistent with the employer's schedule for conducting the process hazard analyses (PHA).*

d. Documented priority order and rationale for conducting process hazard analyses; copies of any process hazard analyses performed after **May 25, 1987**; team members; actions to promptly address findings; written schedules for actions to be completed; documentation verifying communication to appropriate personnel; and 5-year revalidation of original PHA required by standard.

e. Written operating procedures for safely conducting activities in each selected unit; annual certification that operating procedures are current and accurate; written procedures describing safe work practices for potentially hazardous operations, including (but not limited to) lockout/tagout, confined space entry, lifting equipment over process lines, capping over ended valves, opening process equipment or piping, excavation, and control over entrance into a facility of maintenance, laboratory, or other support personnel.

f. Training records for initial and refresher training for all employees in the selected unit(s) whose duties involve operating a process; methods for determining the content of the training; methods for determining frequency of refresher training; certification of required knowledge, skills, and abilities to safely perform job for employees already involved in operating a process on **September 15, 1992**, who have not received initial training; and training material.

g. Pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information; documentation of employee training.

h. Written procedures and schedules to maintain the ongoing integrity of process equipment; the relevant portions of applicable manufacturers' instructions, codes, and standards; and inspection and tests performed on process equipment in the unit(s) selected.

i. Hot work permit program and active permits issued for the unit(s) selected.

j. Written procedures to manage change to process chemicals, technology, equipment and procedures; and changes to facilities that affect a covered process.

k. Incident investigation reports for the unit(s) selected, resolutions and corrective actions.

l. Written emergency action plan including procedures for handling small releases and evidence of compliance with 1910.120 (a), (p), and (q), where applicable.

m. The two most recent compliance audit reports, appropriate responses to each of the findings, verifications that deficiencies have been corrected.

6. DOCUMENTATION TO BE REQUESTED–CONTRACT-RELATED.

The following information relating to contractor compliance shall be requested:

a. Documentation from Employer:

(1) Information relating to contract employers' safety performance and programs;

(2) Methods of informing contract employers of known potential hazards related to contractor's work and the process and applicable provisions of the emergency action plan;

(3) Safe work practices to control the entrance, presence and exit of contract employers and contract employees in covered process areas;

(4) Evaluation of contractor employer performance in fulfilling responsibilities required by the standard;

(5) Contract employee injury and illness logs related to work in process areas; and

(6) A list of unique hazards presented by contractors' work or hazards found in the workplace that have been reported to the employer.

b. Documentation form Contact Employer:

(1) Records showing employees receive training in and understand safe work practices related to the process on or near which they will be working to perform their jobs safely;

(2) Known potential fire, explosion or toxic release hazards related to job, and applicable provisions of emergency action plan; and

(3) A list of unique hazards presented by contractors' work or hazards found in the workplace that have been reported to the employer.

***NOTE**:* *The documentation described at J.5. and J.6.a. may also be required of the contract employer, depending on the scope of the contract employer's activities.*

7. SELECTION OF PROCESS(ES).

The team leader shall select one or more processes within which to evaluate compliance with the standard. This selection shall be based on the factors listed below, and shall be documented in the case file:

a. Factors observed during the walkthrough;

b. Incident reports and other history;

c. Company priorities for or completed process hazard analyses (PHA);

d. Age of the process unit;

e. Nature and quantity of chemicals involved;

f. Employee representative input;

g. Current hot work, equipment replacement, or other maintenance activities; and

h. Number of employees present.

K. <u>Compliance Guidelines for Specific Provisions of § 1910.119</u>.

Guidelines for assessing compliance with the provisions of the PSM standard are provided in Appendix A of this directive.

1. CSHOs shall use the guidance contained in Supplement A during all enforcement activities related to the PSM standard.

2. Clarifications and interpretations are provided in "side-by-side" format in section Q. of this directive. Section Q (or a subsequent revision) shall normally be the first point of reference in interpreting § 1910.119.

NOTE: *Section Q. will be updated on an ongoing basis through page changes to this directive, as more interpretations are developed. CSHOs must therefore take care to ensure that their reference copies are up-to-date.*

L. Citations.

Citations for violations of the PSM standard shall be issued in accordance with the VOSH FOM, Chapter IV, with the following additional directions:

1. CLASSIFICATION.

The requirements of the PSM standard are intended to eliminate or mitigate the consequences of releases of highly hazardous chemicals. The provisions of the standard present closely inter-related requirements, emphasizing the application of management controls when addressing the risks associated with handling or working near hazardous chemicals.

a. Any violation of the PSM standard, therefore, is a condition which could result in death or serious physical harm to employees.

b. Accordingly, violations of the PSM standard shall not normally be classified as "other-than-serious."

2. USE OF SUPPLEMENT "A".

Supplement A, PSM Audit Guidelines, is constructed as a series of questions relating to each of the pertinent provisions of the standard.

a. The questions are designed to elicit a determination of "Yes" or "No" by the CSHO as to whether compliance with the provision has been met.

b. A determination of "No" for any provision indicates noncompliance; thus, any "No" shall normally result in a citation for a violation of that provision.

c. The CSHO shall thoroughly document each such determination in the case file.

M. Non-mandatory Supplements to this Directive.

This directive contains two non-mandatory supplements that are designed to provide additional compliance assistance.

1. Supplement E, Recommended Health Care Management Program Components for Process Safety Management, is still being developed and is designated as "Reserved."

2. Supplement G, Recommended Guidelines for PDV Inspection Preparation, is intended as an aid to Regional and Area Offices in planning resources for PQV and other PSM-related inspections.

N. Recording In IMIS.

Information about PSM-related inspection activity, as described at H. of this directive, shall be recorded in IMIS following current instructions in the IMIS manual. These guidelines shall apply:

1. PQV INSPECTIONS.

The identifier code "PSMPQV" shall be used for these inspections.

a. PQV inspections, as described at J., K., and L. of this directive, shall be identified by recording "PSMPQV" in item 25.d. of the VAOSH-1 Form.

b. Any inspections of onsite contractors shall also be identified by recording "PSMPQV" in item 25.d. of the VAOSH-1 Form.

c. Linkage of all of the employers inspected on-site shall be performed in accordance with the instructions for entering MULTI-EMPLOYER INSPECTIONS currently specified in Chapter V, item E.(5), of the IMIS Forms Manual.

    1. Supplement E, Recommended Health care Management Program Components for Process Safety Management, is still being developed and is designated as "Reserved."

    2. Supplement G, Recommended Guidelines for PQV Inspection Preparation, is intended as an aid to Regional and Area Offices in planning resources for PQV and other PSM-related inspections.

d. PQV inspections may be programmed or unprogrammed; all PQV inspections shall be identified as comprehensive.

2. UNPROGRAMMED PSM-RELATED INSPECTIONS.

All unprogrammed inspection activity relating to the PSM standard, as described at H.3. of this directive, shall be coded as follows in Item 42, Optional Information of the VAOSH-1 form:

TYPE	ID	VALUE
N	06	PSMP

This shall apply to all unprogrammed inspections in which compliance with the PSM standard is investigated, i.e., inspections in which the establishment:

a. Is not in one of the SIC codes listed in Supplement C of this directive.

b. Is not an establishment selected for a PQV inspection, although it is in one of the SIC codes listed in Supplement C of this directive.

3. OTHER PROGRAMMED INSPECTIONS: SCREENING FOR PSM COVERAGE.

In all programmed safety and health inspections in general industry, a determination shall be made as to whether the establishment is covered by the PSM standard. The establishments shall be coded as follows in Item 42, Optional Information of the VAOSH-1 form:

a. Establishments determined to be covered by the PSM standard:

TYPE	ID	VALUE
N	06	PSMY

b. Establishments determined to be NOT covered by the PSM standard:

TYPE	ID	VALUE
N	06	PSMN

Information about PSM-related inspections shall be recorded in IMIS following current instructions given in the IMIS manual. Refer to Supplement H of this directive for additional guidance.

O. <u>Standard with Citation and Compliance Guidelines</u>.

The guidance that follows relates to specific provisions of § 1910.119 and is provided to assist compliance officers in conducting inspections where the standard may be applicable.

Unless specifically stated otherwise in the citation guidelines, all alleged violations shall be normally cited as "serious", the compliance officer shall document the rationale for the selection of any other level of violation.

John Mills Barr
Commissioner

Distribution: Commissioner of Labor and Industry
Chief Deputy Commissioner
Deputy Commissioner
Directors and Managers
VOSH Compliance Staff
Cooperative Programs Staff
Legal Support Staff
OSHA Regional Administrator, Region III

e - ATTACHMENTS (WEB LINKS ONLY):

Appendices

Appendix A: List of Highly Hazardous Chemicals, Toxics and Reactives (Non-mandatory)*

Appendix B: Block Flow Diagram and Simplified Process Flow Diagram (Non-mandatory)*

Appendix C: Compliance Guidelines and Recommendations for Process Safety Management (Non-Mandatory)*

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http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1559&p_text_version=FALSE

Supplements Taken from Osha Instruction Cpl 2-2.45a and Cpl 2-2.45a ch-1 **:** (WEB Links ONLY)

http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=DIRECTIVES&p_id=1559&p_text_version=FALSE

Supplement A: PSM Audit Guidelines

Supplement B: Sample Notification of Process Change Checklist

Supplement C: SIC codes for targeted PQV Inspections

Supplement D: References for Compliance with the Standard

Supplement E: [Reserved] for Recommended Health care Management Program Components for PSM (Non-mandatory guidance)

Supplement F: Sample letter to be provided to employer following screening for PSM coverage

Supplement G: Recommended Guidelines for PQV Inspection Preparation (Non-mandatory)

Supplement H: Sample Accident Investigation Report Form

§1910.119. Process Safety Management of Highly Hazardous Chemicals

The guidance contained in this directive is provided for citation assistance. It shall be followed in interpreting the Process Safety Management (PSM) standard for compliance purposes. Unless otherwise noted, all paragraph citations refer to 1910.119.

NOTE: This VOSH standard is a result of the 1990 amendments to the federal Clean Air Act, as will be the Risk Management Plan (when promulgated) by the Virginia Department of Environmental Quality. Employers who merge the two sets of requirements into their process safety management program will better assure full compliance with each.

Purpose. This section contains requirements for preventing or minimizing the consequences of catastrophic releases of toxic, reactive, flammable, or explosive chemicals. These releases may result in toxic, fire or explosion hazards.

The major objective of process safety management (PSM) of highly hazardous chemicals is to prevent unwanted releases of hazardous chemicals especially into locations that could expose employees and others to serious hazards.

The process safety management standard targets highly hazardous chemicals that have the potential to cause a catastrophic incident. The purpose of the standard as a whole is to aid employers in their efforts to prevent or mitigate episodic chemical releases that could lead to a catastrophe in the workplace and possibly in the surrounding community.

To control these types of hazards, employers need to develop the necessary expertise, experience, judgement, and initiative within their work force to properly implement and maintain an effective process safety management program as envisioned in this VOSH standard.

The various lines of defense that have been incorporated into the design and operation of the process to prevent or mitigate the release of hazardous chemicals need to be evaluated and strengthened to ensure their effectiveness at each level. Process safety management is the proactive identification, evaluation and mitigation or prevention of chemical releases that could occur as a result of failures in processes, procedures, or equipment.

An effective process safety management program requires a systematic approach to evaluating the whole chemical process. Using this approach, the process design, process technology, process changes, operational and maintenance activities and procedures, nonroutine activities and procedures, emergency preparedness plans and procedures, training programs, and other elements that affect the process are all considered in the evaluation.

Although VOSH believes process safety management will have a positive effect on the safety of employees and will offer other potential benefits to employers, such as increased productivity, smaller businesses that may have limited

resources available to them at this time, might consider alternative avenues of decreasing the risks associated with highly hazardous chemicals at their workplaces.

One method that might be considered is reducing inventory of the highly hazardous chemical. This reduction in inventory will result in reducing the risk or potential for a catastrophic incident. Also, employers, including small employers, may establish more efficient inventory control by reducing, to below the established threshold, the quantities of highly hazardous chemicals onsite.

This reduction can be accomplished by ordering smaller shipments and maintaining the minimum inventory necessary for efficient and safe operation. When reduced inventory is not feasible, the employer might consider dispersing inventory to several locations onsite. Dispersing storage into locations so that a release in one location will not cause a release in another location is also a practical way to reduce the risk or potential for catastrophic incidents.

(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;

The standard mainly applies to manufacturing industries--particularly, those pertaining to chemicals, transportation equipment, and fabricated metal products. Other affected sectors include natural gas liquids; farm product warehousing; electric, gas, and sanitary services; and wholesale trade. A laboratory or research operation involving at least the threshold quantity of one or more highly hazardous chemicals is also covered under the PSM standard.

The PSM also standard applies to muriatic (32% HCL) acid. The chemical names: hydrogen chloride (HCL) and anhydrous hydrochloric acid are included in the highly hazardous chemicals listing in Appendix A of the PSM standard. Anhydrous (without water) hydrochloric acid is hydrogen chloride. Both hydrogen chloride and anhydrous hydrochloric acid are identified by the same Chemical Abstract Service (CAS) Number 7647-01-0, as denoted in Appendix A. Hydrochloric acid (muriatic acid)--i.e., a solution of hydrogen chloride gas in water--is not listed in Appendix A and therefore is not considered to be a highly hazardous chemical subject to the PSM standard.

It also applies to pyrotechnics (“fireworks”) and explosives manufacturers covered under other VOSH rules and has special provisions for contractors working in covered facilities. The PSM standard amended the scope of § 1910.109, Explosives and Blasting Agents, by revising paragraph (k), which requires that the manufacturer of

explosives and pyrotechnics must also comply with § 1910.119.

The highly hazardous chemical, "Formaldehyde (Formalin)," listed in Appendix A of the PSM standard should be listed to read: Formaldehyde (37% by weight or greater). The PSM standard will be revised to reflect this change in the near future. Any amount of mixture of Formaldehyde, less than 37% by weight, in solution would not be covered by the PSM standard.

Anhydrous Dimethylamine, identified by Chemical Abstract Service (CAS) Number 124-40-3, is listed in Appendix A of the PSM standard as a highly hazardous chemical. Dimethylamine in aqueous solutions, which is not listed in Appendix A, is not considered to be a highly hazardous chemical covered by the PSM standard except when the solution qualifies as a flammable liquid.

Appendix A of this standard lists cellulose nitrate in concentrations of greater than 12.6% nitrogen as a chemical which presents a potential for a catastrophic event at or above the threshold quantity of 2500 pounds (1,133.9 kg). This standard does not distinguish between "wet" or "dry" cellulose nitrate.

The regulatory limitations and requirements on fireworks manufacturers under 27 CFR 55 Subpart K by the federal Bureau of Alcohol, Tobacco and Firearms should not be confused with the applicability of the PSM standard to <u>any</u> amount of fireworks being manufactured.

In each industry, PSM applies to those companies that deal with any of more than 130 specific toxic and reactive chemicals in listed quantities.

(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 (4535.9kg) or more except for:

Flammable gas thresholds are not chemical specific, therefore, any combination of flammable gases meeting the threshold would be covered.

<u>Gas, flammable</u> means:

(a) A gas that at ambient temperatures and pressure forms a flammable mixture with air at a concentration of thirteen (13) percent by volume or less; or

(b) A gas that, at ambient temperature and pressure, forms a range of flammable mixtures with air wider than twelve (12) percent by volume, regardless of the lower limit.

The requirements of the PSM standard apply to processes in a paint manufacturing facility which include the mixing and blending of flammable liquids with other raw materials, and which typically involve few or no chemical reactions. The exemption provided in § 1910.119 (a)(1)(ii)(B) for situations involving flammable liquids applies only when such liquids are being stored in atmospheric tanks (where the tank pressure does not exceed 0.5 pounds per square inch gauge [p.s.i.g.]) or transferred and the liquids are kept below their normal boiling point without benefit of chilling or refrigeration. This exemption does not apply to a mixing and blending operation related to paint manufacturing.

The key question for coverage is whether the highly hazardous chemical is present in an amount at or above the threshold. Therefore, it is extremely important to convert gallons to pounds and/or separating a mixture to determine actual quantities for each chemical component which can be compared to the threshold values table.

Under the PSM standard, 10,000 pounds of a flammable liquid stored together in 55-gallon (209 liter) drums would be considered exempt as storage in atmosphere tanks (notwithstanding the definitions of "containers" and "tanks" in § 1910.106, unless the drums are in close proximity to a covered process such that they could be involved in a potential release. For the purposes of § 1910.106, such 55-gallon drums are covered in the definition of "container".

(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;

Furnaces, boilers, heaters, etc., fueled by flammable liquids or gases, regardless of the quantity of the fuel, used in processes that are otherwise covered by the PSM standard (i.e., the existence of a threshold quantity of another highly hazardous chemical) are considered part of the process and are covered by the PSM standard. Flammable liquid or gas fueled furnaces, boilers, etc., used in processes not otherwise covered by the PSM standard are exempt from the standard.

Examples of materials used as fuels are: bunker oil, blast furnace gas, coke oven gas, fuel oils, heating oils, MAPP gas, natural gas and tars.

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

Three hundred and fifty (350)-gallon tote tanks containing flammable liquids used at a facility to refuel vehicles are exempt if such fuels are not part of a process containing another highly hazardous chemical covered by the standard.

Quantities of flammable liquids in storage are considered a part of the process if the storage tanks are interconnected with the process, or if they are sufficiently near the process that an explosion, fire or release could reasonably involve the storage area combined with the process in quantities sufficient to meet the threshold amount of 10,000 pounds.

(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.

Atmospheric tanks containing flammable liquids that have feeder connections to processes covered by the standard are also covered by the standard. Atmospheric tanks, containing flammable liquids not having such feeder connections, such as tank farms or bulk transfer terminals where only transfer and storage are done, are not covered under the PSM standard but are covered under § 1910.106.

Under the PSM standard, a "retail facility" means an establishment otherwise subject to this standard which obtains more than half of its income from direct sales to end users.

The following processes, when they involve at least threshold quantities of oil or gas, are covered by the PSM standard. Oil or gas well production fluids from several wells are processed by heating the fluids and physically separating the water from the gas or oil. The water is returned to the ground via a "down hole well" for disposal return to the strata from which it came. But if these oil or gas well drilling operations take place at "normally unoccupied remote facilities", then according to § 1910.119(a)(2)(iii), they are exempt from PSM standard coverage.

(b) ***Definitions***.

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).

Boiling point means the boiling point of a liquid at a pressure of 14.7 pounds per square inch absolute (p.s.i.a.) (760 mm.). For the purposes of this section, where an accurate boiling point is unavailable for the material in question, or for mixtures which do not have a constant boiling point, the 10 percent point of a distillation performed in accordance with the Standard Method of Test for Distillation of Petroleum Products, ASTM D-86-62, may be used as the boiling point of the liquid.

Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more highly hazardous chemicals, that presents serious danger to employees in the workplace. Facility means the buildings, containers or equipment which contain a process.

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.

A facility can include multiple processes. If multiple processes are interconnected, they may be considered a single process for purposes of this standard.

Hot work means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

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.

"Spark producing operations" include operations which use flame or spark-producing equipment such as grinders, welding, burning or brazing that are capable of igniting flammable vapors or gases.

This includes those sites for which periodic visits by employees may be made on a scheduled basis. Examples could include pump stations located miles from the main establishment.

Employees may be assigned to check on the station as needed. **However, this exemption does not apply if the facility has employees present on a regular, i.e., daily, basis**.

The intent behind the use of the term "remote" is that, due to the isolation of the process from employees by distance, such employees would not be effected by the consequences of a catastrophic release. Therefore, the remote location must be geographically separated from other facilities and employees such that employees would not be affected by an explosion, vapor cloud of toxic gas, or other consequences of an uncontrolled release at the remote cite.

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.

Waste burning of solvents covered under this standard is considered a process.

A facility can include multiple processes. If multiple processes are interconnected, they may be considered a single process for the purposes of this standard.

Quantities of particular hazardous chemicals contained in vessels that are interconnected and in unconnected vessels that must be adversely affected due to an incident at a nearby process must be combined to determine whether the threshold level of a hazardous chemical has been reached. If the threshold level is exceeded by the combination of the amount in separate tanks and interconnected vessels then all of these

may be considered one process.

Under the definition of "process" provided in paragraph (b), inventories of highly hazardous chemicals would not be considered to be adequately dispersed if the storage vessels are connected with or in proximity to a covered process such that they could be involved in a potential release.

OSHA has not developed, nor is it aware of, any standard evaluation technique to determine adequate distances to separate chemical inventories. If an employer chooses to disperse highly hazardous chemicals on-site, the separation distances would have to be determined on a case-by-case basis, considering such factors as the nature of the chemicals and covered processes, total inventories, threshold quantities of pertinent chemicals, and facility layout.

Storage of more than 10,000 pounds (4535.9 kg) of a flammable liquid, together in 55-gallon (209-liter) drums would be considered exempt under this standard as storage in atmospheric tanks (notwithstanding the definitions of "containers" and "tanks" in § 1910.106), unless the drums are in proximity to a covered process such that they could be involved in a potential release). For purposes of § 1910.106, 55-gallon (209-liter) drums are covered in the definition of "container."

Replacement in kind means a replacement which satisfies the design specification.

Trade secret means any confidential formula, pattern, process, device, information or compilation of information that is used in an employer's business, and that gives the employer an opportunity to obtain an advantage over competitors who do not know or use it. Appendix D contained in §1910.1200 sets out the criteria to be used in evaluating trade secrets.

(c) <u>Employee participation</u>.

(1) Employers shall develop a written plan of action regarding the implementation of the employee participation required by this paragraph.

(2) Employers shall consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this standard.

This paragraph will be cited serious if no written plan has been prepared or implemented. Under PSM, employers must consult with employees and their representatives on the conduct and development of process hazard analyses and on the development of other elements of process management, and they must provide to employees and their representatives access to process hazard analyses and to all other information required to be developed by the standard.

The intent of "consult" is to exchange information, solicit input and participation from the employees and their representatives. It requires more than simply informing employees. The employer needs to consult with employees and employee representatives and develop information concerning knowledge and expertise of individual employees in various processes and aspects of the facility in order to ensure substantive input by employees and their representatives in developing the written action plan, process hazard analyses, and access to information required under the standard.

The term "employee representative" is intended to mean union representative where a union exists, or an employee-designated representative in the absence of a union. The term is to be construed broadly, and may include the local union, the international union, or an individual designated by these parties, such as the safety and health committee representative at the site or a non-employee consultant. In the absence of a union, employees have a right under the standard to designate a representative to participate in the consultation process.

With respect to the PHA team, in all cases it must consist of one or more persons knowledgeable about the process. The intent of the consultation requirement at paragraph (c)(2) is not to compel the inclusion of any person(s) who are not knowledgeable; ideally, the employer and employees/employee representatives should reach a consensus on including the most capable parties.

(3) Employers shall provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this standard.

A host employer must consult with employees of covered contractors and their representatives, to the same extent that it must consult with similarly situated direct hire employees. Therefore, the host employer must establish a method for informing all contractor employees and their representatives that their process safety concerns and suggestions are welcome, and will be responded to.

The intent of "access" under this standard is for the information to be made available for employees and their representatives in a reasonable manner. Reasonable access may require providing copies loaning documents. The trade secret provision of the standard permits the employer to require confidentiality agreements before providing the information.

Many employers, under their existing safety and health programs, already have established methods to keep employees and their representatives informed about relevant safety and health issues and may be able to adopt these practices and procedures to meet their obligations under PSM.

(d) <u>Process safety information</u>. In accordance with the schedule set forth in paragraph (e)(1), the employer shall complete a compilation of written process safety information before conducting any

process hazard analysis required by the standard. The compilation of written process safety information is to enable the employer and the employees involved in operating the process to identify and understand the hazards posed by those processes involving highly hazardous chemicals. This process safety information shall include information pertaining to the hazards of the highly hazardous chemicals used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(1) Information pertaining to the hazards of the highly hazardous chemicals in the process. This information shall consist of at least the following:

(i) Toxicity information;

(ii) Permissible exposure limits;

(iii) Physical data;

(iv) Reactivity data:

(v) Corrosivity data;

(vi) Thermal and chemical stability data; and

(vii) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.

***Note**: Material Safety Data Sheets meeting the requirements of 29 CFR 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph.*

(2) Information pertaining to the technology of the process.

(i) Information concerning the technology of the process shall include at least the following:

Under paragraph (c)(3), the employer is required to provide access to process hazard analyses and all other information to be developed under this standard to employees of covered contractors, to the same extent that it must provide access to direct hire employees, if similarly situated. Contract employers share responsibility for assuring that their employees are provided with the requested information.

To demonstrate compliance with this paragraph, and to meet the purpose of the standard, the process safety information is to be kept for the lifetime of the process, and updated whenever changes other than "replacement in kind" are made.

The information to be compiled about the chemicals, including process intermediates, needs to be comprehensive enough for an accurate assessment of the fire and explosion characteristics, reactivity hazards, the safety and health hazards to workers, and the corrosion and erosion effects on the process equipment and monitoring tools.

The compiled information will be a necessary resource to a variety of users including the team performing the process hazard analysis an required by PSM; those developing the training programs and the operating procedures; contractors whose employees will be
working with the process; those conducting the pre-startup reviews; as well as local emergency preparedness planners, and insurance and enforcement officials.

Current material safety data sheet (MSDS) information can be used to help meet this requirement but must be

(A) A block flow diagram or simplified process flow diagram (see Appendix B to this section);

(B) Process chemistry;

(C) Maximum intended inventory;

(D) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,

(E) An evaluation of the consequences of deviations, including those affecting the safety and health of employees.

(ii) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(3) Information pertaining to the equipment in the process.

(i) Information pertaining to the equipment in the process shall include:

supplemented with process chemistry information, including runaway reaction and over-pressure hazards, if applicable.

Technology information will be a part of the process safety information package and should include employer-established criteria for maximum inventory levels for process chemicals; limits beyond which would be considered upset conditions; and a qualitative estimate of the consequences or results of deviation that could occur if operating beyond the established process limits. Employers are encouraged to use diagrams that will help users understand the process.

A block flow diagram is used to show the major process equipment and interconnecting process flow lines and flow rates, stream composition, temperatures, and pressures when necessary for clarity. The block flow diagram is a simplified diagram.

Process flow diagrams are more complex and show all main flow streams including valves to enhance the understanding of the process as well as pressures and temperatures on all feed and product lines within all major vessels and in and out of headers and heat exchangers, and points of pressure and temperature control.

If information on the original technology does not exist, then the employer may delay the development of this information until the **process hazard analysis (PHA)** conducted. (Refer to subsection "e" of the standard).

However, the other information required by this section must be compiled before conducting any PHA. The information on the technology must be gathered as the PHA's are conducted in accordance with the priority schedule developed by the employer.

(A) Materials of construction;

(B) Piping and instrument diagrams (P&ID's);

(C) Electrical classification;

(D) Relief system design and design basis;

(E) Ventilation system design;

(F) Design codes and standards employed;

(G) Material and energy balances for processes built after May 15, 1993; and,

(H) Safety systems (e.g., interlocks, detection or suppression systems).

(ii) The employer shall document that equipment complies with recognized and generally accepted good engineering practices.

(iii) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the employer shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

The compilation of the above-described process safety information provides the basis for identifying and understanding the hazards of a process and is necessary in developing the process hazard analysis and may be necessary for complying with other provisions of PSM such as management of change and incident investigations.

Information on construction materials, pump capacities and pressure heads, compressor horsepower, and vessel design pressures and temperatures are shown when necessary for clarity. In addition, process flow diagrams usually show major components of control loops along with key utilities.

Piping and instrument diagrams (P&IDs) may be the more appropriate type diagrams to show some of the above details as well as display the information for the piping designer and engineering staff.

The P&IDs are to be used to describe the relationships between equipment and instrumentation as well as other relevant information that will enhance clarity. Computer software programs that do P&IDs or other diagrams useful to the information package may be used to help meet this requirement.

The information pertaining to process equipment design, i.e., the codes and standards relied on to establish good engineering practice, must be documented by the employer.

These codes and standards are published by such organizations as the American Society of Mechanical Engineers, the American Petroleum Institute, American National Standards Institute, National Fire Protection

Association, American Society for Testing and Materials, the National Board of Boiler and Pressure Vessel Inspectors, National Association of Corrosion Engineers, American Society of Exchange Manufacturers Association, and Model Building Code groups.

For existing equipment designed and constructed many years ago in accordance with the codes and standards available at that time and no longer in general use today, the employer must determine and document which codes and standards were used and that the design and construction along with the testing, inspection and operation are still suitable for the intended use.

Such determination of the adequacy of design and any necessary corrections must occur within the time frames which apply to the PHA under this standard.

Where the process technology requires a design that departs from the applicable codes and standards, the employer must document that the design and construction are suitable for the intended purpose and the equipment is operated safely.

Such documentation must be completed either before or in conjunction with the development of the PHA, except where a pre-startup safety review is required, in which case the documentation must be completed before startup. For older equipment, this may require verification that the design and construction are safe for the intended application. Where corrective action is required, it must be completed as soon as possible pursuant to paragraph (e)(5).

EXCEPTION: For actions required by a pre-startup safety review [see(i)(2)], such corrective action must be implemented prior to the startup if the correction is safety-critical.

(e) <u>Process hazard analysis</u>.

(1) The employer shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this standard. The process hazard analysis shall be appropriate to the complexity of the process and shall identify, evaluate, and control the hazards involved in the process. Employers shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be conducted as soon as possible, but not later than the following schedule:

A **Process Hazard Analysis (PHA)** is an organized and systematic effort to identify and analyze the significance of potential hazards associated with the processing or handling of highly hazardous chemicals.

The purpose of this analysis is to provide information that will assist employers and employees in making decisions for improving safety and reducing the consequences of unwanted or unplanned releases of hazardous chemicals.

(i) No less than **25 percent** of the initial process hazards analyses shall be completed by **May 26, 1994**;

A PHA analyzes potential causes and consequences of fires, explosions, releases of toxic or flammable chemicals, and major spills of hazardous chemicals. It also focuses on equipment, instrumentation, utilities, human actions (routine

(ii) No less than **50 percent** of the initial process hazards analyses shall be completed by **May 26, 1995;**

(iii) No less than **75 percent** of the initial process hazards analyses shall be completed by **May 26, 1997.**

(iv) **All initial process hazards** analyses shall be completed by **May 26, 1997.**

(v) Process hazards analyses completed after **May 26, 1987** which meet the requirements of this paragraph are acceptable as initial process hazards analyses. These process hazard analyses shall be updated and revalidated, based on their completion date, in accordance with paragraph (e)(6).

(2) The employer shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.

(i) What-If;

(ii) Checklist;

and nonroutine) and external factors that might affect the process.

For processes where the highly hazardous chemicals are consumed and converted into other materials, the PHA could properly be confined to those parts of the operations where a failure of safety controls could lead to a catastrophic release.

Citations will be issued if the priority order for conducting a PHA has not been completed and documented.

The appropriate priority for conducting PHAs is to be determined by using all of the criteria identified in this paragraph, e.g., extent of the process hazards (catastrophic potential), age of the process, number of potentially exposed employees, and operating history. Other appropriate factors may also be considered in establishing the priority. The documentation required by this paragraph shall demonstrate the underlying rationale for the prioritization.

All initial process hazard analyses should be conducted as soon as possible. Where there is only one process in a workplace, the analysis must be completed.

In paragraph (e), OSHA also included a specific provision requiring that analyses "be completed as soon as possible" because "plants with a limited number of processes, with simple processes, or which have already completed a number of process hazard analyses" will need less time to complete their analyses.

Process hazard analyses, completed after May 26, 1987, that meet the requirements of the PSM standard, are acceptable as initial process hazard analyses. All process hazard analyses must be updated and revalidated, based on their completion date, at least every 5 years.

Employers are expected to use sound judgement, on a case-by-case basis, with input from employees and their representatives (See paragraph (c)(2)), to determine an appropriate methodology for the process hazard analysis for each covered process. It is not the intent of the standard to require a PHA methodology that is excessively burdensome, but rather one that is appropriate and which will have the capability to elicit all hazards, defects, failure possibilities,

etc., for the process being analyzed, and also have the capability to address all the factors at paragraph (e)(3).

Methodologies of process hazard analysis for job hazard analyses:

(iii) What-If/Checklist;

What-if. For relatively uncomplicated processes, review the process from raw materials to product. At each handling or processing step, "what if" questions are formulated and answered, to evaluate the effects of component failures or procedural errors on the process.

Checklist. For more complex processes, the "what-if" study can be best organized through the use of a "checklist," and assigning certain aspects of the process to the committee members having the greatest experience or skill in evaluating those aspects. Operator practices and job knowledge are audited in the field, the suitability of equipment and materials of construction is studied, the chemistry of the process and the control systems are reviewed, and the operating and maintenance records are audited. Generally, a checklist evaluation of a process precedes use of the more sophisticated methods described below, unless the process has been operated safely for many years and has been subjected to periodic and thorough safety inspections and audits.

What-If /Checklist. The what-if/checklist is a broadly based hazard assessment technique that combines the creative thinking of a selected team of specialists with the methodical focus of a prepared checklist. The result is a comprehensive hazard analysis that is extremely useful in training operating personnel on the hazards of the particular operation.

The review team is selected to represent a wide range of production, mechanical, technical, and safety disciplines. Each person is given a basic information package regarding the operation to be studied. This package typically includes information on hazards of materials, process technology, procedures, equipment design, instrumentation control, incident experience, and previous hazards reviews. A field tour of the operation also is conducted at this time.

(iv) Hazard and Operability Study (HAZOP);

The review team methodically examines the operation from receipt of raw materials to delivery of the finished product to the customer's site. At each step, the group collectively generates a listing of "what-if" questions regarding the hazards and safety of the operation. When the review team has completed listing its spontaneously generated questions, it systematically goes through a prepared checklist to stimulate additional questions.

Subsequently, answers are developed for each question. The review team then works to achieve a consensus on each question and answer. From these answers, a listing of

recommendations is developed specifying the need for action or study. The recommendations, along with the list of and answers, become the key elements of the hazard assessment report.

(v) Failure Mode and Effects Analysis (FMEA);

Hazard and Operability Study (HAZOP). HAZOP is a formally structured method of systematically investigating each element of a system for all of the ways in which important parameters can deviate from the intended design conditions to create hazards and operability problems. The hazard and operability problems are typically determined by a study of the piping and instrument diagrams (or plant model) by a team of personnel who critically analyze effects of potential problems arising in each pipeline and each vessel of the operation.

Pertinent parameters are selected, for example, flow, temperature, pressure, and time. Then the effect of deviations from design conditions of each parameter examined. A list of key words, for example, "more of," "less of," "part of," are selected for use in describing each potential deviation.

The system is evaluated as designed and with deviations noted. All causes of failure are identified. Existing safeguards and protection are identified. An assessment is made weighing the consequences, causes, and protection requirements involved.

(vi) Fault Tree Analysis; or

The FMEA is a methodical study of component failures. This review starts with a diagram of the operation, and includes all components that could fail and conceivably affect the safety of the operation. Typical examples are instrument transmitters, controllers, valves, pumps, rotometers, etc. These components are listed on a data tabulation sheet and individually analyzed for the following:

- Potential mode of failure (i.e., open, closed, on, off, leaks, etc.);

- Consequence of the failure; effect on other components and effects on whole system;

- Hazard class, (i.e., high, moderate, low);

- Probability of failure;

- Detection methods; and

- Remarks/compensating provisions.

(vii) An appropriate equivalent methodology.

Multiple concurrent failures also are included in the analysis. The last step in the analysis is to analyze the data for each

(3) The process hazard analysis shall address:

(i) The hazards of the process;

(ii) The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace;

(iii) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);

(iv) Consequences of failure of engineering and administrative controls;

(v) Facility siting;

(vi) Human factors; and

(vii) A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.

(4) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has

component or multiple component failure and develop a series of recommendations appropriate to risk management.

Fault Tree Analysis. A fault tree analysis can be either a qualitative or a quantitative model of all the undesirable outcomes, such as a toxic gas release or explosion, that could result from a specific initiating event. It begins with a graphic representation (using logic symbols) of all possible sequences of events that could result in an incident. The resulting diagram looks like a tree with many branches listing the sequential events (failures) for different independent paths to the top event. Probabilities (using failure rate data) are assigned to each event and then used to calculate the probability of occurrence of the undesired event.

This technique is particularly useful in evaluating the effect of alternative actions on reducing the probability of occurrence of the undesired event.

The selection of a PHA methodology or technique will be influenced by many factors including how much is known about the process.

Is it a process that has been operated for a long period of time with little or no innovation and extensive experience has been generated with its use? Or, is it a new process or one that has been changed frequently by the inclusion of innovation features? Also, the size and complexity of the process will influence the decision as to the appropriate PHA methodology to use.

The PHA is intended to identify and evaluate acceptable controls for process hazards. The evaluation of the hazards must include all the steps set out in paragraph (e)(3)(i)-(vii), using a methodology consistent with paragraph (e)(2). Through the timely resolution of the PHA findings and recommendations, the PHA is intended to control process hazards.

All PHA methodologies are subject to certain limitations. For example, the checklist methodology works well when the process is very stable and no changes are made, but it is not as effective when the process has undergone extensive change. The checklist may miss the most recent changes and consequently they would not be evaluated. Another limitation to be considered concerns the assumptions made by the team or analyst.

The intent of this paragraph is to require the employer to at

experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

least identify each type of control as well as identify the possible effects of the failure of the listed control. VOSH concurs with OSHA's belief that employers can determine the consequences of a failure of these controls, and establish a reasonable estimate of the safety and health effects on employees without conducting a specialized quantitative evaluation.

With respect to existing plants, "siting" does not refer to the site of the plant in relation to the surrounding community. It refers, rather, to the location of various components within the establishment.

The PHA is dependent on good judgement and the assumptions made during the study need to be documented and understood by the team and reviewer and kept for a future PHA.

VOSH believes that the process hazard analysis is best performed by a team with expertise in engineering and process operations, and that the team should include at least one employee who has experience with and knowledge of the process being evaluated. Also, one member of the team must be knowledgeable in the specific analysis methods being used.

A PHA team can vary in size from two people to a number of people with varied operational and technical backgrounds. Some team members may be part of the team for only a limited time.

The team leader needs to be fully knowledgeable in the proper implementation of the PHA methodology to be used and should be impartial in the evaluation. The other full or part-time team members need to provide the team with expertise in areas such as process technology; process design; operating procedures and practices; alarms; emergency procedures; instrumentation; maintenance procedures, both routine and nonroutine tasks, including how the tasks are authorized; procurement of parts and supplies; safety and health; and any other relevant subjects. At least one team member must be familiar with the process.

The ideal team will have an intimate knowledge of the standards, codes, specification, and regulations applicable to the process being studied. The selected team members need to be compatible and the team leader needs to be able to

manage the team and the PHA study. The team needs to be able to work
together while benefitting from the expertise of others on the team or outside the team to resolve issues and to forge a consensus on the findings of the study and recommendations.

The application of a PHA to a process may involve the use of different methodologies for various parts of the process. For example, process involving a series of unit operations of varying sizes, complexities, and ages may use different methodologies and team members for each operation. Then the conclusions can be integrated into one final study and evaluation.

A more specific example is the use of a PHA checklist for a standard boiler or heat exchanger and the use of a Hazard and Operability PHA for the overall process. Also, for batch-type processes like custom batch operations, a generic PHA of a representative batch may be used where there are only small changes of monomer or other ingredient ratio and the chemistry is documented for the full range and ratio of batch ingredients. Another process where the employer might consider using a generic type of PHA is a gas plant.

Often these plants are simply moved from site to site, and therefore, a generic PHA may be used for these movable plants. Also, when an employer has several similar size gas plants and no sour gas is being processed at the site, a generic PHA is feasible as long as the variations of the individual sites are accounted for in the PHA.

Finally, when an employer has an large continuous process with several control rooms for different portions of the process, such as for a distallation tower and a blending operation, the employer may wish to do each segment separately and then integrate the final results.

Small businesses covered by this rule often will have processes that have less storage volume and less capacity, an may be less complicated than processes at a large facility. Therefore, VOSH would anticipate that the less complex methodologies would be used to meet the process hazard analysis criteria in the standard. These process hazard analyses can be done in less time and with fewer people being involved. A less complex process generally means that less data, P&IDs, and process information are needed to perform a process hazard analysis.
Many small businesses have processes that are not unique, such as refrigerated warehouses or cold storage lockers or water treatment facilities. Where employer associations have a number of members with such facilities, a generic PHA, evolved from a checklist or what-if questions, could be developed and effectively used by employers to reflect their particular process; this would simplify compliance for them.

(5) The employer shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

(6) At least every five (5) years after the

When the employer has a number of processes that require a PHA, the employer must set up a priority system to determine which PHAs to conduct first. A preliminary, hazard analysis may be useful in setting priorities for the processes that the employer has determined are subject to coverage by the process safety management standard. Consideration should be given first to those processes with the potential of adversely affecting the largest number of employees.

This priority setting also should consider the potential severity of a chemical release, the number of potentially affected employees, the operating history of the process, such as the frequency of chemical releases, the age of the process, and any other relevant factors.

Together, these factors would suggest a ranking order using either a weighting factor system or a systematic ranking method. The use of a preliminary hazard analysis will assist an employer in determining which process should be of the highest priority for hazard analysis resulting in the greatest improvement in safety at the facility occurring first.

Detailed guidance on the content and application of process hazard analysis methodologies is available from the American Institute of Chemical Engineers' Center for Chemical Process Safety, 345 E. 47th Street, New York, New York 10017, (212) 705-7319.

Use of the terms, "promptly" and "timely manner" indicate the standard's intent for the employer to take corrective action as soon as possible. "As soon as possible" means that the employer shall proceed with all due speed, considering the complexity of the recommendation and the difficulty of implementation. VOSH expects employers to develop a schedule for completion of corrective actions to document what actions are to be taken, and to document the completion of those actions as they occur.

In certain situations hazards may be identified for which a recommended solution/action might be the shutdown of the process. For example, several processes might be located very close, and if fire were to occur, a domino effect might result. The resolution may be to separate the processes, but there is no additional property on which to expand.

OSHA considers an employer to have "resolved" the teams' findings and recommendations when the employer either has adopted the recommendations, or has justifiably declined to do so. Where a recommendation is rejected, the employer must communicate this to the team, and expeditiously resolve any subsequent recommendations of the team.

An employer can justifiably decline to adopt a recommendation where the employer can document, in

completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (e)(4) of this section, to assure that the process hazard analysis is consistent with the current process.

(7) Employers shall retain process hazards analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e)(5) of this section for the life of the process.

(f) <u>Operating procedures</u>.

(1) The employer shall 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 and shall address at least the following elements.

writing, and based upon adequate evidence, that one or more of the following conditions is true:

1. The analysis upon which the recommendation is based contains material factual errors;

2. The recommendation is not necessary to protect the health and safety of the employer's own employees, or the employees of contractors;

15. An alternative measure would provide a sufficient level of protection; or

16. The recommendation is infeasible.

In such situations, the employer could implement protective measures to minimize the effects of an uncontrolled release. An appropriate response in this specific case, for example, might be to install additional detection systems which may be interlocked to deluge systems for tanks and process equipment, to provide abundant protective measures for onsite personnel, and to implement administrative controls, such as reducing inventories and numbers of exposed personnel.

Employers must make such process hazard analyses and updates or revalidation available to VOSH, on request.

Operating procedures describe tasks to be performed, data to be recorded, operating procedures describe tasks to be performed, data to be recorded, operating conditions to be maintained, samples to be collected, and safety and health precautions to be taken. The procedures need to be technically accurate, understandable to employees, and

revised periodically to ensure that they reflect current operations.

(i) Steps for each operating phase:

The process safety information package helps to ensure that the operating procedures and practices are consistent with the known hazards of the chemicals in the process and that the operating parameters are correct.

(A) Initial startup;

(B) Normal operations;

Operating procedures should be reviewed by engineering staff and operating personnel to ensure their accuracy and that they provide practical instructions on how to actually carry out job duties safely. Also, the employer must certify annually that the operating procures are current and accurate.

(C) Temporary operations;

(D) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.

Computerized process control systems add complexity to operating instructions. These operating instructions need to describe the logic of the software as well as the relationship between the equipment and the control system; otherwise, it may not be apparent to the operator.

Operating procedures and instructions are important for training operating personnel. The operating procedures are often viewed as the standard operating practices (SOPs) for operations. Control room personnel and operating staff, in general, need to have a full understanding of operating procedures.

(E) Emergency Operations;

If workers are not fluent in English, then procedures an instructions need to be prepared in a second language understood by the workers. In addition, operating procedures need to be changed when there is a change in the process. The consequences of operating procedure changes need to be fully evaluated and the information conveyed to the personnel.

(F) Normal shutdown; and,

(G) Startup following a turnaround, or after an emergency shutdown.

Operating procedures provide specific instructions or details on what steps are to be taken or followed in carrying out the stated procedures. The specific instructions should include the applicable safety precautions should include the applicable safety precautions and appropriate information on safety implications.

(ii) Operating limits:

(A) Consequences of deviation; and

For example, the operating procedures addressing operating parameters will contain operating instructions about pressure limits, temperature ranges, flow rates, what to do when an upset condition occurs, what alarms and instruments are pertinent if an upset condition occurs, and other subjects.

(B) Steps required to correct or avoid deviation.

Operating instructions need to clearly indicate the distinctions between start-up and normal operations, such as the appropriate allowances for heating up a unit to reach the normal operating parameters. Also, the operating instructions need to describe the proper method for increasing the temperature of the unit until the normal operating

(iii) Safety and health considerations:

(A) Properties of, and hazards presented by, the chemicals used in the process;

(B) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;

(C) Control measures to be taken if physical contact or airborne exposure occurs;

(D) Quality control for raw materials and control of hazardous chemical inventory levels; and,

(E) Any special or unique hazards.

(iv) Safety systems and their functions.

(2) Operating procedures shall be readily accessible to employees who work in or maintain a process.

(3) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to facilities. The employer shall certify annually that these operating procedures are current and accurate.

(4) The employer shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

(g) <u>Training</u>.

temperatures are reached.

Training must include instruction on how to handle upset conditions as well as what operating personnel are to do in emergencies such as pump seal failures or pipeline ruptures. Communication among operating personnel and workers within the process area performing nonroutine tasks also must be maintained.

Another example of using operating instructions to properly implement operating procedures is in starting up or shutting down the process. In these cases, different parameters will be required from those of normal operation.

For example, mechanical changes to the process made by the maintenance department (like changing a valve from steel to brass or other subtle changes) need to be evaluated to determine whether operating procedures and practices also need to be changed.

All management of change actions must be coordinated and integrated with current operating procedures and operating personnel must be alerted to the changes in procedures before the change is made. When the process is shut down to make a change, then the operating procedures must be updated before restarting the process.

Rather than industrial hygiene services, this paragraph primarily means first aid or emergency medical services, which should be consistent with the information on the material safety data sheet.

(1) Initial training.

(i) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in paragraph (f) of this section. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

To ensure that a ready and up-to-date reference is available, and to form a foundation for needed employee training, operating procedures must be readily accessible to employees who work in or maintain a process. The term "readily accessible" means that the employees can immediately obtain the required information in an emergency in their work area.

The operating procedures must be reviewed as often as necessary to ensure that they reflect current operating practices, including changes in process chemicals, technology, and equipment, and facilities. To guard against outdated or inaccurate operating procedures, the employer must certify annually that these operating procedures are current and accurate.

The employer must develop and implement safe work practices to provide for the control of hazards during work activities such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a facility by maintenance, contractor, laboratory, or other support personnel. These safe work practices must apply both to employees and to contractor employees.

The hazards of the tasks are to be conveyed to operating personnel in accordance with established procedures and to those performing the actual tasks. When the work is completed, operating personnel should be informed to provide closure on the job.

All employees, including maintenance and contractor employees involved with highly hazardous chemicals, need to fully understand the safety and health hazards of the chemicals and process they work with so they can protect themselves, their fellow employees, and the citizens of nearby communities. Training conducted in compliance with the **VOSH Hazard Communication Standard (HAZCOM), Part 1910.1200,** will inform employees about the chemicals they work with and familiarize them with reading and understanding MSDSs.

However, additional training in subjects such as operating procedures and safe work practices, emergency evacuation and response, safety procedures, routine and nonroutine work authorization activities, and other areas pertinent to process safety and health need to be covered by the employer's

(ii) In lieu of initial training for those employees already involved in operating a process on **September 15, 1992,** an employer may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

(2) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The employer, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

training program.

In establishing their training programs, employers must clearly identify the employees to be trained, the subjects to be covered, and the goals and objectives they wish to achieve. The learning goals or objectives should be written in clear measurable terms before the training begins. These goals and objectives need to 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. Hands-on training, where employees actually apply lessons learned in simulated or real situations, will enhance learning.

For example, operating personnel, who will work in a control room or at control panels, would benefit by being trained at a simulated control panel. Upset conditions of various types could be displayed on the simulator, and then the employee could go through the proper operating procedures to bring the simulator panel back to the normal operating parameters.

A training environment could be created to help the trainee feel the full reality of the situation but under controlled conditions. This type of realistic training can be very effective in teaching employees correct procedures while allowing them also to see the consequences of what might happen if they do not follow established operating procedures.

Other training techniques using videos or training also can be very effective for teaching other job tasks, duties, or imparting other important information. An effective training program will allow employees to fully participate in the training process and to practice their skills or knowledge.

"Operating procedures," as used in this paragraph, may be written or otherwise. Such certification may be based upon on-the-job evaluation or other equivalent determination methods. **When new operating procedures are subsequently developed, they must be written and the employer must give training to operating employees prior to their implementation.**

The time period for refresher training of an employee involved in operating a process is to be measured from the date of the employee's last training ["or grandfathering", as allowed at (g)(1)(ii)] in the overview and current operating procedures of the process.

Employers, in consultation with employees, shall determine

the appropriate frequency, which may be based on consideration of such factors as deviation from standard operating procedures, recent incidents, or apparent deficiencies in training.

(3) Training documentation. The employer shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The employer shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

Training under "management of change" is not to be considered refresher training under this paragraph. Management of change training is an independent requirement, in addition to other training requirements of the standard.

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

The methods for evaluating the training should be developed along with the training should be developed along with the training program goals and objectives. 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 should 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 also should 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.

Careful consideration must be given to ensure that employees, including maintenance and contract employees, receive current and updated training. For example, if changes are made to a process, affected employees must be trained in the changes and understand the effects of the changes on their job tasks. Additionally, as already discussed, the evaluation of the employee's absorption of training will certainly determine the need for further training.

To comply with this section, there must be some positive means taken by the employer to determine if employees have understood their training and are capable of adhering to the current operating procedures of the process. This could include the administration of a written test, although the standard does not require that a formal written test be used. Other means of ascertaining comprehension of the training, such as on-the-job demonstrations, etc., are acceptable as long as they are adequately documented.

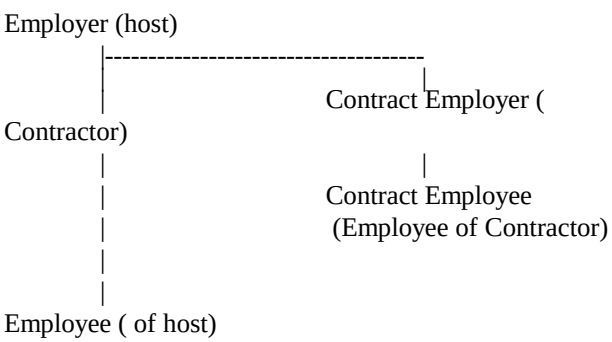
(h) Contractors.

(1) Application. This paragraph applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

(2) Employer responsibilities.

(i) The employer, when selecting a contractor, shall obtain and evaluate information regarding the contract employer's safety performance and programs.

Terminology:



This standard is performance-oriented and does not require that employers refrain from using contractors with less than perfect safety records. However, the required evaluation may indicate some gaps in the contractor's approach to safety, thus the employer may need to develop and implement more stringent safe work practices to control the presence of contractors in covered process areas.

(ii) The employer shall inform contract employers of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.

Paragraph (h)(2)(i) requires that the employer be fully informed regarding the contractor's safety performance (e.g., what is the contractor's experience modification rate?) and safety programs. This evaluation is an important measure to assure the integrity of processes and to assure that additional hazards are not introduced.

(iii) The employer shall explain to contract employers the applicable provisions of the emergency action plan required by paragraph (n) of this section.

This standard is performance-oriented and does not require that employers refrain from using contractors with less than perfect safety records. However, the required evaluation may indicate some gaps in the contractor's approach to safety, thus, the employer may need to develop and implement more stringent safe work practices to control the presence of contractors in covered process areas.

(iv) The employer shall develop and implement safe work practices consistent with paragraph (f)(4) of this section, to control the entrance, presence and exit of contract employers and contract employees in covered process areas.

The host employer and the general contractors are both responsible for ensuring that the duties contained in (h)(2) are performed; this applies to inquiring into the safety records of their subcontractors, informing the subcontractor of known potential hazards, the emergency action plan, and safe work practices, and ensuring the subcontractor's compliance with the standard.

(v) The employer shall periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3).

The intention of this paragraph is that host employers and contractors exercise responsible oversight of their respective

contractors' and subcontractors' performance of safety and health requirements under this standard.

The standard does not require the employer to document this evaluation of the information obtained regarding contractor safety performance and programs. However, compliance officers should review records about these aspects of the selection process and to determine if the employer has met the intent of this provision. [See Appendix A of this instruction, PSM Audit Guidelines, page A-25.]

Many categories of contract labor may be present at a jobsite; such workers may actually operate the facility or do only a particular aspect of a job because they have specialized knowledge or skill. Others work only for short periods when there is need for increased staff quickly, such as in turnaround operations.

PSM includes special provisions for contractors and their employees to emphasize the importance of everyone taking care that they do nothing to endanger those working nearby who may work for another employer.

(vi) The employer shall maintain a contract employee injury and illness log related to the contractor's work in process areas.

Employers who use contractors to perform work in and around processes that involve highly hazardous chemicals have to establish a screening process so that they hire and use only contractors who accomplish the desired job tasks without compromising the safety and health of any employees at a facility.

For contractors whose safety performance on the job is not known to the hiring employer, the employer must obtain information on injury and illness rates and experience and should obtain contractor references.

In addition, the employer must ensure that the contractor has the appropriate job skills, knowledge, and certifications (e.g., for pressure vessel welders).

(3) Contract employer responsibilities.

To satisfy its obligations under (h)(2)(v), the host employer must ensure, through periodic evaluations, that the training provided to these contact employees by the contract employer is in fact equivalent to the training that the standard requires for direct hire employees. Such training need not be identical in format or content or context to training given to the host's employees. The critical element is that information required by the standard must be conveyed to and learned by contract employees as well as direct hire employees. The obligation may be satisfied by joint training or by separate training.

(i) The contract employer shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

Contractor work methods and experience should be evaluated. For example, does the contractor conducting demolition work swing loads over operating processes or does the contractor avoid such hazards?

(ii) The contract employer shall assure that each

contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.

(iii) The contract employer shall document that each contract employee has received and understood the training required by this paragraph. The contract employer shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

Although the standard places the primary responsibility for providing training to its employees on the contract employer itself, the host employer bears the responsibility to "periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3). Such "obligations" clearly include training obligations. The standard also requires the host employer to select a contract employer only after evaluating its safety performance and programs [(h)(2)(i)], and to inform the contract employer about the specific hazards associated with the process [(h)(2)(ii)], and the provisions of the emergency action plan [(h)(2)(iii)].

Maintaining a site injury and illness log for contractors is another method employers must use to track and maintain current knowledge of activities involving contract employees working on or adjacent to processes covered by PSM.

If the contract employer is willing to share the OSHA 200 log and the First Reports of Injury (or equivalent) with the employer, and if those injuries and illnesses are related to process areas, then such records would
be for the employer to develop a contract employer injury and illness log separately for each contractor or a combined log for all contractors if the combined log distinguishes among contractors.

Injury and illness logs of both the employer's employees and contract employees allow the employer to have full knowledge of process injury and illness experience. This log contains information useful to those auditing process safety management compliance and those involved in incident investigations.

Contract employees must perform their work safely. Considering that contractors often perform very specialized and potentially hazardous tasks, such as confined space entry activities and nonroutine repair activities, their work must be controlled while they are on or near a process covered by PSM.

The burden of training contractor employees is on the contractor employer. However, under § 1910.119(h)(2)(v), the host employer shall periodically evaluate the contract employer's performance with respect to the (contract) employee's instruction and training requirements at § 1910.119 (h)(3).

NOTE: The employer must inform a contract employer of the hazards related to the contractor's work and the process.

(iv) The contract employer shall assure that each contract employee follows the safety rules of the facility including the safe work practices required by paragraph (f)(4) of this section.

(v) The contract employer shall advise the employer of any unique hazards presented by the contract employer's work, or of any hazards found by the contract employer's work.

Although the standard places the primary responsibility for providing training to its employees on the contract employer itself, the host employer bears the responsibility to "periodically evaluate the performance of contract employers in fulfilling their obligations as specified in paragraph (h)(3)." Such "obligations" clearly include training obligations.

If contract employees are involved in operating a process or maintaining the on-going integrity of process equipment, then they must receive training in accordance with the specific training requirement set forth in paragraphs (g) and (j), respectively. To satisfy its obligations under (h)(2)(v), the host employer must ensure, through periodic evaluations, that the training provided to these contract employees by the contract employer is in fact equivalent to the training that the standard requires for direct hire employees. The critical element is that information required by the standard must be conveyed to and learned by contract employees as well as direct hire employees. The obligation may be satisfied by joint training or by separate training.

Moreover, (h) requires that every employee of a covered contractor be trained in the work practices necessary to perform safely his or her job. The contract employee must be able to perform his or her own job tasks safely and should receive:

(a) training prior to beginning work on or near a covered process, which should encompass (i) instruction regarding known process hazards related to his or her job, including training in the applicable provisions of the emergency action plan; and (ii) training in the safe work practices adopted by the host employer and the contract employer; and (b) additional training as necessary (i) to prepare the employee for changes in the operations or work practices at the facility and (ii) to ensure that the employee's understanding of the applicable safe work practices and other rules remains current.

(i) <u>Pre-startup safety review</u>.

(1) The employer shall perform a pre-startup safety review for new facilities and for modified facilities when the modification is significant enough to require a change in the process safety information.

(2) The pre-startup safety review shall confirm that prior to the introduction of highly hazardous chemicals to a process:

(i) Construction and equipment is in accordance with design specifications;

(ii) Safety, operating, maintenance, and emergency procedures are in place and are adequate;

A permit system or work authorization system for these activities is helpful for all affected employers. The use of a work authorization system keeps an employer informed of contract employee activities. Thus, the employer has better coordination and more management control over the work being performed in the process area.

(iii) For new facilities, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified facilities meet the requirements contained in management of change, paragraph (l).

(iv) Training of each employee involved in operating a process has been completed.

(j) Mechanical integrity.

(1) Application. Paragraphs (j)(2) through (j)(6) of this section apply to the following process equipment:

(i) Pressure vessels and storage tanks;

(ii) Piping systems (including piping components such as valves);

(iii) Relief and vent systems and devices;

(iv) Emergency shutdown systems;

(v) Controls (including monitoring devices and sensors, alarms, and interlocks) and,

(vi) Pumps.

(2) Written procedures. The employer shall establish and implement written procedures to maintain the on-going integrity of process equipment.

For existing processes that have been shutdown for turnaround or modification, the employer must ensure that any changes other than "replacement in kind" made to the process during shutdown go through the **management of change procedures**. Piping and instrument diagrams (P&IDs) will need to be updated, as necessary, as well as operating procedures and instructions.

The employer is responsible for ensuring that process equipment meets design specification prior to startup. For older equipment, this may require verification that the design and construction are safe for the intended application. For equipment that has been modified to the extent that a change to the process safety information is required, the employer must ensure that the process safety information has been modified prior to startup. (*Note also the requirements of 1910.119(j)(4)(ii) regarding Mechanical Integrity -- Inspection and Testing.*)

P&IDs should be completed, the operating procedures in place, and the operating staff trained to run the process, before start-up. The initial start-up procedures and normal operating procedures must be fully evaluated as part of the pre-start-up review to ensure a safe transfer into the normal operating mode.

If the changes made to the process during shutdown are significant and affect the training program, then operating personnel as well as employees engaged in routine and nonroutine work in the process area may need some refresher or additional training in light of the changes. Any incident investigation recommendations, compliance audits, or PHA recommendations need to be reviewed to see what affect they may have on the process before beginning the start-up.

For new processes, the employer will find a PHA helpful in improving the design and construction of the process from a reliability and quality point of view. The safe operation of the new process is enhanced by making use of the PHA recommendation before final installations are completed.

Employers must review their maintenance programs and schedules to see if there are areas where "break-down" maintenance is used rather than the more preferable on-going mechanical integrity program. Equipment used to process, store, or handle highly hazardous chemicals has to be designed, constructed, installed, and maintained to minimized the risk of releases of such chemicals. This requires that the mechanical integrity program be in place to ensure the continued integrity of process equipment.

Elements of a mechanical integrity program include the identifying and categorizing equipment and instrumentation, inspections and tests and their frequency; maintenance procedures; training of maintenance personnel; criteria for acceptable test results; documentation of test and inspection results; and documentation of manufacturer recommendations for equipment and instrumentation.

"Pressure vessels and storage tanks" includes "pressurized" storage tanks, i.e., tanks designed to be used above atmospheric pressure, as well as non-pressurized (atmospheric) storage tanks.

(3) Training for process maintenance activities. The employer shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.

The purpose of this provision is to require written procedures in adequate detail to ensure that specific process equipment receives careful, appropriate, regularly scheduled maintenance to ensure its continued safe operation. A "breakdown" maintenance program (i.e., a program wherein action is taken only when something breaks down) does not meet the requirements of this paragraph.

(4) Inspection and testing.

(i) Inspections and tests shall be performed on process equipment.

(ii) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.

(iii) The frequency of inspections and tests of

The first step of an effective mechanical integrity program is to compile and categorize a list of process equipment and instrumentation to include in the program. This list includes pressure vessels, storage tanks, process piping, relief and vent systems, fire protection system components, emergency

process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.

shutdown systems and alarms, and interlocks and pumps. For the categorization of instrumentation and the llisted equipment, the employer should set priorities for which pieces of equipment require closer scrutiny than others.

The procedures need to be specific to the type of vessel or equipment. Identical or very similar vessels and items of equipment in similar service need not have individualized maintenance procedures. Each procedure must clearly identify the equipment to which it applies.

This paragraph clearly contemplates that new maintenance employees be trained before beginning work at the site, and all maintenance employees receive additional training appropriate to their constantly changing job tasks.

Moreover, although "maintenance employees need not be trained in process operating procedures to the same extent as those employees who are actually involved in operating the process," they must be trained in all "procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner." Thus, a maintenance worker sent to work on a process breakdown must be trained in operating procedures that are relevant to the repair or installation on which he or she is working.

(iv) The employer shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

VOSH intends that employers incorporate all safety-related topics applicable to maintenance tasks into the ongoing training program required by paragraph (j) to assure that maintenance employees can perform their job tasks in a safe manner. Thus, to train maintenance workers in "procedures applicable" to their job tasks under paragraph (j) an employer must, in appropriate circumstances, train these workers in the safe work practices required under paragraph (f)(4), in the written procedures to manage change under paragraph (1), and in the appropriate provisions of the emergency action plan under paragraph (n) of the standard.

The mean time to failure of various instrumentation and equipment parts would be known from the manufacturer's data or the employer's experience with the parts which then influence inspection and testing frequency and associated procedures. Also, applicable codes and standards--such as:

(5) Equipment deficiencies. The employer shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in paragraph (d)) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

-National Board Inspection Code (NBIC),
-American Society for Testing and Materials (ASTM),
-American Petroleum Institute (API),
-National Fire Protection Association (NFPA),
-American National Standards Institute (ANSI),
-American Society of Mechanical Engineers (ASME)
and other groups--provide information to help establish an effective testing and inspection frequency, as well as appropriate methodologies.

(6) Quality assurance.

(i) In the construction of new plants and equipment, the employer shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.

(ii) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.

(iii) The employer shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

The applicable codes and standards provide criteria for external inspections for such items as foundation and supports, anchor bolts, concrete or steel supports, guy wires, nozzles and sprinklers, pipe hangers, grounding connections, protective coatings and insulation, and external metal surfaces of piping and vessels.

These codes and standards also provide information on methodologies for internal inspection and frequency formula based on the corrosion rate of the materials of construction. Also, internal and external erosion must be considered along with corrosion effects for piping and valves. Where the corrosion rate is not known, a maximum inspection frequency is recommended (methods of developing the corrosion rate are available in the codes).

Internal inspections need to cover items such as the vessel shell, bottom and head; metallic linings; nonmetallic linings; thickness measurements for vessels and piping; inspection for erosion, corrosion, cracking and bulges; internal equipment like trays, baffles, sensors and screens for erosion, corrosion or cracking and other deficiencies. Some of these inspections may be performed by state or local government inspectors under state and local statutes.

However, each employer must develop procedures to ensure that tests and inspections are conducted properly and that consistency is maintained even where different employees may be involved. 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.

The Compliance Officer shall review employer documentation of inspection and testing when evaluating employer compliance with paragraph J.

If equipment is found to be operating outside acceptable limits resulting in that continued safe operation of the process cannot be ensured, then equipment deficiencies must be corrected before further use. However, the employer may continue operation of the process until the equipment deficiencies can be corrected in a safe and timely manner if necessary means, such as continuous monitoring of the equipment are taken or other appropriate precautions are taken to ensure safe operation.
Note: *Operating equipment outside acceptable limits is considered to be a deficiency.*

The employer is responsible for ensuring that equipment is installed consistent with design specifications and manufacturer's instructions. This may require the employer

(k) <u>Hot work permit</u>.

(1) The employer shall issue a hot work permit for hot work operations conducted on or near a covered process.

(2) The permit shall document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

to be involved in the review, inspection, certification, and quality assurance of work performed by contractors.

A quality assurance system helps ensure the use of proper materials of construction, the proper fabrication and inspection procedures, and appropriate installation procedures that recognize field installation concerns. The quality assurance program is an essential part of the mechanical integrity program and will help maintain the primary and secondary lines of defense designed into the process to prevent unwanted chemical releases or to control or mitigate a release. "As built" drawings, together with certifications of coded vessels and other equipment and materials of construction, must be verified and retained in the quality assurance documentation.

Equipment installation jobs need to be properly inspected in the field for use of proper materials and procedures and to assure that qualified craft workers do the job. The use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods needs to be verified in the field.

Also, procedures for installing safety devices need to be verified, such as the torque on the bolts on rupture disc installations, uniform torque on flange bolts, and proper installation of pump seals. If the quality of parts is a problem, it may be appropriate for the employer to conduct audits of the equipment supplier's facilities to better ensure proper purchases of required equipment suitable for intended service. Any changes in equipment that may become necessary will need to be reviewed for management of change procedures.

(l) Management of change.

(1) The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.

(2) The procedures shall assure that the following considerations are addressed prior to any change:

(i) The technical basis for the proposed change;

(ii) Impact of change on safety and health;

(iii) Modifications to operating procedures;

(iv) Necessary time period for the change; and,

(v) Authorization requirements for the proposed change.

(3) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

This paragraph will normally be cited as serious if an employer fails to issue permits or provide the required documentation. Citations shall also be issued for 1910.252(a) and other applicable standards.

A permit must be issued for hot work operations conducted on or near a covered process. The permit must document that the fire prevention and protection requirements in OSHA regulations (1910.252(a)) have been implemented prior to beginning the hot work operations; it must indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit must be kept on file until completion of the hot work.

Nonroutine work conducted in process areas must be controlled by the employer in a consistent manner. The hazards identified involving the work to be accomplished must be communicated to those doing the work, and to those

(4) If a change covered by this paragraph results in a change in the process safety information required by paragraph (d), such information shall be updated accordingly.

operating personnel whose work could affect the safety of the process.

A work authorization notice or permit must follow a procedure that describes the steps the maintenance supervisor, contractor representative, or other person needs to follow to obtain the necessary clearance to start the job. The work authorization procedures must reference and coordinate, as applicable, lockout/tagout procedures, line breaking procedures,
confined space entry procedures, and hot work authorizations.

This procedure also must provide clear steps to follow once the job is completed to provide closure for those that need to know the job is now completed and that equipment can be returned to normal.

(5) If a change covered by this paragraph results in a change in the operating procedures or practices required by paragraph (f), such procedures or practices shall be updated accordingly.

Any change whatsoever that may affect a covered process triggers the management of change provisions. The only exception to this is when there is a replacement in kind. Replacements in kind are not covered. If a new gasket is to be installed that is of different material, composition, shape, size, or design then a management of change would be required.

VOSH believes that contemplated changes to a process must be thoroughly evaluated to fully assess their impact on employee safety and health and to determine needed changes to operating procedures.

To properly manage changes to process chemicals, technology, equipment and facilities, one must define what is meant by change. In the process safety management standard, change includes all modifications to equipment, procedures, raw materials, and processing conditions other than “replacement in kind”.

These changes must be properly managed by identifying and reviewing them prior to implementing them. For example, the operating procedures contain the operating parameters (pressure limits, temperature ranges, flow rates, etc.) And the importance of operating within these limits.

While the operator must have the flexibility to maintain safe operation within the established parameters, any operation outside of these parameters requires review and approval by a written management of change procedure. Management of change also covers changes in process technology and changes to equipment and instrumentation.

(m) Incident investigation.

(1) The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of highly hazardous chemical in the workplace.

(2) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(3) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

(4) A report shall be prepared at the conclusion of the investigation which includes at a minimum:

(i) Date of incident;

(ii) Date investigation began;

(iii) A description of the incident;

(iv) The factors that contributed to the incident; and,

(v) Any recommendations resulting from the investigation.

Changes in process technology can result from changes in production rates, raw materials, experimentation, equipment unavailability, new equipment, new product development, change in catalysts, and changes in operating conditions to improve yield or quality.

Equipment changes can be in materials of construction, equipment specifications, piping pre-arrangements, experimental equipment, computer program revisions, and alarms and interlocks. Employers must establish means and methods to detect both technical and mechanical changes.

Temporary changes have caused a number of catastrophes over the years, and employers must establish ways to detect both temporary, and permanent changes. It is important that a time limit for temporary changes be established and monitored since otherwise, without control, these changes may tend to become permanent. Temporary changes are subject to the management of change provisions.

In addition, the management of change procedures are used to ensure that the equipment and procedures are returned to their original or designed conditions at the end of the temporary change. Proper documentation and review of these changes are invaluable in ensuring that safety and health considerations are incorporated into operating procedures and processes.

Employers may wish to develop a form or clearance sheet to facilitate the processing of changes through the management of change procedures. A typical change form may include a description and the purpose of the change, the technical basis for the change, safety and health considerations, documentation of changes for the operating procedures, maintenance procedures, inspection and testing, P&IDs, electrical classification, training and communications, pre-startup inspection, duration (if a temporary change), approvals, and authorization.

Where the impact of the change is minor and well understood, a check list reviewed by an authorized person, with proper communication to others who are affected, may suffice. (See **Supplement B** for a sample request for change form that can be helpful in guiding this procedure.)

For a more complex of significant design change, however, a hazard evaluation procedure with approvals by operations, maintenance, and safety departments may be appropriate. Changes in documents such as P&ID's, raw materials, operating procedures, mechanical integrity programs, and electrical classifications should be noted so that these revisions can be made permanent when the drawings and procedure manuals are updated.

(5) The employer shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.

Copies of process changes must be kept in an accessible location to ensure that design changes are available to operating personnel as well as to PHA team members when a PHA is being prepared or being updated.

A crucial part of the process safety management program is a thorough investigation of incidents to identify the chain of events and causes so that corrective measures can be developed and implemented.

Incident investigation is the process of identifying the underlying causes of incidents and implementing steps to prevent similar events from occurring. The intent of an incident investigation is for employers to learn from past experiences and thus avoid repeating past mistakes.

The incidents VOSH expects employers to recognize and to investigate are the types of events that resulted in or could reasonably have resulted in a catastrophic release. These events are sometimes referred to as "near misses," meaning that a serious consequence did not occur, but could have.

(See **Supplement H** for sample incident investigation report form.)

Employers must develop in-house capability to investigate incidents that occur in their facilities. A team should be assembled by the employer and trained in the techniques of investigation including how to conduct interviews of witnesses, assemble needed documentation, and write reports.

A multi-disciplinary team is better able to gather the facts of the event and to analyze them and develop plausible scenarios as to what happened, and why. Team members should be selected on the basis of their training, knowledge, and ability to contribute to a team effort to fully investigate the incident.

(6) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

Employees in the process area where the incident occurred should be consulted, interviewed or made a member of the team. Their knowledge of the events represents a significant set of facts about the incident that occurred. The report, its finding, and recommendations should be shared with those who can benefit from the information.

(7) Incident investigation reports shall be retained for five years.

The cooperation of employees is essential to an effective incident investigation. The focus of the investigation should be to obtain facts, and not to place blame. The team and the investigative process should clearly deal with all involved individuals in a fair, open, and consistent manner.

(n) Emergency planning and response.

The employer shall establish and implement an emergency action plan for the entire plant in accordance with the provisions of 29 CFR 1910.38(a). In addition, the emergency action plan shall include procedures for handling small releases. Employers covered under this standard may also be subject to the hazardous waste and emergency response provisions contained in 29 CFR 1910.120(a), (p) and (q).

This paragraph requires that a team of knowledgeable individuals investigate every catastrophic incident and "near-miss."

This provision was designed to require the employer to respond to the team's findings and recommendations, while at the same time allowing the employer the flexibility not only to reject proposals that are erroneous or infeasible, but also to modify a recommendation that may not be as protective as possible or may be no more protective than a less complex or expensive measure.

VOSH considers an employer to have "resolved" the team's findings and recommendations when the employer either has adopted the recommendations, or has justifiably declined to do so. Where a recommendation is rejected, the employer must communicate this to the team, and expeditiously resolve any subsequent recommendations of the team.

An employer can justifiably decline to adopt a recommendation where the employer can document, in writing and based upon adequate evidence, that one or more of the following conditions is true:

17. The analysis upon which the recommendation is based contains material factual errors;

2. The recommendation is not necessary to protect the health and safety of the employer's own employees, or the employees of contractors;

3. An alternative measure would provide a sufficient level of protection; or

4. The recommendation is infeasible.

Each employer must address what actions employees are to take when there is an unwanted release of highly hazardous chemicals. Emergency preparedness is the employer's third line of defense that will be relied on along with the second line of defense, which is to control the release of chemicals.

Control releases and emergency preparedness will take place when the first line of defense to operate and maintain the process and contain the chemicals fails to stop the release. In preparing for an emergency chemical release, employers will need to decide the following:

- Whether they want employees to handle and stop small or minor incidental releases;

- Whether they wish to mobilize the available resources at the plant and have them brought to bear on a more significant release;

- Whether employers want their employees to evacuate the danger area and promptly escape to a preplanned safe zone area, and then allow the local community emergency response organization to handle the release; or

- Whether the employer wants to use some combination of these actions.

Employers will need to select how many different emergency preparedness or third lines of defense they plan to have, develop the necessary emergency plans and procedures, appropriately train employees in their emergency duties and responsibilities, and then implement these lines of defense.

Employers, at a minimum, must have an emergency action plan that will facilitate the prompt evacuation of employees when there is an unwanted release of a highly hazardous chemical. This means that the employer's plan will be activated by an alarm system to alert employees when to evacuate, and that employees who are physically impaired will have the necessary support and assistance to get them to a safe zone.

The intent of these requirements is to alert and move employees quickly to a safe zone. The use of process control centers or buildings as safe areas is discouraged. Recent catastrophes indicate that lives are lost in these structures because of their location and because they are not necessarily designed to withstand over-pressures from shock waves resulting from explosions in the process area.

When there are unwanted incidental releases of highly hazardous chemicals in the process area, the employer must inform employees of the actions/procedures to take. If the employer wants employees to evacuate the area, then the emergency action plan will be activated.

For outdoor processes, where wind direction is important for selecting the safe route to a refuge area, the employers should place a wind direction indicator, such as a wind sock or pennant, at the highest point visible throughout the process area. Employees can move upwind of the release to gain safe access to the refuge area by knowing the wind direction.

If the employer wants specific employees in the release area to control or stop the minor emergency or incidental release, these actions must be planned for in advance and procedures developed and implemented. Handling incidental releases minor emergencies in the process area must include pre-planning, providing appropriate equipment for the hazards, and conducting training for those employees who will perform the emergency work before they respond to handle an actual release. The employer's training program, including the Hazard Communication Standard training, is to address, identify, and meet the training needs for employees who are expected to handle incidental or minor releases.

Preplanning for more serious releases is an important element in the employer's line of defense. When a serious release of a highly hazardous chemical occurs, the employer, through preplanning, will have determined in advance what actions employees are to take.

The evacuation of the immediate release area and other areas, as necessary, would be accomplished under the emergency action plan. If the employer wishes to use plant personnel--such as a fire brigade, spill control team, a hazardous materials team--or employees to render aid to those in the immediate release area and to control o mitigate the incident, refer to **VOSH's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (Part 1910.120).**

If outside assistance is necessary, such as through mutual aid agreements between employers and local government emergency response organization, these emergency responders are also covered by HAZWOPER. The safety and health protection required for emergency responders is the responsibility of their employers and of the on-scene incident commander.

Responders may be working under very hazardous conditions, therefore, the objective is to have them competently led by an on-scene incident commander and the commander's staff, properly equipped to do their assigned work safely, and fully

(o) <u>Compliance Audits</u>.

(1) Employers shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.

trained to carry out their duties safely before they respond to an emergency.

Drills, training exercises, or simulations with the local community emergency response planners and responder organizations is one means to obtain better preparedness. This close cooperation and coordination between plant and local community emergency preparedness managers also will aid the employer in complying with the Environmental Protection Agency's Risk Management Plan criteria.

An effective way for medium to large facilities to enhance coordination and communication during emergencies within the plant and with local community organizations is by establishing and equipping an emergency control center.

The emergency control center would be located in a set zone so that it could be occupied throughout the duration of an emergency. The center should serve as the major communications link between the on-scene incident commander and plant or corporate management as well as with local community officials.

The communications equipment in the emergency control center should include a network to receive and transmit information by telephone, radio, or other means. It is important to have a backup communication network in case of power failure or if one communication means fails.

The center also should be equipped with the plant layout; community maps; utility drawings, including water for fire extinguishing; emergency lighting; appropriate reference materials such as government agency notification list, company personnel phone list, SARA Title III reports and material safety data sheets, emergency plans and procedures manual; a listing with the location of emergency response equipment and mutual aid information; and access to meteorological or weather condition data and any dispersion modeling data.

If, despite the best planning, an incident occurs, it is essential that emergency pre-planning and training make employees aware of, and able to execute, proper actions. For this reason, an emergency action plan for the entire plant must be developed and implemented in accordance with the provisions of other VOSH rules. In addition, the emergency action plan must include procedures for handling small releases of hazardous chemicals. Employers covered under PSM also may be subject to the VOSH hazardous waste and emergency response regulation (HAZWOPER) 1910.120.

(2) The compliance audit shall be conducted by at least one person knowledgeable in the process.

Under this section, employers must conduct compliance audits in a timely manner to meet this certification

requirement. The first certification is required no later than September 15, 1995. When employers conduct compliance audits and certify compliance with 1910.119 before September 26, 1995, the subsequent certification must be within 3 years from the certification date.

Note: It may be necessary for employers to conduct compliance audits and certify that they have evaluated compliance more frequently than every 3 years, because of significant or numerous deficiencies disclosed by the previous audit, or for other reasons.

An audit is a technique used to gather sufficient facts and information, including statistical information, to verify compliance with standards. Employers must select a trained individual or assemble a trained team to audit the process safety management system and program.

A small process or plant may need only one knowledgeable person to conduct an audit. The audit includes an evaluation of the design and effectiveness of the process safety management system and a field inspection of the safety and health conditions and practices to verify that the employer's systems are effectively implemented.

The audit should be conducted or led by a person knowledgeable in audit techniques who is impartial towards the facility or area being audited. The essential elements of an audit program include planning, staffing, conducting the audit, evaluating hazards and deficiencies and taking corrective action, performing a follow-up and documenting actions taken.

Planning is essential to the success of the auditing process. During planning, auditors should select a sufficient number of processes to give a high degree of confidence that the audit reflects the overall level of compliance with the standard. Each employer must establish the format, staffing, scheduling, and verification methods before conducting the audit.

(3) A report of the findings of the audit shall be developed.

The format should be designated to provide the lead auditor with a procedure or checklist that details the requirements of each section of the standard. The names of the audit team members should be listed as part of the format as well.

The checklist, if properly designed, could serve as the verification sheet that provides the auditor with the necessary information to expedite the review of the program and ensure that all requirements of the standard are met. This verification sheet format could also identify those elements that will require an evaluation or a response to correct deficiencies. This

(4) The employer shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(5) Employers shall retain the two (2) most recent compliance audit reports.

(p) Trade secrets.

(1) Employers shall make all information necessary to comply with the section available to those persons responsible for compiling the process safety information (required by paragraph (d)), those assisting in the development of the process hazard analysis (required by paragraph (e)), those responsible for developing the operating procedures (required by paragraph (f)), and those involved in incident investigations (required by paragraph (m)), emergency planning and response

sheet also could be used for developing the follow-up and documentation requirements.

Staffing

The selection of effective audit team members is critical to the success of the program. Team members should be chosen for their experience, knowledge, and training and should be familiar with the process and auditing techniques, practices and procedures. The size of the team will vary depending on the size and complexity of the process under consideration. A small process of plant may need only one knowledgeable person to conduct an audit.

For large, complex, highly instrumental plant, it may be desirable to have team members with expertise in process engineering and design; process chemistry; instrumentation and computer controls; electrical hazards and classifications; safety and health disciplines; maintenance; emergency preparedness; warehousing or shipping; and process auditing. The team may use part-time members to provide the expertise required and to compare what is actually done or followed with the written PSM program. See also Section 14 of appendix "C" .

Conducting the Audit

An effective audit includes a review of the relevant documentation and process safety information, inspection of the physical facilities, and interviews with all levels of plant personnel. Utilizing the audit procedure and checklist development in the preplanning stage, the audit team can systematically analyze compliance with the provisions of the standard and any other corporate policies that are relevant. For example, the audit team will review all aspects of the training program as part of the overall process.

The team will review the written training program for adequacy of contents, 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 team can determine employees' knowledge and awareness of the safety procedures, duties, rules, and emergency response assignments.

During the inspection, the team can observe actual practices such as safety and health policies, procedures, and work authorization practices. This
approach enables the team to identify deficiencies and determine where corrective actions or improvements are necessary.

Evaluation and Corrective Action

(paragraph (n)) and compliance audits (paragraph (o)) without regard to possible trade secret status of such information.

(2) Nothing in this paragraph shall preclude the employer from requiring the persons to whom the information is made available under paragraph (p)(1) of this section to enter into confidentiality agreements not to disclose the information as set forth in 29 CFR 1910.1200.

(3) Subject to the rules and procedures set forth in 29 CFR 1910.1200(i)(1) through 1910.1200(i)(12), employees and their designated representatives shall have access to trade secret information contained within the process hazard analysis and other documents required to be developed by this standard.

The audit team, through its systematic analysis, should document areas that require corrective action as well as where the process safety management system is effective. This provides a record of the audit procedures and findings and serves as a baseline of operation data for future audits. It will assist in determining changes or trends in future audits.

Corrective action is one of the most important parts of the audit and includes identifying deficiencies, and planning, following-up, and documenting the corrections. 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 procedures or a minor maintenance effort to remedy the problem. Management of change procedures need to be used, as appropriate, even for a seemingly minor change.

Many of the deficiencies can be acted on promptly, while some may require engineering studies or more detailed review of actual procedures and practices. There may be instances where no action is necessary; this is a valid response to an audit finding. All actions taken, including an explanation when no action is taken on a finding, need to be documented.

The employer must assure that each deficiency identified is addressed, the corrective action to be taken is noted, and the responsible audit person or team is properly documented. To control the corrective action process, the employer should consider the use of a tracking system.

This tracking system might include periodic status reports shared with affected levels of management, specific reports such as completion of an engineering study, and a final implementation report to provide closure for audit findings that have been through management of change, if appropriate, and then
shared with affected employees and management.

This type of tracking system provides the employer with the status of the corrective action. It also provides the documentation required to verify that appropriate corrective actions were taken on deficiencies identified in the audit.

Only specific chemical identities may be withheld under the 1910.1200 (HAZCOM) trade secret provisions. Even when a chemical's identity is rightfully withheld as a trade secret, its release may be required by the trade secret access provisions of HAZCOM.

Where VOSH believes that the chemical manufacturer, importer or employer will not be able to support the trade secret claim, the withholding of a specific chemical identity shall be cited as a violation of 1910.1200(g)(2).

Where VOSH does not question the claim that a specific chemical identity is a trade secret, but the employer has failed to comply with 1910.1200(i)(1)(i), (ii), (iii) or (iv), or with 1910.1200(i)(2) or (3), such failure shall be grouped with 1910.1200(g)(2), stating the deficiency in the ADV.

For example the employer claims a trade secret exists but failed to indicate on the MSDS that the specific chemical was being withheld for that reason, as required under 1910.1200(i)(1)(iii).