

CHAPTER 6: PREVENTION PROGRAM (PROGRAM 2)

6.0 ABOUT THE PROGRAM 2 PREVENTION PROGRAM

The Program 2 prevention program identifies the basic elements that are the foundation of sound prevention practices — safety information, hazard review, operating procedures, training, maintenance, compliance audits, and accident investigation. The good news is that through meeting other federal regulations, state laws, industry codes and standards, and good engineering practices, you probably are already in compliance with most of the Program 2 prevention elements.

As important as each of the elements is, you will not gain the full benefit from them unless you integrate them into an accidental release prevention program that you implement on an on-going basis. For example, the hazard review must be built on the safety information; the results of the hazard review should be used to revise and update operating and maintenance procedures. Workers must be trained in these procedures and must use them every day.

EPA is working with the following industry sectors and governmental agencies to write model RMP Guidance for Program 2 and Program 3 processes:

- American Warehouse Association (AWA) – for Warehouses;
- American Water Works Association (AWWA) – for Drinking Water Utilities/Systems;
- International Institute of Ammonia Refrigeration (IIR) – a revised version for Ammonia Refrigeration Facilities;
- National Association of Chemical Distributors (NACD) – for Chemical Distributors; and,
- State of Delaware – for Propane Distributors, for Propane users, and for POTWs.

These industry-specific programs will help you comply by giving you standard elements for the sector that you can adopt for your particular business. If there is an industry-specific program for your sector, you must review and revise it to ensure that it meets the CalARP regulatory requirements and CCCHSD expectations.

There are seven elements in the Program 2 prevention program, which is Article 5 of the CalARP regulations. Exhibit 6-1 sets out each of the seven elements and corresponding section numbers. **In addition to these seven elements, the stationary source must also establish procedures to manage proposed modifications to covered processes as described in Section 2745.11 of the CalARP regulations.** The stationary source may find it beneficial to use the management of change program discussed in Section 2760.6 and the pre-startup review discussed in Section 2760.7 of the CalARP regulation as templates for their

programs. Examples of change authorization forms and pre-startup review forms are included in Appendix G.

Owners or operators of stationary sources must notify CCCHSD of modifications to covered processes which result in significant increases in either the amount of regulated substance (compared to the amount described in the RMP) or the risk of handling the regulated substance (compared to the risk described in the RMP). Where reasonably possible, CCCHSD must be notified in writing of the intent of the modification at least five calendar days before implementing any modification. Where prenotification is not reasonably possible (i.e., emergency modifications), the owner or operator must provide written notice to CCCHSD no later than 48 hours following the modification.

**EXHIBIT 6-1
SUMMARY OF PROGRAM 2 PREVENTION PROGRAM**

Number	Section Title
§ 2755.1	Safety Information
§ 2755.2	Hazard Review
§ 2755.3	Operating Procedures
§ 2755.4	Training
§ 2755.5	Maintenance
§ 2755.6	Compliance Audits
§ 2755.7	Incident Investigation

You must integrate these seven elements into an accidental release prevention program that you and your staff implement on a daily basis. Understanding and managing risks must become part of the way you operate. Doing so will provide benefits beyond accident prevention as well. Preventive maintenance and routine inspections will lessen the number of equipment failures and down time; well trained workers, aware of optimum operating parameters, will allow you to gain the most efficient use of your substances.

6.1 SAFETY INFORMATION (§2755.1)

The purpose of this requirement is for you to understand the equipment and processes you have, know what limits they place on your operations, and adopt accepted standards and codes where they apply. Having current information about your process is the foundation of an effective prevention program. Many elements (especially the hazard review) depend on the accuracy and thoroughness of the information this element requires you to provide.

WHAT DO I NEED TO DO?

You must compile and maintain safety information related to the regulated substances and process equipment for each Program 2 process. You probably have much of this information already, because you would have developed it to comply with Cal/OSHA or other rules. Exhibit 6-2 gives a brief summary of the safety information requirements for Program 2.

EXHIBIT 6-2 SAFETY INFORMATION REQUIREMENTS

<p>You must compile and maintain this safety information:</p> <ul style="list-style-type: none"> 4Material Safety Data Sheets 4Maximum intended inventory 4Safe upper and lower limits for temperature, pressure, flow, and composition 4Equipment specifications 4Codes & standards used to design, build, and operate the process 	<p>You must ensure:</p> <ul style="list-style-type: none"> 4That the process is designed in compliance with recognized codes and standards 	<p>You must update the safety information if:</p> <ul style="list-style-type: none"> 4There is a <i>major change</i> at your business that makes the safety information inaccurate
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HOW DO I START?

MSDSs. You are required to maintain Material Safety Data Sheets under the Cal/OSHA Hazard Communication Standard (HCS) (T8 CCR §5194). If you do not have an MSDS for a regulated substance, you should contact your supplier or the manufacturer for a copy. You do not have to do anything under this requirement that you are not already doing to comply with the HCS.

MAXIMUM INVENTORY. You must document the maximum intended inventory of any vessel in which you store or process a regulated subject above its threshold quantity. If you are not sure of the capacity of the vessel, you can obtain this

information from the manufacturer of the vessel or tank. In some cases, this information will be attached to the tank itself. Industry-specific risk management programs, developed to satisfy the federal regulatory requirements, may include this information.

You may want to check with the trade association or standards group that develop standards for your industry to determine if there are any limitations on inventories. For example, in some cases the maximum capacity of a tank may be 10,000 gallons, but an industry standard may recommend that the tank never be filled to more than 85 percent capacity. If you follow the standard, your maximum inventory would be 8,500 gallons.

STORAGE AND PROCESS LIMITS. You must document the safe upper and lower temperatures, pressures, process flows (if applicable), and compositions (if applicable).

Your process (i.e., storage, transfer, reaction, mixing) has safe upper and lower limits for parameters such as temperature, pressure, process flow, and composition. These limits are determined by the properties of the chemical, the equipment, and the technology of the process. It is vital that you and your operators know these limits, know how to avoid these limits, and know how to correct the process if the limits are violated. You should contact your vendor, the chemical manufacturer, or your trade association if you do not know these limits. The following examples demonstrate the importance of knowing these safe upper and lower limits:

- Many people are aware of the dangers of overheating their vessels, but extreme low temperatures also may pose hazards you should consider;
- Chemicals may tolerate high or low pressures, but the pipes used to transfer the chemicals may have structural limits;
- Reactions may become unstable outside of their limits and compromise safety; and,
- Some equipment may be susceptible to excessive corrosion if the equipment or your chemical becomes contaminated with water.

EQUIPMENT SPECIFICATIONS. You must document the specifications of any equipment you maintain to use, store, manufacture, handle, move, or react regulated substances in a covered process. Equipment specifications will usually include information on the materials of construction, actual design, and tolerances. The vendor should be able to provide this information; you may have the specifications in your files from the time of purchase. You are not expected to develop engineering drawings of your equipment to meet this requirement.

Specifications are particularly important if your vessels or pipes are not specifically designed for your type of operation. Substances may react with certain metals or corrode them if water is introduced. You should be sure that the vessels you purchase or lease are appropriate for your operations. Understanding equipment specifications will help you when you need to buy replacement parts. Any such parts must be appropriate for your existing equipment and your use of that equipment. It is not sufficient to replace parts with something that “fits” unless the new part meets the specifications; substitution of inappropriate parts may create serious hazards.

CODES AND STANDARDS. You must document the codes and standards you used to design and build your stationary source and that you follow to operate. These codes will probably include the electrical and building codes that you must comply with under California laws. These codes will also include all the local codes that have been adopted. Your equipment vendors will be able to provide you with information on the codes they comply with for their products. Exhibit 6-3 lists some codes that may be relevant to your operation. Note that the Uniformed Fire Codes (UFC) have been adopted by California. The American National Standards Institute (ANSI) is an umbrella, standards-setting organization, which imposes a specific process for gaining approval of standards and codes. ANSI codes may include codes and standards also issued by other organizations.

HOW DO I DOCUMENT ALL THIS?

The CalARP regulations do not require you to develop piles of papers to document your safety information. Your MSDS(s) are each usually three or four pages long. You only have to keep them on file, as you already do for Cal/OSHA. Equipment specifications are usually on a few sheets or a booklet provided by the vendor; you need only keep these on file. You can probably document the other information on a single sheet that simply lists each of the required items and any codes or standards that apply. See Exhibit 6-4 for a sample. Maintain that sheet in a file and update it whenever any item changes or new equipment is added.

**EXHIBIT 6-3
CODES AND STANDARDS**

ORGANIZATION	SUBJECT/CODES
American National Standards Institute (ANSI)	Piping, Electrical, Power wiring, Instrumentation, Lighting, Product storage and handling, Insulation and fireproofing, Painting and coating, Ventilation, Noise and vibration, Fire protection equipment, Safety equipment, Pumps, Compressors, Motors, Refrigeration equipment, Pneumatic conveying
American Society of Mechanical Engineers	Power boilers, Pressure vessels, Compressors, Shell and tube exchangers, Vessel components, General design and fabrication codes

(ASME)	
American Petroleum Institute (API)	Welded tanks, Rotating equipment, Bulk liquid storage systems
Uniform Fire Code (UFC)	Fire pumps, Flammable liquid code, LNG storage and handling, Plant equipment and layout, Electrical system design, Shutdown systems, Pressure relief equipment, Venting requirements, Gas turbines and engines, Cooling towers, Storage tanks
American Society for Testing Materials (ASTM)	Inspection and testing, Noise and vibration, Materials of construction, Piping materials and systems, Instrumentation

The equipment specifications and list of standards and codes will probably meet the final requirement (i.e., that you ensure that your process is designed in compliance with recognized and generally good engineering practices). If you have any doubt that you are meeting this requirement, you should contact your trade association to determine if there are practices or standards that you are not aware of that may be useful in your operation.

You must ensure that your safety information remains current by updating it whenever equipment is replaced, technology is changed, or chemicals are added. You must also ensure that when these changes are made the equipment specification are satisfied and the other prevention program elements are revised to reflect the changes.

WHERE CAN I LOOK FOR MORE INFORMATION?

Guidance and Reports. Although the reports below target the chemical industry, you may find useful information in them:

- *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 I, II, and III*, Frank P. Lees, Butterworths: London 1996.

**EXHIBIT 6-4
 SAMPLE SAFETY INFORMATION SHEET**

PROPANE STORAGE	
MSDS Propane	On file (1994)
Maximum Intended Inventory	400,000 pounds
Temperature	Upper: max 110°F Lower: min -15°F
Pressure	Upper: 240 psi @ 110°F

	Lower: 35 psi @ -15°F
Flow Rate	Loading: 100 GPM (max) Unloading: 265 GPM (max)
Vapor Piping	250 PSIG
Liquid Piping and Compressor Discharge	350 PSIG
Safety Relief Valves	Each relieves 9,250 SCFM/air RV 1 replaced 9/96 RV 2 replaced 6/97 RV 3 replaced 8/98
Excess Flow Valve	3", closes at 225 GPM with 100 PSIG inlet 2", closes at 100 GPM with 100 PSIG inlet 2", closes at 34,500 SCFH with 100 PSIG inlet
Emergency Shutoff Valve	ESV1 1 1/4", closes at 26,000 SCFH with 100 PSIG inlet ESV 2", closes at 225 GPM with 100 PSIG inlet
Codes and Standards	Designed under NFPA-58-1985 and UFC Article 82
Piping Design	ASME B31-3
Tank Design	ASME NB# 0012

6.2 HAZARD REVIEW (§ 2755.2)

You must conduct a hazard review for a Program 2 process. The hazard review will help you determine whether you're meeting applicable codes and standards, identify and evaluate the types of potential failures, and focus your emergency response planning efforts. Many Program 2 processes will have model risk management programs that will help you conduct this hazard review.

WHAT DO I NEED TO DO?

The hazard review is key to understanding your operation and continuing to operate safely. You must identify and review specific hazards and safeguards of your Program 2 processes. The CalARP regulations list these hazards and safeguards. Exhibit 6-5 summarizes things you must do for a hazard review.

EXHIBIT 6-5

Conduct a review & identify...	Use a guide for conducting the	Document results & resolve problems.	Update your hazard review.
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	review.		
3 The hazards associated with the Program 2 process & regulated substances.	3 You may use any checklist (such as you might in a model risk management program) to conduct the review.	3 Your hazard review must be documented and you must show that you have addressed problems.	3 You must update your review at least once every five years or whenever there is a major change in the process.
3 Opportunities for equipment malfunction or human error that could cause a release.	3 For a process designed to industry standards like NFPA-58 or Federal /state design rules, check the equipment to make sure that it's fabricated, installed, and operated properly.		3 You must resolve problems identified in the new review <i>before</i> you startup the changed process.
3 Safeguards that will control the hazards or prevent the malfunction or error.			
3 Steps to detect or monitor releases.			

HOW DO I START?

There are three possible approaches to conducting a hazard review; which you use will depend on your particular situation. **You must consult with CCCHSD to decide which hazard review methodology is best suited to determine and evaluate the hazards of the process analyzed.**

Processes designed to industry-specific codes. If your process was designed and built to comply with a federal or state standards for your industry or an industry-specific design code, your hazard review will be relatively simple. The standard-setting organization has already conducted a hazard review, identified the hazards, and designed the equipment and operating requirements to minimize the risks. You can use the code or standard as a checklist. The purpose of your review is to ensure that your equipment still meets the code and is being operated in appropriate ways.

Industry checklist/model risk management program. If there is not a single code or standard you must meet, you may want to use a checklist developed by a third party, such as your national trade association. Model RMP guidance is being developed for some industry sectors. These models will include checklists you can use as the basis of your review.

The trade association or model developers will have already identified what your hazards are and what types of equipment and procedures you should be using. Your job is to use the checklist to decide if you meet the requirements and, if you do not, whether you should. In some cases, your individual circumstances may make a checklist item unnecessary.

Develop your own hazard review. If you have no industry standards or checklists, you will have to conduct your own hazard review. As discussed in the requirements section, the review must identify:

- The hazards of the substance and process;
- Possible equipment failures or human errors that could lead to a release;
- Safeguards used to prevent failures or errors; and
- Steps needed to detect or monitor releases.

You will probably be able to define the hazards of the substance using the MSDS, which lists the hazardous properties of the substance. The hazards of the process (as opposed to the equipment) will be limited for most Program 2 processes. However, if you react or mix chemicals, or your process could be contaminated by water or other chemicals, you may have process hazards that you need to define. Your safety information should help here.

The next step may be to conduct a “What If” analysis, where your technical staff ask for each piece of equipment and procedure, “What if the pump stops running?” and/or “What if the operator fails to do this?” Most industry standards and codes have already considered these questions and developed responses, in terms of design and operating practices. If you are doing this on your own, the important thing to remember is that you should not assume that something will not happen. Ask if something could happen; ask whether the safeguards that you think protect the equipment or operator are really adequate. In some cases, they may be adequate, but it is useful to ask, to force yourself to examine your own assumptions.

From this exercise, you should develop a checklist of items that you need to check. For example, if you have listed mixing tank pump failure as a possible problem, the checklist might then include the following items to check: pump maintenance plans, tank high-level alarms, overflow tanks. You would also want to ask what effect a power outage would have on the pump. You may want to consider the particular procedures that have to be followed for safe operation of the equipment and ask what will happen if an operator omits a step or does them out of order. Do your procedures address these possible problems? Will failure of the pump affect the safe operating limits you have documented in your safety information?

When you finish the checklist, it is useful to show it to your operators. They are familiar with the equipment and may be able to point out other areas of concern. A review with your vendors or trade association may also help; their wider knowledge of the industry may give them ideas about failures you may not have experienced or considered.

Whichever hazard review methodology you choose, it must be stressed to never use someone else’s checklist blindly. You must be sure that your chosen approach

addresses all of your potential problems. You must consult with CCCHSD to decide which hazard review methodology is best suited to determine and evaluate the hazards of the process analyzed.

EXTERNAL EVENTS

Whichever approach 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 without releasing the substance. You should consider the potential impacts of lightning strikes and power failures. If your process could be hit by vehicles (including rail), you should examine the consequences of vehicle impacts. You should consider the potential for attacks from terrorist or internal or external sabotage. 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 hazard review. 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.

**EXHIBIT 6-6
EXTERNAL EVENTS**

EVENT	NOTES AND COMMENTS
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	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 water sewers.

Following is a partial list of safeguards and controls for the above events. These safeguards, (which include instrumentation, equipment, and administrative procedures) prevent, detect, or mitigate the causes or consequences of the above events:

Prevention

- 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

DOCUMENTING THE REVIEW

You should maintain a copy of the checklist you used. The easiest way to document findings is to enter them into the checklist after each item. This approach will give you a simple, concise way of keeping track of findings and recommendations. You may also want to create a separate document of recommendations that require implementation or other resolution. CalARP does not require that you implement every recommendation. It is up to you to decide which recommendations are necessary and feasible. You may decide that other steps are as effective as the recommended actions or that the risk is too low to merit the expense. You must, however, document your decision on each recommendation.

UPDATES

You must update the hazard review every five years or whenever a major change in the process occurs. This includes reviewing the external events associated with the process. For most Program 2 processes, major changes will be limited. If you install a new tank next to an existing one, you would want to consider whether the closeness of the two creates any new hazards. Replacing a tank with an identical tank would not be considered a change. Replacing a tank with a new type of tank should trigger an update. Changing process composition or safe operating limits is considered a major change. Even if the changes prove to be minor, you should examine the process carefully before starting. Combining old and new equipment can sometimes create unexpected hazards. You will operate more safely if you take the time to evaluate the hazards before proceeding.

WHERE CAN I LOOK FOR MORE INFORMATION?

Although the reports below target the chemical industry, you may find useful information in them:

- *Guidelines for Hazard Evaluation Procedures, 2nd Ed. with Worked*

examples, Center for Chemical Process Safety of the American Institute of Chemical Engineers 1992.

- *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.

6.3 OPERATING PROCEDURES (§ 2755.3)

Written operating procedures describe what tasks a process operator must perform, set safe process operating parameters that must be maintained, and set safety precautions for operations and maintenance activities. These procedures are the guide for telling your employees how to work safely every day, giving everyone a quick source of information that can prevent or mitigate the effects of an accident, and providing workers and management with a standard against which to assess performance.

What Do I Need To Do?

You must prepare written operating procedures that give workers clear instruction for safely conducting activities involving a covered process. You may use standardized procedures developed by industry groups or provided in model risk management programs as the basis for your operating procedures, but be sure to check that these standard procedures are appropriate for your activities. You must review and if necessary update your Program 2 operating procedures whenever there is a major change and before you startup the changed process. Exhibit 6-7 briefly summarizes what your operating procedures must address.

**EXHIBIT 6-7
OPERATING PROCEDURES REQUIREMENTS**

Steps for each operating phase	Operating limits
<ul style="list-style-type: none"> 4Initial startup 4Normal operations 4Temporary operations 4Emergency shutdown 4Emergency operations 4Normal shutdown 4Startup following a normal or emergency shutdown or a major change 	<ul style="list-style-type: none"> 4Consequences of deviating 4Steps to avoid or correct deviations

Your operating procedures must be:

- Appropriate for your equipment and operations;
- Complete; and
- Written in language that is easily understood by your operators.

HOW DO I START?

If you already have written procedures, you should review them to ensure that they are accurate and that they reflect your actual operating procedures. You should watch operators performing the steps to be sure that the procedures are being used and are appropriate. Talk with the operators to identify any problems they have identified and any improvements they may have made. When you are satisfied that they meet the criteria listed above, you are finished. You should also check them against any recommended procedures provided by equipment manufacturers, trade associations, or standard setting organizations. You are responsible for ensuring that the procedures explain how to operate your equipment and processes safely.

If you do not have written procedures, you may want to check with equipment manufacturers, trade associations, or standard setting organizations. They may have recommended practices and procedures that you can adapt. Do not accept anyone else's procedures without checking to be sure that they are appropriate for your particular equipment and uses and are written in language and reading level that your operators will understand. You may also want to review any requirements imposed under state or federal rules. For example, if you are subject to federal rules for loading and unloading of hazardous materials, those rules may dictate some procedures. Copies of these rules are sufficient for those operations if your operators can understand and use them.

WHAT DO THESE PROCEDURES MEAN?

The rule lists eight procedures. Not all of them may be applicable to you. The following is a brief description to help you decide whether you need to develop procedures for each item. If a particular element does not apply, do not spend any time on it. We do not expect you to create a document that is meaningless to you.

INITIAL STARTUP. This item applies primarily to stationary sources that process or use substances and covers all the steps you need to take before you start a process for the first time. You should include all the steps needed to check out equipment as well as the steps needed to start the process itself. Warehouses, for example, will probably not have procedures for startup. Retailers who store a substance and download it may

want to substitute procedures for checking out and loading the tank for the first time for this item.

NORMAL OPERATIONS. These procedures should cover your basic operations. If you are a warehouse, these would include stacking, moving, and repackaging, if you do that. For retailers, they would cover loading and downloading. For users, the procedures would include all the steps operators take to check the process and ensure that equipment is functioning properly and substances are flowing or mixing appropriately. These are your core procedures that you expect your operators to follow on a daily basis to run your processes safely.

TEMPORARY OPERATIONS. These operations are short-term; they will usually occur either when your regular process is down or when additional capacity is needed for a limited period. The procedures should cover the steps you need to take to ensure that these operations will function safely. The procedures will generally cover pre-startup checks and determinations (e.g., have you determined what the maximum flow rate will be). The actual operating procedures for running the temporary process will be written as the operation is put into place, but before operations begin.

This item may apply to most stationary sources. Even warehouses may need to consider procedures to ensure that if a new substance or product is brought into the warehouse for temporary storage, the necessary steps are taken before that storage to ensure that it is safe (e.g., barrels are not stacked too high or located with incompatible substances). If you have the possibility of operating your process in a way that is not covered under normal operations, you should have these procedures. If you will simply shutdown your process (e.g., stop unloading the substance), you can ignore this item.

EMERGENCY SHUTDOWNS AND OPERATIONS. These procedures cover the steps you need to take if you must shutdown your process quickly. For most Program 2 stationary sources, these procedures may be brief because shutting a process down may be no different in an emergency than in normal shutdown. For warehouses, they may not apply. If you have a more complex process (e.g., one that operates under high pressure or temperature), you will need procedures to ensure that you can shutdown safely. Normally you would take time to reduce flows, depressurize, and lower the temperature gradually. If you need to do any of these quickly, you must have procedures that identify the steps workers should take to carry out these operations safely.

NORMAL SHUTDOWN. These procedures again apply mainly to stationary sources that process or use regulated substances. They may apply to you if you only store a substance and if you empty the tank for cleaning. These procedures probably will not apply to warehouses unless they repackage.

These procedure should provide all the steps needed to stop a process safely. For a complex process or one that operates under extreme conditions, shutdown may take considerable time and may be hazardous. The procedures should set out the time that should be taken and the checks that must be made before proceeding to next steps.

STARTUP FOLLOWING A NORMAL OR EMERGENCY SHUTDOWN OR A MAJOR CHANGE¹. These procedures will be similar to those for initial startup. Startup procedures following normal shutdown may include fewer equipment checks because you may not need to check equipment on a frequent basis. You must include all the steps your workers should take to ensure that the process can operate safely. Startup after an emergency shutdown will generally require more checks to ensure that valves that were closed are open and that all equipment is functioning properly. These procedures will be limited if you only store a substance; they may not apply to warehouses.

CONSEQUENCES OF DEVIATIONS. Your operating procedures must tell the workers what will happen if something starts to go wrong. For example, if the pressure or temperature begins to rise or fall unexpectedly or the flow rate from one feed suddenly drops sharply, the operator must know (1) whether this poses a problem that must be addressed and (2) what steps to take to correct the problem or otherwise respond to it. Your safety information will have defined the safe limits for your substances, equipment, and processes; the hazard review will have defined the possible consequences and the steps needed to prevent a deviation from causing serious problems. You should include this information in each of the other procedures (startup, normal operations, shutdowns), rather than as separate documents.

EQUIPMENT INSPECTIONS. You should include steps for routine inspection of equipment by operators as part of your other procedures. These inspections cover the items that operators should look for on a daily basis to be sure that the equipment is running safely (e.g., vibration checks). These inspections are not the same as those detailed checks that maintenance workers will perform, but rather are the “eyeball,” “sound,” and “feel” tests that experienced operators do, often without realizing it. Your operators, your vendors, and your trade association can help you define the things that should trigger concern: When is a small leak at a seal normal; when is it a cause of concern? How much vibration is normal? What does a smoothly running motor sound like? These inspections should also include procedures for personnel to follow if they identify leaks.

SAFework PRACTICES. You may also have developed and implemented safework practices such as hot-work permits and programs, lockout/tagout permits and programs, confined space entry permits and programs, and pipeline breaking permits and programs at your stationary source. The CalARP regulations do not require that you develop these practices; however, you should develop, review, and update those

(1)Major change is defined (in Section 2735.5 of the CalARP regulations) as the introduction of a new process, process equipment, or regulated substance, an alteration of process chemistry that results in any change to safe operating limits, or other alteration that introduces a new hazard.

programs and permitting systems applicable to your process. Examples of a hot-work permit, lockout/tagout permit, and pipeline breaking permit are provided in Appendix G.

UPDATING PROCEDURES

You must update your procedures whenever you change your process in a way that alters the steps needed to operate safely. If you add new equipment, you will need to expand your procedures or develop a separate set to cover the new items. Whenever you change your safety information you should review your procedures to be sure that they are still appropriate. Anytime you conduct a hazard review, check your operating procedures as you implement changes to address hazards.

WHAT KIND OF DOCUMENTS DO I HAVE TO KEEP?

You must maintain your current set of operating procedures. You are not required to keep old versions; in fact, you should avoid doing so because keeping copies of outdated procedures may cause confusion. You should date all procedures so you will know when they were last updated.

WHERE CAN I LOOK FOR MORE INFORMATION?

Although the reports below target the chemical industry, you may find useful information in them:

- *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.

6.4 TRAINING (§ 2755.4)

Training programs often provide immediate benefits because trained workers have fewer accidents, damage less equipment, and improve operational efficiency. Training gives workers the information they need to understand how to operate safely and why safe operations are necessary. A training program, including refresher training, is the key to ensuring that the rest of your prevention program is effective. You already have some type of training program because you must conduct training to comply with Cal/OSHA's Hazard Communication standard (T8 CCR §5194).

WHAT DO I NEED TO DO?

You must train all new operators in your operating procedures developed under the previous element; if any of your more experienced operators need training on these procedures, you should also train them. Any time the procedures are revised, you must train everyone using the new procedures. At least once every three years, you must provide refresher training on the operating procedures even if they have not changed. You and your operators must determine the appropriate frequency for refresher training. The training must cover all parts of the operating procedures, including information on the consequences of deviations and steps needed to address deviations.

For employees already operating a process on June 21, 1999, you may certify in writing that the employees have the “required knowledge, skills, and abilities to safely carry out the duties and responsibilities as provided in the operating procedures.” This “grandfather clause” means that you do not need to conduct additional training, other than refresher training, for employees who are employed prior to June 21, 1999, and who have the appropriate knowledge and skills to operate covered processes safely, in accordance with the operating procedures. However, CCCHSD recommends that you document specifically how you certified that each of these employees has the “required knowledge, skills, and abilities...”. This certification should be kept in your files; you do not need to submit it to CCCHSD in the RMP.

You are not required to provide a specific amount of training or training format. You should develop a training approach that works for you. If you are a small stationary source, one-on-one training and on-the-job training may work best. Larger stationary sources may want to provide classroom training or video courses developed by vendors or trade associations before moving staff on to supervised work. You may have senior operators present the training or use trainers provided by vendors or other outside sources. The form and the length of the training will depend on your resources and your processes. If you can teach someone the basics in two hours and move them on to supervised work, that is all right. The important thing is that your workers understand how to operate safely and can carry out their tasks properly. Find a system that works for you. Exhibit 6-8 lists things that you may find useful in developing your training program.

HOW DOES THIS TRAINING FIT WITH OTHER REQUIRED TRAINING?

You are required by Cal/OSHA to provide training under the hazard communication standard; this training covers the hazards of the chemicals and steps to take to prevent exposures. DOT has required training for loading and unloading of hazardous materials. Some of that training will cover items in your operating procedures. You do not need to repeat that training to meet the CalARP requirements or CCCHSD expectations. You may want to integrate the training programs, but you do not have to do so.

WHAT KIND OF DOCUMENTATION DO I NEED TO KEEP?

You are not required to maintain documentation of your training program. However, CCCHSD recommends that you maintain training records for your employees including the type of training, the instructor, and the means used to verify competency. This allows you to ensure that everyone who needs to be trained is trained. It will also serve as documentation during compliance audits. Without the written documentation, you will have to rely on your memory and the memories of your employees.

EXHIBIT 6-8 TRAINING CHART

4Who needs training?	Clearly identify the employees who need to be trained and the subjects to be covered.
4What are the objectives?	Specify learning objectives, and write them in clear, measurable terms before training begins. Remember that training must address the process operating procedures.
4How will you meet the training objectives?	Tailor the specific training modules or segments to the training objectives. Enhance learning by including hands-on training like using simulators whenever appropriate. Make the training environment as much like the working environment as you can, consistent with safety. Allow your employees to practice their skills and demonstrate what they know.
4Is your training program working?	Evaluate your training program periodically to see if your employees have the skills and know the routines required under your operating procedures. Make sure that language or presentation are not barriers to learning. Decide how you will measure your employees' competence.
4How will your program work for new hires and refresher training?	Make sure all operators – including contract employees – receive initial and refresher training. If you make changes to process chemicals, equipment, or technology, make sure that involved workers understand the changes and the effects on their jobs.

WHERE CAN I 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.

6.5 MAINTENANCE (§ 2755.5)

Preventive maintenance, inspection, and testing of equipment are critical to safe operations. Waiting for equipment to fail often means waiting for an accident that could harm people and the environment. Further, a thorough maintenance program will save you money by cutting down-time caused by equipment failures. Your hazard review and safety information will have identified equipment that is critical to safe operations. You should use the information you develop while putting together these documents and reviews to build your maintenance program.

WHAT DO I NEED TO DO?

You must prepare and implement procedures for maintaining the mechanical integrity of process equipment, and train your maintenance personnel in the maintenance procedures. You may use procedures or instructions from equipment vendors, in federal or state regulations, or in industry codes as the basis of your maintenance program. You should develop a schedule for inspecting and testing your equipment based on manufacturers' recommendations, industry standards or codes, good engineering practice, and prior operating experience. Exhibit 6-9 briefly summarizes the elements of a maintenance program that would satisfy the CalARP regulations.

HOW DO I START?

Your first steps will probably be to determine whether you already meet all these requirements. If you review your existing written procedures and determine that they are appropriate, you do not need to revise or rewrite them. If your maintenance personnel are already trained in the procedures and carry them out, you may not need to do anything else.

If you do not have written procedures, you will need to develop them. Your equipment vendors may be able to provide procedures and maintenance schedules. Using these as the basis of your program is acceptable. Your trade association may also be able to help you with industry-specific checklists. If there are existing standards, your trade association can provide you with the references. Copies of

these may form the basis for your maintenance program. If there are federal or state regulations that require certain maintenance, you should use these as well.

**EXHIBIT 6-9
MAINTENANCE GUIDELINES**

Written procedures	Training	Inspection & testing
<p>4You may use someone else's procedures as the basis for your program. If you choose to develop your own, you must write them down.</p>	<p>4Train process maintenance personnel in process hazard and how to avoid or correct an unsafe condition.</p> <p>4Make sure this training covers the procedures applicable to safe job performance.</p>	<p>4Inspect & test process equipment.</p> <p>4Use recognized and generally accepted good engineering practices.</p> <p>4Follow a schedule that matches the manufacturer's recommendations or that prior operating experience indicates is necessary.</p>

You need to determine if procedures provided by vendors, manufacturers, trade associations, or others are appropriate for your operation. If your safety information indicates that you are operating in a standard way (e.g., using only parts designed for refrigeration service in your cold storage system), you may assume that these other procedures will work for you. If you are using equipment for purposes other than those for which it was designed, you need to decide whether your use changes the kinds of maintenance required.

TRAINING

Once you have written procedures, you must ensure that your maintenance personnel are trained in the procedures and in the hazards of the process. As with the training discussed in the previous section, how you provide this training is up to you. We believe that you are in the best position to decide how to train your workers. Vendors may provide the training or videos; you may already provide training on hazards and how to avoid or correct them as part of Hazard Communication Standard training.

If you hire contractors to do your maintenance, you must ensure that they are trained to carry out the procedures. You can do this by providing training or by developing agreements with the contractor that gives you the assurance that only trained workers will be sent to your site. In some cases, you may be able to rely on licenses (e.g., electricians). For any outside worker, however, you must ensure that they are informed of the hazards of your particular process. If you have standard equipment and hire contractors that specialize in servicing your types of processes, you can ensure their knowledge through agreements with the contractor.

INSPECTION AND TESTING

You must establish a schedule for inspecting and testing equipment associated with covered processes. You may obtain recommendations from manufacturers, vendors, or trade associations. You should, however, use your own experience as a basis for examining any schedules you obtain from others. Many things may affect whether a schedule is appropriate. The manufacturer may assume a constant rate of use. If your use (e.g., the amount of substance pumped per hour) varies considerably, the variations may affect the wear on the equipment. Extreme weather conditions may also impact wear on equipment.

Talk with your maintenance personnel as you prepare or adopt these procedures and schedules. If their experience indicates that equipment fails more frequently than the manufacturer expects, you should adjust the inspection schedule to reflect that experience. Your hazard review should identify these potential problem areas as well and should be used as you develop schedules. For example, if you determined that corrosion is one of the hazards of the process, your schedule must address inspections for corrosion and replacement before failure. Your trade association may also be able to provide advice on these issues.

WHAT KIND OF DOCUMENTATION MUST I KEEP?

You must keep your written procedures and schedules as well as any agreements you have with contractors. As workers leave or change jobs at your company, it can be difficult to keep track of when inspections and tests were done. Maintaining a record of when something was last done or is scheduled to be done next can help keep your program working smoothly.

WHERE CAN I GO FOR MORE INFORMATION?

CODES AND STANDARDS: The following groups develop codes and standards that may help you determine the appropriate frequency and methods to use for testing and inspection: National Board Inspection Code, the American Society for Testing and Material, American Petroleum Institute, National Fire Protection Association, American National Standards Institute, American Society of Mechanical Engineers.

Q and A

Q. I have a propane tank for fuel use. I lease the tank from the propane supplier. The supplier does all the maintenance. My staff never work on the equipment. How I do meet this requirement?

A. As part of your contract with the supplier, you should gain an agreement, in writing, that the supplier will provide maintenance and trained maintenance workers that meet the requirements of T8 CCR §2755.5.

GUIDANCE AND REPORTS. Although the reports below target the chemical industry, you may find useful information in them:

- *Guidelines for 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.

6.6 COMPLIANCE AUDITS (§ 2755.6)

Any risk management program should be reviewed periodically to ensure that employees and contractors are implementing it properly. A compliance audit is a way for you to evaluate and measure the effectiveness of your risk management program. An audit reviews each of the prevention program elements to ensure that they are current and are being implemented. The audit will also help you identify problem areas and take corrective actions to resolve deficiencies.

WHAT DO I NEED TO DO?

The purpose of the compliance audit is to ensure the continual development and implementation of the risk management program. At least every three years, you must certify that you have evaluated compliance with the CalARP regulatory requirements for each prevention program element. To be in compliance, the prevention programs must be integrated into the “culture” of the stationary source and the programs must be used daily.

The audit can be conducted by an individual or a team, with at least one person being knowledgeable about the covered process. The audit team may find it beneficial to do the following:

- Develop an audit protocol or questionnaire to guide them in the audit and to ensure the consistency of the audits. Exhibit 6-10 provides a protocol or checklist;
- Conduct document reviews, records reviews, and employee interviews to assess and verify compliance;
- Formulate recommendations to address any potential deficiencies; and,
- Review each recommendation and develop and incorporate subsequent action items.

You may choose to have the audit conducted by a qualified outside party. For example, you may have someone from another part of your company do the audit or hire an expert in your process. If you do either of these, you should have someone work with the person, both to understand the findings and answer questions.

Remember, this is an audit of compliance with the prevention program of this rule. You may choose to expand the scope to cover your compliance with other parts of the rule and the overall safety of your operation, but you are not required to do so.

EXHIBIT 6-10
SAMPLE AUDIT CHECKLIST
FOR SAFETY INFORMATION AND HAZARD REVIEWS

Element	Yes/No/NA	Action/Completion Data
Safety Information		
MSDSs updated?		
Maximum intended inventory determined?		
Determined Safe upper and lower temperature? Safe upper and lower pressures? Safe process flow rates? Compositions?		
Equipment specifications Tanks? Piping? Pressure relief valves? Emergency shutoff valves? Gauges? Pumps? Compressors? Hoses?		
Hazard Review (Note: this is not a complete		

Element	Yes/No/NA	Action/Completion Data
audit checklist for hazard review)		
Has equipment been inspected to determine if it is designed, manufactured, installed, and operated according to industry standards and codes?		
Are the results of the inspections documented?		
Have inspections been conducted after every major change?		

WHAT KIND OF DOCUMENTATION MUST I KEEP?

You must retain the two most recent compliance audit reports. You may also want to keep a record of who conducted the audit, but you are not required to do this.

WHERE CAN I LOOK FOR MORE INFORMATION?

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

Q and A

Q. Do the compliance audits cover all of the CalARP requirements or just the prevention program requirements?

A. The compliance audit applies only to the requirements of the prevention programs under Subpart C. If you have a Program 2 process you must certify that you have evaluated compliance with the Program 2 prevention program provisions at least every three years to verify that the procedures and practices developed under the rule are adequate and are being followed. You may want to expand your audit to check other CalARP requirements but you are not required to do so.

6.7 INCIDENT INVESTIGATION (§ 2755.7)

Incidents can provide valuable information about site hazards and the steps you need to take to prevent accidental releases. Often, the immediate cause of an incident is the result of a series of other problems that need to be addressed to prevent recurrences. For example, an operator's mistake may be the result of poor training. Equipment failure may result from improper maintenance or misuse. Without a thorough investigation, you may miss the opportunity to identify and solve these underlying causes.

WHAT DO I NEED TO DO?

You must investigate each incident that resulted in, or could have resulted in (i.e., near miss) 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. Exhibit 6-11 briefly summarizes the steps you must take for investigating incidents. You should also consider investigating minor accidents because they may help you identify problems that could lead to more serious accidents; however, you are not required to do so under the CalARP regulations.

How Do I Start?

You should start with a set of procedures that you will use to begin an investigation. You may want to assign someone to be responsible for compiling the initial incident data and putting together the investigation team. If you have a small stationary source, your “team” may be one person who works with the local responders, if they were involved.

The purpose of the investigation is to find out what went wrong and why, so you can prevent it from happening again. Do not stop at the obvious failure or “initiating event” (e.g., the hose was clogged, the operator forgot to check the connection); try to determine why the failure occurred. In many cases, the underlying cause will be what matters (e.g., the operator did not check the connection because the operating procedures and training did not include this step). If the accident occurred because of operator error, you should determine if the operator made the mistake because he or she had been trained in the wrong procedures or because design flaws made mistakes likely. If you write off the accident as operator error alone, you miss the chance to take the steps needed to prevent such errors the next time. Similarly, if equipment fails, you should try to decide whether it had been used or maintained improperly. Remember, your goals are to prevent accidents, not to blame someone, and correct any problems in your prevention program. In this way, you can prevent recurrences.

In many cases, an investigation will not take long. If you have a complex stationary source, if equipment has been severely damaged, or the workers were seriously hurt, an investigation may take several days. You should talk with the operators who were in the area at the time and check records on maintenance (another reason for keeping logs). If equipment has failed in an unusual way, you may need to talk to the manufacturer and your trade association to determine if similar equipment has suffered similar failures.

EXHIBIT 6-11
INCIDENT INVESTIGATION REQUIREMENTS

4Initiate an investigation promptly.	Begin the investigation no later than 48 hours following the incident.
4Summarize the investigation in a report.	Among other things, this report will include 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.
4Address the team's findings and recommendations.	Establish a system to address the incident report findings and recommendations and document resolutions and corrective actions.
4Review the report with your staff and contractors.	You must share the report – its findings and recommendations – with affected workers whose job tasks are relevant to the incident.
4 Retain the report.	Keep incident investigation summaries for five years.

You must develop a summary of the accident and its causes and make recommendations to prevent recurrences. You must address each recommendation and document the resolution and any actions taken. Finally, you must review the findings with operators affected by the findings.

WHAT KIND OF DOCUMENTATION MUST I KEEP?

You must maintain the summary of the accident, recommendations, and action items. A sample format is shown in Exhibit 6-12 that combines all of these in a single form. A second example Incident/Accident Investigation form is included in Appendix G. Note that the form also includes accident data that you will need for the five-year accident history. These data are not necessarily part of the incident investigation report, but including them will create a record you can use later to create the accident history.

WHERE CAN I LOOK FOR MORE INFORMATION?

Although the reports below target the chemical industry, you may find useful information in them:

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

EXHIBIT 6-12

SAMPLE INCIDENT INVESTIGATION FORMAT

Ammonia Tank Release		
Date: May 15, 1998; 3 pm	Substance: Ammonia	Quantity: 2 tons
Duration: 2 hours	Weather ² : 82 F, 8 mph winds	
Description:	Unloading hose split open and spilled substance; operator was in the main building and failed to notice spill for several minutes	
Findings	Recommendations	Action Items
Hose split because the pressure was too great	Replace hose with higher pressure hose Revise procedures for checking on pressure	Replaced hose as recommended; revised procedures; conducted training on new procedures
Operator failed to stay at the tank during loading	Conduct refresher training to stress necessity of remaining at the tank during loading	Refresher training provided; safety meetings added and held on a monthly basis to review safety issues
Tank required manual shutoff	Determine if automatic shutoff valve is feasible	Automatic shutoff valve installed

6.8 CONCLUSION

Many of you will need to do little that is new to comply with the Program 2 prevention program, because you already are complying with many program elements through other federal rules, California requirements, and industry-specific codes and standards. If you have voluntarily implemented Cal/OSHA's PSM standard for your Program 2 processes, you will meet the Program 2 prevention program requirements. No matter what choices you make in complying with the Program 2 prevention program, keep these things in mind:

- Integrate the elements of your prevention program. For Program 2 owners and operators, a major change in any single element of your program should lead to a review of other elements to identify any effect caused by the change.
- 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 everyday.

(2) As much of the meteorological conditions as possible will be useful if any vapor dispersion modeling is to be performed.

- Check your operations on a continuing basis and ask if you can improve them to make them safer as well as more efficient.