

CHAPTER 7: PREVENTION PROGRAM (PROGRAM 3)

Many of you will need to do little that's new to comply with the Program 3 prevention program, because you already have the PSM program in place. However, if your process is in Program 3 due to NAICS code only, you may have to develop a new program virtually identical to PSM. Whether you are building on the PSM standard or creating a new program, keep these things in mind.

- CalARP and OSHA have different authority and objectives. OSHA PSM addresses releases that affect worker safety, while CalARP addresses releases that affect the public and the environment. If you are already complying with the PSM standard, your PHA team may have to review your PHAs, including recommendations for worker safety for hazards that could affect the public or the environment offsite.
- Integrate the elements of your prevention program. You must ensure that a change in any single element of your program leads to a review of other elements to identify any effect caused by the change.
- Most importantly, make accident prevention an institution at your site. Like the entire risk management program, a prevention program is more than a collection of written documents. It is a way to make safe operations and accident prevention the way you do business every day.

7.1 PROGRAM 3 PREVENTION PROGRAM AND OSHA PSM

The Program 3 prevention program includes the requirements of the federal OSHA PSM standard, which are very similar to the Cal/OSHA PSM requirements. (There are differences between the Cal/OSHA standard and the federal OSHA PSM standard, e.g., federal OSHA requires a compliance audit every three years while Cal/OSHA does not explicitly require the audit every three years. You should review your PSM program developed to meet Cal/OSHA's requirements and ensure that it meets the requirements of the CalARP Program 3 prevention program). With a few exceptions, the CalARP regulations language is the same as OSHA's. The few terms that were changed reflect the differences between CalARP's responsibility and OSHA's responsibility. For example, OSHA's responsibility is to protect workers; CalARP's responsibility is to protect public health and safety and the environment. Therefore, an "owner or operator" subject to the CalARP regulations must investigate an incident "that present(s) (an) imminent and substantial endangerment to public health and the environment," but a PSM "employer" would focus its concerns on the workplace. To clarify these distinctions, specific references to workplace impacts and "safety and health" contained in PSM standards are not included in the CalARP regulation.. The exhibit below compares terms in CalARP's rule with their counterparts in the OSHA PSM standard's prevention program.

Comparable CalARP and OSHA Terms

PSM TERM	CalARP TERM
<ul style="list-style-type: none"> • Highly hazardous substance • Employer • Facility • Standard 	<ul style="list-style-type: none"> • Regulated substance • Owner or operator • Stationary source • CalARP regulations

There are twelve elements in the Program 3 prevention program. Each element corresponds with a section of the CalARP regulation. Exhibit 7-1 sets out each of the twelve elements, the corresponding section numbers, and OSHA references.

EXHIBIT 7-1: SUMMARY OF PROGRAM 3 PREVENTION PROGRAM
(CalARP Regulation and Title 8 CCR: Cal OSHA)

CalARP Section	Title	CAL OSHA PSM Section
§ 2760.1	Process Safety Information	PSM standard § 5189(d).
§ 2760.2	Process Hazard Analysis (PHA)	PSM standard § 5189(e).
§ 2760.3	Operating Procedures	PSM standard § 5189(f).
§ 2760.4	Training	PSM standard § 5189(g).
§ 2760.5	Mechanical Integrity	PSM standard § 5189(j).
§ 2760.6	Management of Change	PSM standard § 5189(l).
§ 2760.7	Pre-Startup Review	PSM standard § 5189(i).
§ 2760.8	Compliance Audits	PSM standard § 5189(o).
§ 2760.9	Incident Investigation	PSM standard § 5189(m).
§ 2760.10	Employee Participation	PSM standard § 5189(p).
§ 2760.11	Hot Work Permits	PSM standard § 5189(k).
§ 2760.12	Contractors	PSM standard § 5189(h).

Federal OSHA provided guidance on PSM in non-mandatory appendix C to their standard. Cal/OSHA has included this appendix in the appendices to the Cal/OSHA standard. In the following sections, the federal OSHA guidance is used with minor changes necessary to be used with the CalARP regulations. In some cases, further guidance is provided on the meaning of specific terms.

7.2 PROCESS SAFETY INFORMATION (§2760.1)

Exhibit 7-2 briefly summarizes the process safety information requirements.

**EXHIBIT 7-2
PROCESS SAFETY INFORMATION REQUIREMENTS**

<p>For chemicals, you must complete information on:</p> <ul style="list-style-type: none"> • Toxicity • Permissible exposure limits • Physical data • Reactivity • Corrosivity • Thermal & chemical stability • Hazardous effects you can foresee if you mixed materials together accidentally 	<p>For process technology, you must provide:</p> <ul style="list-style-type: none"> • A block flow diagram or simplified process flow diagram • Information on process chemistry • Maximum intended inventory of the CalARP-regulated chemical • Safe upper & lower limits for such items as temperature, pressure, flows, or composition • An evaluation of the consequences of deviations. 	<p>For equipment in the process, you must include information on:</p> <ul style="list-style-type: none"> • Materials of construction • Piping & instrument diagrams (P&IDs) • Electrical classification • Relief system design & design basis • Ventilation system design • Design codes & standards employed • Safety systems
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Complete and accurate written information concerning process chemicals, process technology, and process equipment is essential to an effective process safety management program and to a process hazard analysis (PHA). The compiled information will be a necessary resource to a variety of users including the team that will perform the process hazards analysis; those developing the training programs and the operating procedures; contractors whose employees will be working with the process; those conducting the pre-startup reviews; local emergency preparedness planners; and insurance and enforcement officials.

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

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

Process technology information will be a part of the process safety information package and it is expected that it will include diagrams as well as your 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 you are encouraged to use diagrams that will help users understand the process.

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

Process flow diagrams are more complex and will show all main flow streams with flowrates; as well as pressures and temperatures on all feed and product lines, within all major vessels, in and out of headers and heat exchangers, and points of pressure and temperature control. Also, materials of construction information, pump capacities and pressure heads, compressor horsepower and vessel design pressures and temperatures are shown when necessary for clarity. In addition, major components of control loops are usually shown along with key utilities on process flow diagrams.

Piping and instrument diagrams (P&IDs) may be the more appropriate type of diagrams to show some of the above details and to 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. P&IDs show all process equipment, piping, valves, and instrumentation. Pressure and temperature and materials of construction are shown for all process equipment. Size and material specifications is shown for all piping as well and the presence insulation, heat tracing, corrosion monitors and other special piping equipment. A complete and accurate P&ID is essential for doing a PHA. Computer software programs that create 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 must be documented. In other words, what were the codes and standards relied on to establish good engineering practice. These codes and standards are published by such organizations as the American Society of Mechanical Engineers, American Petroleum Institute, American National Standards Institute, National Fire Protection Association, American Society for Testing and Materials, National Board of Boiler and Pressure Vessel Inspectors, National Association of Corrosion Engineers, American Society of Exchange Manufacturers Association, and model building code groups. In addition, various engineering societies issue technical reports which impact process design. For example, the American Institute of Chemical Engineers has published technical reports on topics such as two-phase flow for venting devices. This type of technically recognized report would constitute good engineering practice.

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 you must 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 current or intended use. Where the process technology requires a design that departs from the applicable codes and standards, you must document that the design and construction is suitable for the intended purpose.

7.2.1 WHERE CAN YOU GO FOR MORE INFORMATION?

Diagrams: You may find it useful to consult Appendix B of federal OSHA's PSM final rule (included in the Cal/OSHA standard appendices), computer software programs that do P&IDS, or other diagrams.

Guidance and Reports: Various engineering societies issue technical reports relating to process design. Other sources you may find useful include:

- *Guidelines for Process Safety Documentation*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1995.
- *Loss Prevention in the Process Industries, Volumes II, III* Frank P. Lees, Butterworths, I: London 1996.

7.3 PROCESS HAZARD ANALYSIS (2670.2)

You must conduct a process hazard analysis (PHA) for all Program 3 covered processes. A PHA is a method for identifying existing hazards at your source and estimating the risks associated with these hazards. The PHA is an important part of your prevention program. You can use any of several different techniques in CalARP's rule for conducting a PHA, but your choice of technique must be appropriate to the size and complexity of your process. To determine the hazards and potential failure points or failure modes in a process, consider all the things that impact a process: equipment, instrumentation, utilities, human actions (routine and non-routine), and external events.

7.3.1 What Do You Need To Do?

You must perform an initial PHA on a covered process, and you must complete, update, and revalidate your PHA according to the requirements and timetables in the risk management program rule. Remember that you can use a PHA conducted under the CalOSHA PSM standard as your initial process hazard analysis. All OSHA PHAs must have been completed by May 1997, and PHAs conducted after August 1996 must meet the CalARP requirements. Therefore, the only "new" PHAs will be for non-OSHA Program 3 processes. You can update and revalidate your PHA on OSHA's schedule where appropriate. Exhibit 7-3 summarizes things you must do for

a PHA.

The CalARP regulation requires you to consult with CCCHSD to decide which PHA methodology is best suited to determine and evaluate the hazards of the process analyzed.

.3.2 PHA Techniques

The CalARP regulation and OSHA PSM rule list six PHA methodologies you may use; you may also use other equivalent methodologies. A PHA is a qualitative approach for identifying potential hazards, generate credible accident scenarios and their consequences, and listing existing safeguards. A PHA also allows you to consider possible risk reduction alternatives for your process. Briefly, the methodologies are the following:

Checklist: A checklist contains information on specific items of process design, construction, and operation (such as process covered by standards, codes, and industry practices), and provides a means for standardized evaluation of plant hazards. Checklists can be generated using existing industry standards, etc., however they must be tailored to fit your specific process. OSHA suggests that they are most appropriate for simple processes that do not change (e.g. storage tanks).

What-If: A “What-If” analysis is a brainstorming approach in which a group of people familiar with the process ask questions about possible deviations from standard design or operating procedures, or equipment failures within the process. These questions are usually worded as a “What if” question, as in “What if the pump fails?”

What-If/Checklist: This technique combines the systematic approach of the checklist with the brainstorming approach of a “What-If” analysis.

HAZOP: A hazard and operability study (HAZOP) is conducted by a team that systematically identifies hazards and operability problems by searching for deviations from the design intent of each portion of the process. The team considers the causes and consequences of these deviations to generate potential hazards, generate credible accident scenarios and their consequences and list existing safeguards. The team then considers possible risk reduction alternatives.

Failure Mode and Effects Analysis (FMEA): A FMEA is a qualitative approach of tabulating system/plant equipment, their failure modes, and each failure mode's effect on the system/plant. A failure mode is a description of how equipment fails. The consequences of these failures are analyzed to identify each failure's potential hazards, generate credible accident scenarios and their consequences, list existing safeguards, and generate possible risk reduction alternatives.

Fault Tree Analysis (FTA): A FTA is a deductive technique that focuses on one particular accident (final) event and provides a method for determining causes of the event. The fault tree is a graphic model that displays the various combinations of equipment failures and faults that can result in the final event. The probability of each event can be calculated using the estimated probabilities of each event path leading to the final event.

The CalARP regulations and OSHA PSM rule require that whichever methodology you use, you must have at least one person on the PHA team who is trained in the use of the methodology. Training on such methodologies is available from a number of professional organization as well as private companies.

7.3.3 WHAT SPECIAL ISSUES SHOULD YOU CONSIDER?

Offsite Impacts: You must consider offsite impacts when you conduct a PHA under CalARP's rule. If you are in the Program 3 prevention program because you must comply with the PSM standard, Cal/OSHA will not require this of you, because Cal/OSHA's responsibility is to protect workers. Practically speaking, however, there should be few instances where the scenarios you considered for OSHA will not cover offsite impacts. A well-done PHA should identify all failure scenarios that could lead to significant exposure of workers, the public, or the environment. The only issue that is likely to require consideration above what you have done already for the PSM standard, is whether any protection measures that were adequate for worker safety are inadequate for public and environmental safety. For instance, locating ammonia refrigeration piping or vessels outside may protect the workers while increasing the hazards to the public and environment.

Consider two circumstances; one where PSM and the CalARP rule should lead to the same result, and another where protecting workers could mean endangering the public and the environment. For flammables, any scenario that could affect the public almost certainly would have the potential to affect workers; measures taken to protect your employees likely will protect the public and the environment. On the other hand, for toxics under PSM, you may plan to address a loss of containment by venting toxic vapors to the outside air (e.g., ammonia refrigeration process piping/vessels located outside to protect employees, while increasing hazards to the public and the environment). In each circumstance, a PHA should define the failure sequence. However, for toxics, the PHA team must reassess venting as an appropriate mitigation measure.

**EXHIBIT 7-3
 PHA CHART**

Establish a priority system	If you have many processes that require a PHA, you must set up a priority system to decide which PHA's to conduct first. To determine a priority order, you should consider relevant factors such as the potential severity of a chemical release, offsite impacts, operating history, and age of the process. Because most Program 3 processes are subject to OSHA PSM, you have probably already done this. You do not need to repeat this step for CalARP.
Choose an appropriate methodology	You must use an appropriate methodology to determine and evaluate your process hazards. A process involving a series of unit operations of varying sizes, complexities, and ages may use different methodologies and team members for each operation.
Address relevant factors	Your PHA must address the following factors: the process hazards, previous incidents with catastrophic potential, engineering and administrative controls applicable to the hazards, consequences of failure of controls, source siting, human factors, and a qualitative evaluation of possible safety and health effects of failure of controls.
Choose a qualified team	Your PHA must be conducted by a team that can vary in size from two people to any number of people with varied operational and technical backgrounds. The ideal team will have an intimate knowledge of the standards, codes, specifications and regulations applicable to the process being studied.
Ensure follow-up	You must establish a system to promptly address findings and recommendations; assure findings are resolved and documented; document action taken; develop a written schedule for completing actions; and communicate actions to operating, maintenance and other employees who work in the process or might be affected by actions.
Update	You must update and revalidate your PHA at least every five years or in accordance with the OSHA PSM standard.

7.3.4 EXTERNAL EVENTS

Whichever PHA methodology you use, remember, you shall consider external events as well as internal failures. The California Accidental Release Prevention Program requires stationary sources in the PHA to include the consideration of external events analysis, including seismic events, if applicable. In Contra Costa County the

inclusion of seismic events are applicable. If you are in an area subject to tornadoes/high winds or floods, you should examine whether your process would withstand these natural events while maintaining primary containment of the regulated substance. You should consider the potential impacts of lightning strikes and power failures. You should consider the potential for attacks from terrorist or internal or external sabotage. If vehicles (including rail) could hit your process, you should examine the consequences of vehicle impacts. If you have anything near the process that could burn, ask yourself what would happen if the fire affected the process. For example, if you have a propane tank and an ammonia tank at your facility and they are close to each other, when you look at the ammonia tank you should consider what a fire in the propane tank would do to the ammonia. These considerations may not be part of standard checklists or model programs. If you use these standards and models, you may have to modify them to address these site-specific concerns. In addition, safeguards should be listed which would prevent, detect, or mitigate the causes or consequences of these events. In general, safeguards include instrumentation, equipment, and administrative procedures.

The following is a list of example external events to be considered during the PHA. Each example event listed below should be considered where there is a substantial probability for it to be a factor in causing an accident subject to reporting under this rule, or where previous experience indicates it to be a factor. It is not all encompassing and should be used with engineering judgment.

EXTERNAL EVENTS

<i>EVENT</i>	<i>NOTES AND COMMENTS</i>
Nearby Pipeline Accident	Site specific (nearby pipelines): unconfined vapor cloud explosions, spreading pool fires, and toxic chemical release could impact facility operations.
Release of Chemicals	Toxic chemicals may impair operators; corrosive chemicals may damage equipment and instruments.
Sabotage	Disgruntled employee may deliberately damage or destroy vital plant systems.
Terrorist Activity	CCCHSD recommends you follow the Security and Vulnerability Assessment Guidelines document included in Appendix I as part of your prevention program.
Seismic Activity	CCCHSD recommends you follow the Seismic Assessment Guidelines document included in Appendix B as part of your prevention program.
Transportation Accidents	Site specific: an accident on a major highway or airplane crash may cause evacuation of plant site; an accident at the facility might damage vital equipment.
Maintenance Activities	Review forklift and crane traffic potential for equipment damage during movement or lifting operations.
External Flooding/Landslides	Review rivers, lakes, streams, and storm water drainage locations for potential impacts to the facility.
Extreme Winds	Site specific: review equipment design for service in extreme winds.
Fire	Review location of flammable material containing systems near process site; gasoline storage, fuel oil, wild fire potential, etc.
Fog	Presence of fog may increase frequency of accidents.
High/Low Temperatures	Review impact on vapor pressure of chemicals in storage systems. Review susceptibility of equipment to freezing

Internal Flooding	Review failure of any large water storage tank on plant site; blockage of storm watersewers.
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Prevention: Examples of safeguards are:

- Speed limits/traffic barriers
- Security/limited access
- Aircraft warning lights
- Marine warning system (light and sound)
- Heat tracing/insulation

Detection

- Flammable/toxic gas detectors (permanent)

Mitigation

- General evacuation procedures
- Emergency response team
- Personal protective equipment
- Control room design
- Dikes and berms
- Emergency shutdown devices

Rejecting team recommendations. You may not always agree with your PHA team's recommendations and may wish to reject a recommendation. You may decline a team recommendation if you can document one of the following: (1) the analyses upon which the recommendations are based contain factual errors; (2) The recommendation is not necessary i.e., the safeguards may be inadequate, but the consequences are operational only; (3) an alternative measure would provide a sufficient level of protection; or (4) the recommendation is not feasible.

Updating and revalidating your PHA. For CalARP, you must complete the initial PHA for each Program 3 process not later than the required date of submission, and update it at least once every five years. You may use a PSM PHA as your initial PHA, and update and revalidate it every five years on the PSM schedule. Remember, though, that if you complete a PHA after August 19, 1996 you must consider offsite impacts.

Revising your PHA. You may want to consider revising your PHA whenever there is a new hazard or risk created by changes to your process. Such changes might include introducing a new process, process equipment, or regulated substance; altering process chemistry that results in any change to safe operating limits; or other alteration that introduces a new hazard. You might, for example, introduce a new hazard if you installed a gas pipeline next to a storage tank containing a regulated substance. Other candidates could be making changes in process constituents that increase the possibility of runaway reactions or polymerization. CCCHSD

recommends that you consider revising your PHA whenever adjoining processes create a hazard affecting another covered process. Remember that you have a general duty to prevent accidents and ensure safety at your source, which may require you to take steps beyond those explicitly specified in the risk management program rule. It is not intended that you resubmit your RMP whenever there is a PHA performed in conjunction with the management of change (MOC) process. A covered process modification under CalARP regulations Section 2745.11 may require a revised PHA.

7.3.5 WHERE CAN YOU GO FOR MORE INFORMATION?

Many trade associations publish detailed guidance on methods for conducting a process hazard analysis. You might find the following documents useful.

Guidelines for Hazard Evaluation Procedures, 2nd Ed. with Worked Examples, Center for Chemical Process Safety of the American Institute of Chemical Engineers

Evaluating Process Safety in the Chemical Industry, Chemical Manufacturers Association.

Loss Prevention in the Process Industries, Volumes I, II, and III Frank P. Lees, Butterworths: London 1996.

Management of Process Hazards (R.P. 750), American Petroleum Institute.

Risk-Based Decision Making (Publication 16288), American Petroleum Institute.

Q and A

Q. If I need to revise a PHA to consider offsite consequences, when do I have to do that?

A. For a PHA completed to meet the requirements of OSHA PSM, you must revise the PHA to consider offsite consequences when you update that PHA. Any PHA for a covered process completed or updated for OSHA PSM after August 19, 1996 must examine offsite consequences. For example, if you completed an initial PHA for OSHA PSM in May 1993, OSHA requires that you update that PHA by May 1998. In that update, you must consider offsite consequences. If you complete your initial PHA for OSHA in May 1995, you must update it by May 2000 and include consideration of offsite consequences at that time. PHAs done after August 1996 that do not include consideration of offsite consequences will have to be revised to meet CalARP regulations.

7.4 OPERATING PROCEDURES (§ 2760.3)

Exhibit 7-5 summarizes what your operating procedures must address.

EXHIBIT 7-5 OPERATING PROCEDURES REQUIREMENTS

Steps for each operating phase	Operating limits	Safety & health considerations	Safety systems & their functions
<ul style="list-style-type: none"> • Initial startup • Normal operations • Temporary operations • Emergency shutdown • Emergency operations • Normal shutdown • Startup following a turnaround or emergency shutdown 	<ul style="list-style-type: none"> • Consequences of deviating • Steps to avoid or correct deviations 	<ul style="list-style-type: none"> • Chemical properties & hazards • Precautions for preventing chemical exposure • Control measures for exposure • QC for raw materials and chemical inventory • Special or unique hazards 	<ul style="list-style-type: none"> • Address whatever is applicable

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. The process safety information package is to be used as a resource to better assure that the operating procedures and practices are consistent with the known hazards of the chemicals in the process and that the operating parameters are accurate. Operating procedures should be reviewed by engineering staff and operating personnel to ensure that they are accurate and provide practical instructions on how to actually carry out job duties safely.

Operating procedures will include specific instructions or details on what steps are to be taken or followed in carrying out the stated procedures. These operating instructions for each procedure should include the applicable safety precautions and should contain appropriate information on safety implications. 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. 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. These operating instructions need to clearly indicate the distinctions between startup 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 temperature parameters are achieved.

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 procedures (SOPs) for operations. Control room personnel and operating staff, in general, need to have a full understanding of operating procedures. If workers are not fluent in English then procedures and 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 as a result of the management of change procedures. The consequences of operating procedure changes need to be fully evaluated and the information conveyed to the personnel. 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 if 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 oriented to the changes in procedures before the change is made.

When the process is shutdown to make a change, the operating procedures must be updated and operators trained before startup of the process.

Training in how to handle upset conditions must be accomplished as well as what operating personnel are to do in emergencies such as when a pump seal fails or a pipeline ruptures. Communication between operating personnel and workers performing work within the process area, such as non-routine tasks, also must be maintained. 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.

7.4.1 WHERE CAN YOU GO FOR MORE INFORMATION?

Chapter 6 of this document provides descriptions of each operating phase and when these phases may not apply to certain operations.

- *Guidelines for Process Safety Fundamentals for General Plant Operations*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1995.
- *Guidelines for Safe Process Operations and Maintenance*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1995.
- *Guidelines for Writing Effective Operating and Maintenance Procedures*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1996.

7.5 TRAINING (§ 2760.4)

All employees, including maintenance and contractor employees, involved with regulated substances need to fully understand the safety and health hazards of the chemicals and processes they work with for the protection of themselves, their fellow employees and the citizens of nearby communities. Training conducted in compliance with Title 8 CCR § 5194, the California Hazard Communication standard, will help employees to be more knowledgeable about the chemicals they work with as well as familiarize them with reading and understanding MSDSs. However, additional training in subjects such as operating procedures and safety work practices, emergency evacuation and response, safety procedures, routine and non-routine work authorization activities, and other areas pertinent to process safety and health will need to be covered by your training program.

In establishing their training programs, you must clearly define the employees to be trained and what subjects are to be covered in their training. In setting up your training program you will need to clearly establish the goals and objectives you wish to achieve with the training that you provide to your employees. 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. You 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 are able to use their senses beyond listening, 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 or panels. 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, of course, under controlled conditions. This realistic type of training can be very effective in teaching employees correct procedures while allowing them

to also see the consequences of what might happen if they do not follow established operating procedures. Other training techniques, such as using videos or on-the-job training, can also be very effective for teaching other job tasks, duties, or other important information. An effective training program will allow the employee to fully participate in the training process and to practice their skill or knowledge.

You need to periodically evaluate your training programs to see if the necessary skills, knowledge, and routines are being properly understood and implemented by your trained employees. The means or methods for evaluating the training should be developed along with the training program goals and objectives. Training program evaluation will help you 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, you will need to revise the training program, provide retraining, or provide more frequent refresher training sessions until the deficiency is resolved. Those who conducted the training and those who received the training should also be consulted as to how best to improve the training process. If there is a language barrier, the language known to the trainees should be used to reinforce the training messages and information.

Careful consideration must be given to assure that employees including maintenance and contract employees receive current and updated training. For example, if changes are made to a process, impacted employees must be trained in the changes and understand the effects of the changes on their job tasks (e.g., any new operating procedures pertinent to their tasks). Additionally, as already discussed, the evaluation of the employee's absorption of training will certainly influence the need for training.

7.5.1 WHERE CAN YOU GO FOR MORE INFORMATION?

- *Guidelines for Process Safety Fundamentals for General Plant Operations*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1995.
- *Guidelines for Technical Planning for On-Site Emergencies*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1995.
- *Federally Mandated Training and Information (Publication 12000)*, American Petroleum Institute.

7.6 MECHANICAL INTEGRITY (§ 2760.5)

You must have a mechanical integrity program for pressure vessels and storage tanks, piping systems, relief and vent systems and devices, emergency shutdown systems, controls, and pumps. Exhibit 7-6 briefly summarizes the other requirements for your mechanical integrity program.

**EXHIBIT 7-6
 MECHANICAL INTEGRITY CHART**

<p>Written procedures</p> <ul style="list-style-type: none"> Establish & implement written procedures to maintain the integrity of process equipment. 	<p>Training</p> <p>Train process maintenance employees in an overview of the process and its hazards. Make sure this training covers the procedures applicable to safe job performance.</p>	<p>Inspection & testing</p> <ul style="list-style-type: none"> Inspect & test process equipment. <ul style="list-style-type: none"> Use recognized and generally accepted good engineering practices. Follow a schedule that matches the manufacturer's recommendations or that prior operating experience indicates is necessary. Document each inspection & test. 	<p>Equipment deficiencies</p> <ul style="list-style-type: none"> Correct equipment deficiencies before further use of process equipment or whenever necessary to ensure safety. 	<p>Quality assurance (QA)</p> <ul style="list-style-type: none"> Establish a QA program for new construction & equipment, newly installed equipment, maintenance materials, and spare parts & equipment.
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You will need to review your maintenance programs and schedules to see if there are areas where "breakdown" maintenance is used rather than an on-going mechanical integrity program. Equipment used to process, store, or handle regulated substances needs to be designed, constructed, installed and maintained to minimize the risk of releases of such chemicals. This requires that a mechanical integrity program be in place to assure the continued integrity of process equipment.

Elements of a mechanical integrity program include the identification and categorization of equipment and instrumentation, inspections and tests, inspection and testing frequencies, development of maintenance procedures, training of maintenance personnel, the establishment of criteria for acceptable test results, documentation of test and inspection results, and documentation of manufacturer recommendations as to meantime to failure for equipment and instrumentation.

The first line of defense an you has available is to operate and maintain the process as designed, and to keep the chemicals contained. This line of defense is backed up by the next line of defense which is the controlled release of chemicals through venting to scrubbers or flares, or to surge or overflow tanks which are designed to receive such chemicals, etc. These lines of defense are the primary lines of defense or means to prevent unwanted releases. The secondary lines of defense would include fixed fire protection systems like sprinklers, water spray, or deluge systems, monitor guns, etc., dikes, designed drainage systems, and other systems which would control or mitigate hazardous chemicals once an unwanted release occurs. These primary and secondary lines of defense are what the mechanical integrity program needs to protect and strengthen these primary and secondary lines of defenses where appropriate.

The first step of an effective mechanical integrity program is to compile and categorize a list of process equipment and instrumentation for inclusion in the program. This list would include pumps, compressors, pressure vessels, storage tanks, process piping, relief and vent systems, fire protection system components, emergency shutdown systems, permissive start systems and alarms. For the categorization of instrumentation and the listed equipment you would prioritize which pieces of equipment require closer scrutiny than others. Meantime-to-failure of various instrumentation and equipment parts should be known from the manufacturer's data or your experience with the parts, which would then influence the inspection and testing frequency and associated procedures. Also, applicable codes and standards such as the National Board Inspection Code, or those from the American Society for Testing and Material, American Petroleum Institute, National Fire Protection Association, American National Standards Institute, American Society of Mechanical Engineers, and other groups, provide information to help establish an effective testing and inspection frequency, as well as appropriate methodologies.

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, etc. These codes and standards also provide information on methodologies for internal inspection, and a frequency formula based on the corrosion rate of the materials of construction. Erosion, both internal and external, needs to be considered along with corrosion effects for piping and valves. Where the corrosion rate is not known, a maximum inspection frequency is recommended, and methods of developing the corrosion rate are available in the codes. Internal inspections need to cover items such as 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. State or local government inspectors under state and local statutes may perform some of these inspections. However, you need to 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 is to 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.

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

Equipment installation jobs need to be properly inspected in the field for use of proper materials and procedures and to assure that qualified craftsmen are used to do the job. The use of appropriate gaskets, packing, bolts, valves, lubricants and welding rods need to be verified in the field. Also, procedures for installation of safety devices need to be verified, such as the torque on the bolts on ruptured disc installations, uniform torque on flange bolts, proper installation of pump seals, etc. If the quality of parts is a problem, it may be appropriate to conduct audits of the equipment supplier's facilities to better assure proper purchases of required equipment that is suitable for its intended service. Any changes in equipment that may become necessary will need to go through the management of change procedures.

7.6.1 WHERE CAN YOU GO FOR MORE INFORMATION?

Guidance and Reports. Other sources of guidance and reports you may find useful include:

- *Guidelines for Process Equipment Reliability Data with Data Tables*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1989.
- *Guidelines for Process Safety Documentation*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1995.
- *Pressure Vessel Inspection Code: Maintenance Inspection, Rating, Repair, and Alteration (API 510)*, American Petroleum Institute.
- *Tank Inspection, Repair, Alteration, and Reconstruction (Std 653)*, American Petroleum Institute.

7.7 MANAGEMENT OF CHANGE (§ 2760.6)

Exhibit 7-7 is a summary the Management of Change (MOC) requirements.

To properly manage changes to process chemicals, technology, equipment and facilities, one must define what is meant by change. In this process safety management standard, change includes all modifications to equipment, procedures, raw materials and processing conditions other than "replacement in kind." These changes need to be properly managed by identifying and reviewing them prior to implementation of the change. 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 an operator must have the

EXHIBIT 7-7 MANAGEMENT OF CHANGE REQUIREMENTS

<p>MOC procedures must address:</p> <ul style="list-style-type: none"> • Operating Technical basis for the change • Impact on safety and health • Modifications to procedures • Necessary time period for the change • Authorization requirements for the proposed change 	<p>Employees affected by the change must:</p> <ul style="list-style-type: none"> • Be informed of the change before startup • Trained in the change before startup 	<p>Update process safety information if:</p> <ul style="list-style-type: none"> • A change covered by MOC procedures results in a change in any PSI required under CalARP's regulation (see § 2760.6) 	<p>Update operating procedures if:</p> <ul style="list-style-type: none"> • covered by MOC procedures results in a change in any operating procedure required under CalARP's regulation (see § 2760.6)
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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 covers changes to process chemistry, technology, equipment, procedures and any other changes at a stationary source that can affect a covered process. Changes in process technology can result from changes in production rates, raw materials, experimentation, equipment unavailability, new equipment, new product development, change in catalyst and changes in operating conditions to improve yield or quality. Equipment changes include among others change in materials of construction, equipment specifications, piping pre-arrangements, experimental equipment, computer program revisions and changes in alarms and interlocks. You need to establish means and methods to detect both technical changes and mechanical changes.

Temporary changes have caused a number of catastrophes over the years, and you need to establish ways to detect temporary changes as well as those that are permanent. It is important that a time limit for temporary changes be established and monitored since,

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 procedure is 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 is invaluable in assuring that the safety and health considerations are being incorporated into the operating procedures and the process. You 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 of a temporary change, approvals and authorization. Where the impact of the change is minor and well understood, a checklist reviewed by an authorized person with proper communication to others who are affected may be sufficient.

However, for a more complex or significant design change, a hazard evaluation procedure with approvals by operations, maintenance, and safety departments may be appropriate. Changes in documents such as P&IDs, raw materials, operating procedures, mechanical integrity programs, electrical classifications, etc., need to be noted so that these revisions can be made permanent when the drawings and procedure manuals are updated. Copies of process changes need to 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 done or one is being updated.

Examples of a change authorization form and a notification of process change checklist are included in Appendix G.

7.7.1 WHERE CAN YOU GO FOR MORE INFORMATION?

- ◆ *Management of Change in Chemical Plants: Learning from Case Histories*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1993.
- ◆ *Plant Guidelines for Technical Management of Chemical Process Safety*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1992.
- ◆ *Management of Process Hazards (RP 750)*, American Petroleum Institute.

7.8 PRE-STARTUP REVIEW (§ 2760.7)

You must conduct your pre-startup review *before* you introduce a regulated substance to a process, and you must address the items listed in Exhibit 7-8.

For new processes, you will find a PHA helpful in improving the design and construction of the process from a reliability and quality point of view. Making use of the PHA recommendations before final installations are completed will enhance the safe operation of the new process. P&IDs are to be completed along with having the operating procedures in place and the operating staff trained to run the process before startup. The initial startup procedures and normal operating procedures need to be fully evaluated as part of the pre-startup review to assure a safe transfer into the normal operating mode for meeting the process parameters.

**EXHIBIT 7-8
PRE-STARTUP REVIEW REQUIREMENTS**

Design Specifications	Adequate Procedures	Training
<ul style="list-style-type: none"> • Confirm that new or modified construction and equipment meet design specifications. 	<ul style="list-style-type: none"> • Ensure that procedures for safety, operating, maintenance, and emergencies are adequate and in place. • For new stationary sources, a PHA has been performed and recommendations have been resolved or completed before start-up. • Modified stationary sources meet §2760.6 management of change procedures 	<ul style="list-style-type: none"> • Confirm that each employee involved in the process has been trained completely.

For existing processes that have been shutdown for turnaround, or modification, etc., you must assure that any changes other than "replacement in kind" made to the process during shutdown go through the management of change procedures. P&IDs will need to be updated as necessary, as well as operating procedures and instructions. If the changes made to the process during shutdown are significant and impact the training program, then operating personnel as well as employees engaged in routine and non-routine 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 as well to see what impacts they may have on the process before beginning the startup.

Examples of pre-startup safety review forms are included in Appendix G.

7.9 COMPLIANCE AUDITS (§ 2760.8)

You need to select a trained individual or assemble a trained team of people to audit the CalARP program 3 prevention program. A small process or plant may need only one knowledgeable person to conduct an audit. The audit is to include an evaluation of the design and effectiveness of the CalARP program 3 prevention program and a field inspection of the safety and health conditions and practices to verify that your systems are effectively implemented. The audit should be conducted or lead by a person knowledgeable in audit techniques and who is impartial towards the stationary source or area being audited. The essential elements of an audit program include planning, staffing, conducting the audit, evaluation and corrective action, follow-up and documentation. An audit is a technique used to gather sufficient facts and information, including statistical information, to verify compliance with standards.

Planning in advance is essential to the success of the auditing process. you needs to establish the format, staffing, scheduling and verification methods prior to conducting the audit. The format should be designed 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 and assure that no requirements of the standard are omitted. This verification sheet format could also identify those elements that will require evaluation or a response to correct deficiencies. This sheet could also be used for developing the follow-up and documentation requirements.

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 processes and with auditing techniques, practices and procedures. The size of the team will vary depending on the size and complexity of the process under consideration. For a large, complex, highly instrumented 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 safety auditing. The team may use part-time members to provide for the depth of expertise required.

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. Using the audit procedure and checklist developed in the preplanning stage, the audit team can systematically analyze compliance with the provisions of the CalARP regulations 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 audit. The team will review the written training program for adequacy of content, frequency of training, effectiveness of training in terms of its goals and objectives as well as to how it fits into

meeting the standard's requirements, documentation, etc. Through interviews, the team can determine the employee's knowledge and awareness of the safety procedures, duties, rules, emergency response assignments, etc. 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. Auditors can also use statistical information to verify compliance. To do this, auditors should select as part of their preplanning a sample size sufficient to give a degree of confidence that the audit reflects the level of compliance with the standard. The audit team, through this systematic analysis, should document areas that require corrective action as well as those areas where the process safety management system is effective and working. This provides a record of the audit procedures and findings, and serves as a baseline of operation data for future audits. It will assist future auditors in determining changes or trends from previous audits.

Corrective action is one of the most important results of the audit. It includes not only addressing the identified deficiencies, but also planning, follow up, and documentation. The corrective action process normally begins with a management review of the audit findings. The purpose of this review is to determine what actions are appropriate, and to establish priorities, timetables, resource allocations and requirements, and responsibilities. In some cases, corrective action may involve a simple change in procedure or minor maintenance effort to remedy the concern. Management of change procedures need to be used, as appropriate, even for what may seem to be a minor change. Many of the deficiencies can be acted on promptly, while some may require engineering studies or an in-depth review of actual procedures and practices. There may be instances where no action is necessary and this is a valid response to an audit finding. All actions taken, including an explanation where no action is taken on a finding, needs to be documented as to what was done and why.

It is important to assure that each deficiency identified is addressed, the corrective action to be taken noted, and the audit person or team responsible be properly documented by you.

To control the corrective action process, you 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 you with the status of the corrective action. It also provides the documentation required verifying that appropriate corrective actions were taken on deficiencies identified in the audit.

7.9.1 WHERE CAN YOU GO FOR MORE INFORMATION?

- *Guidelines for Auditing Process Safety Management Systems*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1993.

7.10 INCIDENT INVESTIGATION (§ 2760.9)

Exhibit 7-9 briefly summarizes the steps you must take for investigating incidents.

EXHIBIT 7-9 INCIDENT INVESTIGATION REQUIREMENTS

<ul style="list-style-type: none"> Initiate an investigation promptly. 	<ul style="list-style-type: none"> Begin investigating no later than 48 hours following the incident.
<ul style="list-style-type: none"> Establish a knowledgeable investigation team. 	<ul style="list-style-type: none"> Establish an investigation team to gather the facts, analyze the event, and develop the how and why of what went wrong. At least one team member must have process knowledge. Consider adding other workers in the process area where the incident occurred. Their knowledge will be significant and should give you the fullest insight into the incident.
<ul style="list-style-type: none"> Summarize the investigation in a report. 	<ul style="list-style-type: none"> Among other things, this report will include the factors contributing to the incident. Remember that identifying the root cause may be more important than identifying the initiating event. Remember, also, that the purpose of the report is to help management take corrective action.
<ul style="list-style-type: none"> Address the team's findings and recommendation 	<ul style="list-style-type: none"> Establish a system to address the incident report findings and recommendations and document resolutions and corrective actions.
<ul style="list-style-type: none"> Review the report with your staff and contractors. 	<ul style="list-style-type: none"> You must share the report - its findings and recommendations - with affected workers whose job tasks are relevant to the incident.
<ul style="list-style-type: none"> Retain the report. 	<ul style="list-style-type: none"> Keep incident investigation reports for five years.

An example of an incident investigation report form is included in Appendix G.

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 you to learn from past experiences and thus avoid repeating past mistakes. Some of the events are sometimes referred to as "near misses," meaning that a serious consequence did not occur, but could have. You need to develop in-house capability to investigate incidents that occur in your stationary source. A team needs to be assembled by you and trained in the techniques of investigation including how to conduct interviews of

witnesses, needed documentation and report writing. 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.

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 forms a significant set of facts about the incident that occurred. The report, including its findings and recommendations are to be shared with those who can benefit from the information. 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 investigation process should clearly deal with all involved individuals in a fair, open and consistent manner.

You must investigate each incident that resulted in, or could have resulted in a “catastrophic release of a regulated substance.” A catastrophic release is one that presents an imminent and substantial endangerment to public health and the environment. Although the rule requires you to investigate only those incidents that resulted in, or could reasonably have resulted in a catastrophic release, CCCHSD encourages you to investigate all accidental releases. Investigating minor accidents or near misses can help you identify problems that could result in major releases if not addressed.

7.10.1 WHERE CAN YOU GO FOR MORE INFORMATION?

- *Guidelines for Investigating Chemical Process Incidents*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1992
- *Guide for Fire and Explosion Investigations (NFPA 921)*, National Fire Protection Association.

7.11 EMPLOYEE PARTICIPATION (§ 2760.10)

Exhibit 7-10 briefly summarizes what you must do for employee participation.

EXHIBIT 7-10 EMPLOYEE PARTICIPATION REQUIREMENTS

<ul style="list-style-type: none">• Write a plan.	Develop a written plan of action regarding how you will implement employee participation.
<ul style="list-style-type: none">• Consult with employees.	Consult your employees and their representatives regarding conducting and developing PHAs and other elements of process safety management in the risk management program rule.
<ul style="list-style-type: none">• Provide access to information.	Ensure that your employees and their representatives have access to PHAs and all other information required to be developed under the rule.

Section 304 of the Clean Air Act Amendments (§2760.10 of the CalARP regulation) states that you are to consult with their employees and their representatives regarding your efforts in the development and implementation of the CalARP prevention program elements and hazard assessments. Section 2760.4 of the CalARP regulation requires you to train and educate their employees and to inform affected employees of the findings from incident investigations required by the CalARP prevention program. Many owner/operators, under their safety and health programs, have already established means and methods to keep employees and their representatives informed about relevant safety and health issues and you may be able to adapt these practices and procedures to meet their obligations under this standard. Owner operators who have not implemented an occupational safety and health program may wish to form a safety and health committee of employees and management representatives to help you meet the obligations specified by this standard. These committees can become a significant ally in helping you to implement and maintain an effective process safety management program for all employees.

7.12 HOT WORK PERMITS (§ 2760.11)

Exhibit 7-11 briefly summarizes how you meet the hot work permit requirement.

EXHIBIT 7-11 HOT WORK PERMIT REQUIREMENTS

<ul style="list-style-type: none"> • Issue a hot work permit. 	<ul style="list-style-type: none"> • You must issue this permit for hot work conducted on or near a covered process.
<ul style="list-style-type: none"> • Implement fire prevention and protection. 	<ul style="list-style-type: none"> • You must ensure that the fire prevention and protection requirements in 29 CFR 1910.252(a) and Title 8, CCR§4848 and CCR§6777 are implemented before the hot work begins. The permit must document this.
<ul style="list-style-type: none"> • Indicate the appropriate dates. 	<ul style="list-style-type: none"> • The permit should indicate the dates authorized for hot work.
<ul style="list-style-type: none"> • Identify the work. 	<ul style="list-style-type: none"> • The permit must identify the object on which hot work is to be performed.
<ul style="list-style-type: none"> • Maintain the permit on file. 	<ul style="list-style-type: none"> • You must keep the permit on file until workers have completed the hot work operations.

You need to control non-routine work which is conducted in process areas controlled by you in a consistent manner. The hazards identified involving the work that is to be accomplished must be communicated to those doing the work, but also to those operating personnel whose work could affect the safety of the process. A work authorization notice or permit must have a procedure that describes the steps the maintenance supervisor, contractor representative or other person needs to follow to obtain the necessary clearance to get the job started. The work authorization procedures need to reference and coordinate, as applicable, electrical lockout/tagout procedures, pipeline-breaking procedures, confined space entry procedures and hot work authorizations. This procedure also needs to 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 equipment can be returned to normal.

Examples of a hot work permit, electrical lockout/tagout procedures and pipeline-breaking permits are included in Appendix G.

7.12.1 WHERE CAN YOU GO FOR MORE INFORMATION?

- Standard for Fire Prevention in Use of Cutting and Welding Processes (NFPA 518), National Fire Protection Association.
- Standard for Welding, Cutting and Brazing, 29 CFR 19190 Subpart Q

7.13 CONTRACTORS (§ 2760.12)

Exhibit 7-12 summarizes both your and the contractors' responsibilities

EXHIBIT 7-12 CONTRACTORS CHART

You must...	Your contractor must...
<ul style="list-style-type: none">• Check safety performance. You must evaluate the safety performance of the contractor.• Provide safety and hazard information. You must inform the contractor of potential fire, explosion, or toxic release hazards; and of your emergency response activities as they relate to the contractor's work and the process.• Ensure safe practices. You must ensure that you have safe work practices such as controlling the entrance, presence, and exit of contract employees in covered process areas.• Verify that the contractor acts responsibly. You must verify that the contractor is fulfilling its responsibility to provide appropriate health, safety, and craft training.	<ul style="list-style-type: none">• Ensure training for its employees. The contractor must train and supervise contract employees to ensure that they perform their jobs safely and in accordance with your source's safety procedures.• Ensure its employees know process hazards and applicable emergency actions. The contractor must assure that contract employees are aware of hazards and emergency procedures relating to the employees' work.• Document training. The contractor must prepare a record documenting and verifying adequate employee training.• Inform you of hazards. The contractor must tell you of any unique hazards presented by its work or of any hazards it finds during performance.

If you use contractors to perform work in and around processes that involve regulated substances, you will need to establish a screening process so that you hire and use contractors who accomplish the desired job tasks without compromising the safety and health of employees at a facility. For contractors, whose safety performance on the job is not known to you, you will need to obtain information on injury and illness rates and experience, and should obtain contractor references. Additionally, you must assure that the contractor has the appropriate job skills, knowledge, and certifications (such as for pressure vessel welders). Contractor work methods and experiences should be evaluated. For example, does the contractor conducting demolition work swing loads over operating processes or does the contractor avoid such hazards?

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 non-routine repair activities it is quite important that their activities be controlled while they are working on or near a covered process. A permit system or work authorization system for these activities would also be helpful to you. The use of a work authorization system keeps you informed of contract employee activities, and as a benefit you

will have better coordination and more management control over the work being performed in the process area. A well run and well maintained process where employee safety is fully recognized will benefit all of those who work in the stationary source whether they be contract employees or employees of the owner.

7.13.1 CALARP/OSHA DIFFERENCES

CalARP has no authority to require that you maintain an occupational injury and illness log for contract employees. However, Federal OSHA does require that an employer maintain a contract employee injury and illness log for contractors. Cal/OSHA (§5189(h)) requires that an employer shall obtain and make available upon request the contractor's injury and illness log.

7.13.2 WHERE CAN YOU GO FOR MORE INFORMATION?

- *Contractor and Client Relations to Assure Process Safety*, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1996.
- *API/CMA Managers Guide to Implementing a Contractor Safety Program (RP 2221)*, American Petroleum Institute.
- *Improving Owner and Contractor Safety Performance (RP 2220)*, American Petroleum Institute.