PDHonline Course K104 (4 PDH)

Chemical Accident Prevention

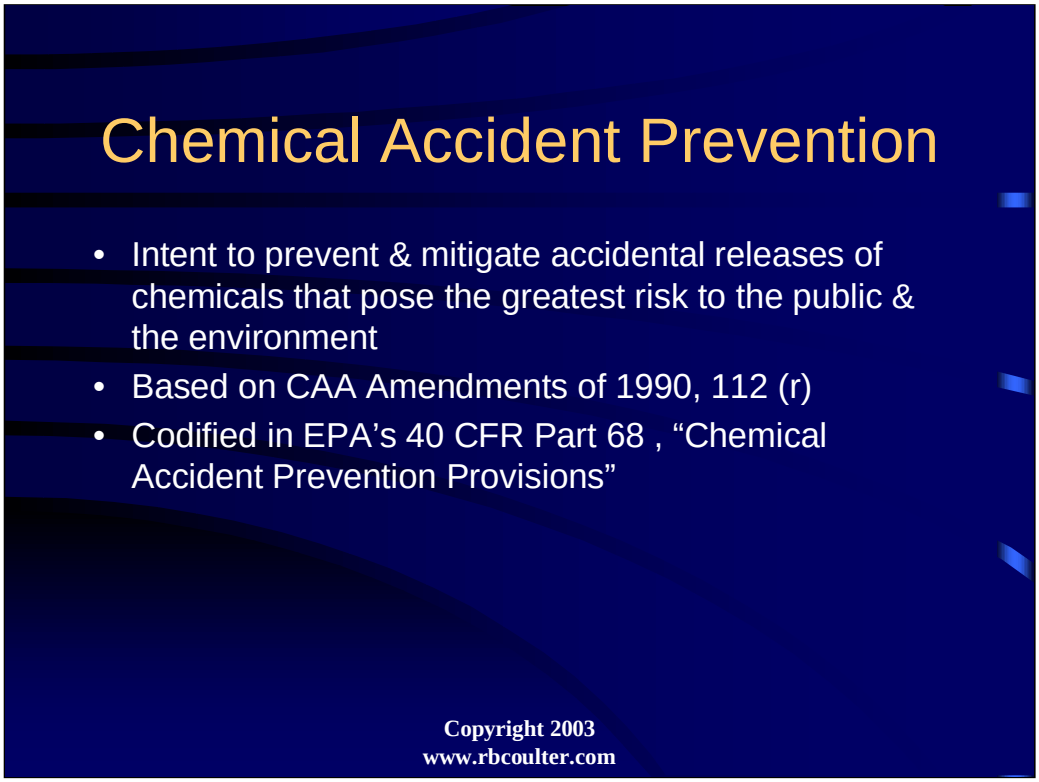
Instructor: Robert B. Coulter, PE

2020

PDH Online | PDH Center

5272 Meadow Estates Drive
Fairfax, VA 22030-6658
Phone: 703-988-0088
www.PDHonline.com

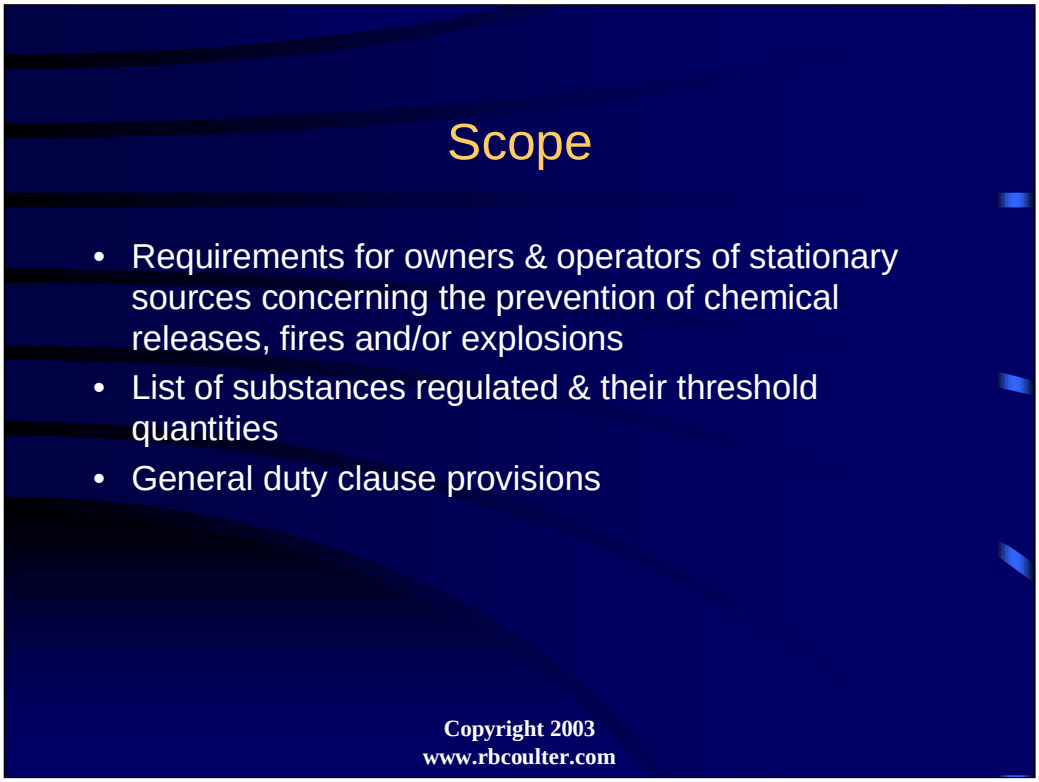
An Approved Continuing Education Provider



The intent of the CAP regulation is to prevent & mitigate accidental releases of chemicals that pose the greatest risk to the public & the environment.

This rule is based on the CAA Amendments of 1990, 112 (r) . The amendments were enacted as the result of chemical disasters that occurred in Texas circa 1989-1990 and resulted in multiple fatalities. (Pasadena & Channelview incidents). It was also motivated by the Bhopal , India disaster of 1984.

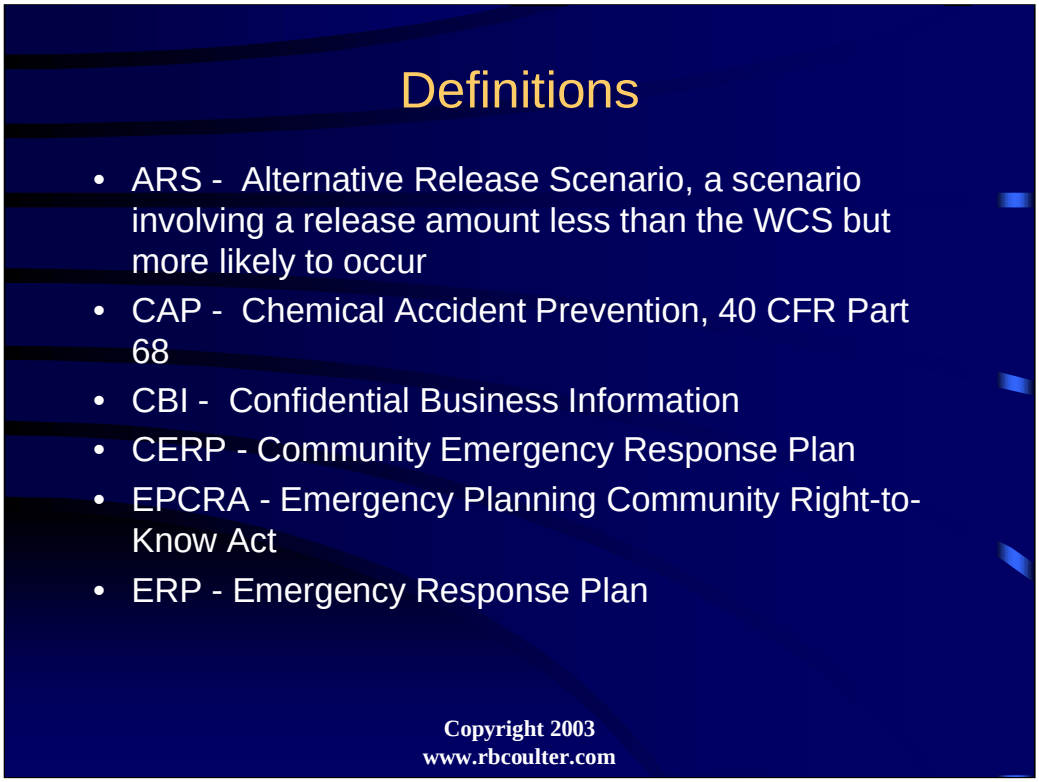
This rule is codified in EPA's 40 CFR Part 68 , as the "Chemical Accident Prevention Provisions". In this course these regulations will be called the "CAP rule or regulations" or simply "CAP", for short.



The regulation sets out requirements for owners & operators of stationary sources that are meant to prevent and/or mitigate the negative impact of chemical releases, fires and/or explosions on the public and environment.

The codified regulation targets those facilities storing or handling a listed substance above the threshold quantity as indicated in 68.130. See the link to the CAP rule below.

There is also a general duty clause in the CAA that places a burden on all stationary sources that can release an extremely hazardous chemical to implement preventive and mitigating measures (more information about the CAP general duty clause can be found at the link below). This requirement is in place regardless of a stationary source having a listed substance in 68.130.



Definitions for this course are given here to make it easier for the student later.
ARS - Alternative Release Scenario, a scenario involving a release of a listed substance in an amount less than the WCS but has a greater chance of occurring.

CAP - Chemical Accident Prevention, 40 CFR Part 68

CBI - Confidential Business Information - Information that a business owner chooses to withhold from public view in order to maintain a competitive advantage in the market place.

CERP - Community Emergency Response Plan

EPCRA - Emergency Planning Community Right-to-Know Act - Title III of SARA (Superfund Amendments & Reauthorization Act) which deals with local emergency response and facility reporting of hazardous chemical inventories.

ERP - Emergency Response Plan

ICP - Integrated Contingency Plan (consolidated ERPs from compliance of multiple regulations) For example, a facility may combine their ERP with their SPCC (Spill Prevention Control & Countermeasure) plan into one document (the ICP).

LOC or Level of Concern - This is the airborne concentration of a substance where a dispersion model is terminated. The term "toxic endpoint" is often used synonymously. The LOC is usually the ERPG-2 (Emergency Response Planning guide - 2 which is from the (American Industrial Hygiene Association) or 10 % of the IDLH (Immediately Dangerous to Life & Health) value.

MOC - Management of Change - A formalized procedure of managing change to a process at a stationary source.

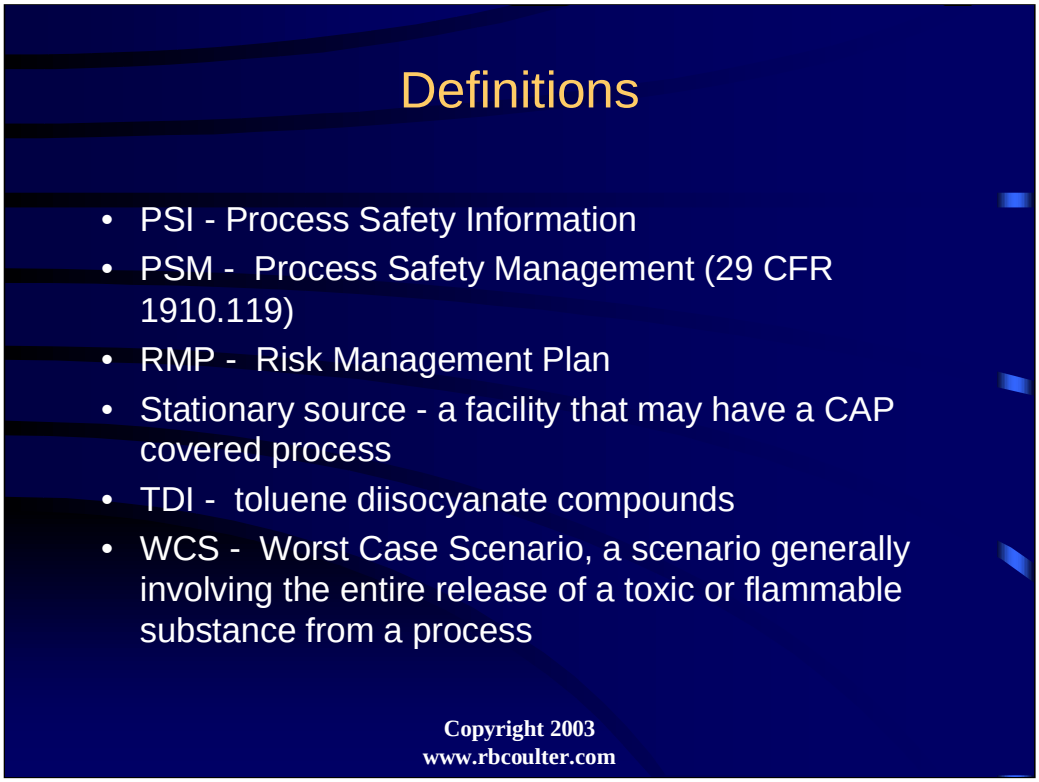
MSDS - Material Safety Data Sheet

NAICS - North American Industrial Classification System

OCA - Offsite Consequence Analysis - A objective method used calculate the toxic or flammable endpoint of a WCS or ARS.

PID - Process Instrumentation Diagram

PHA - Process Hazard Analysis - A detailed method of identifying hazards in a process



PSI - Process Safety Information - The specific safety related information about a covered process that is required to be generated & maintained.

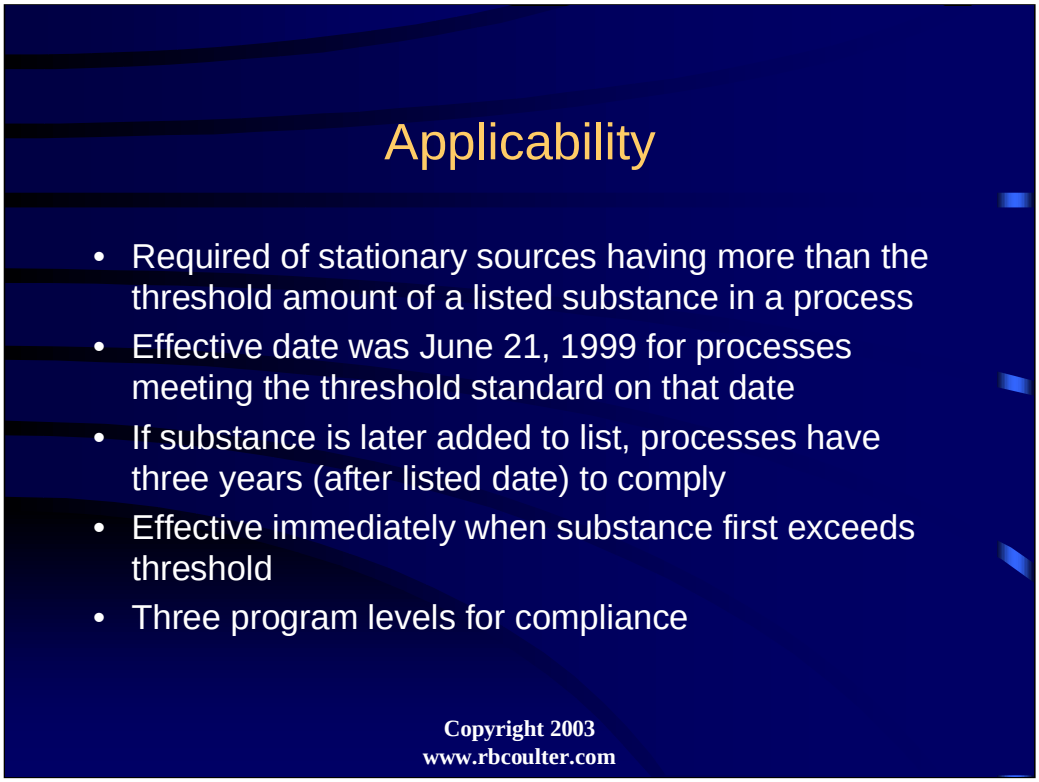
PSM - Process Safety Management (29 CFR 1910.119) A similar regulation to CAP that became law in 1992 with emphasis on protecting employees (OSHA).

RMP - Risk Management Plan - This can have several meanings. Some people use RMP and the CAP rule synonymously. The RMP can also be the EPA submission required by the CAP rule and/or the stationary source overall compliance plan.

Stationary source - a facility that may have a CAP covered process

TDI - toluene diisocyanate compounds

WCS - Worst Case Scenario, a scenario generally involving the entire release of a toxic or flammable substance from a process

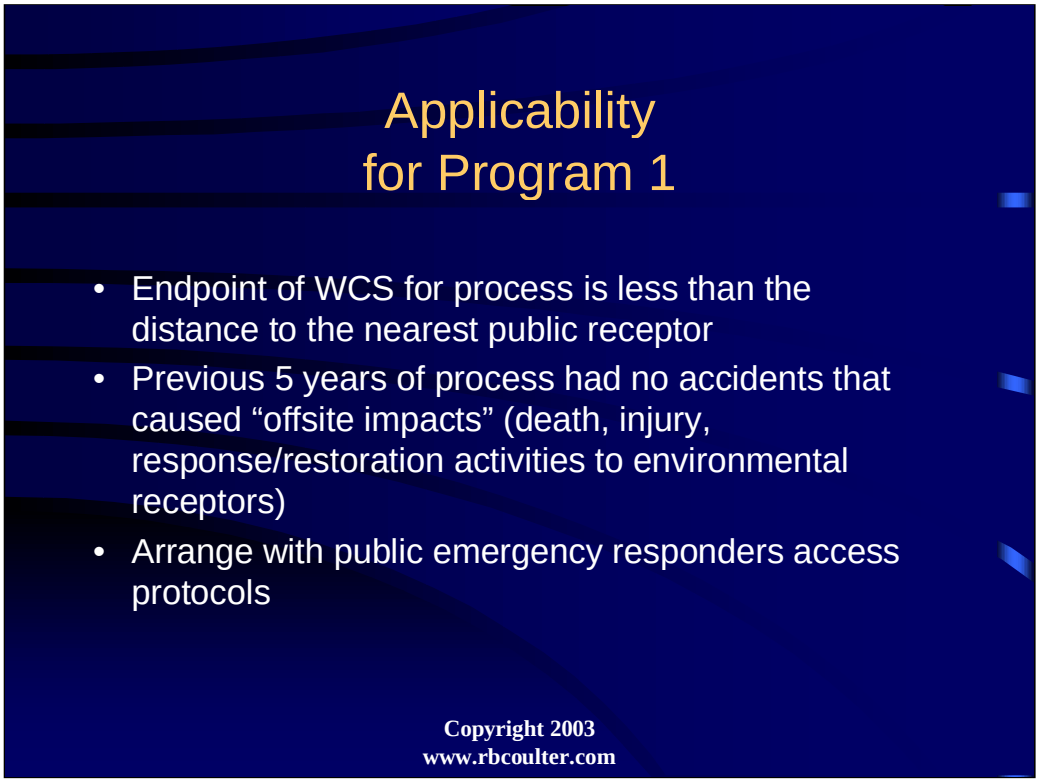


CAP compliance is required of stationary sources having more than the threshold amount of a listed substance in a process.

The effective date was June 21, 1999 for processes meeting the threshold standard on that date.

If EPA adds a substance to the list (68.130) then owners / operators of applicable covered processes have three years (after listed date) to comply with the CAP provisions.

If a process exceeds the threshold amount of a listed substance then the process owner/operator must immediately comply with CAP. This obviously implies that the owner / operator must be in compliance before raising a listed substance above the threshold in the process. There are three program levels for compliance - program 1,2 and 3. Program 1 is the least burdensome. Program 3 is the most burdensome.

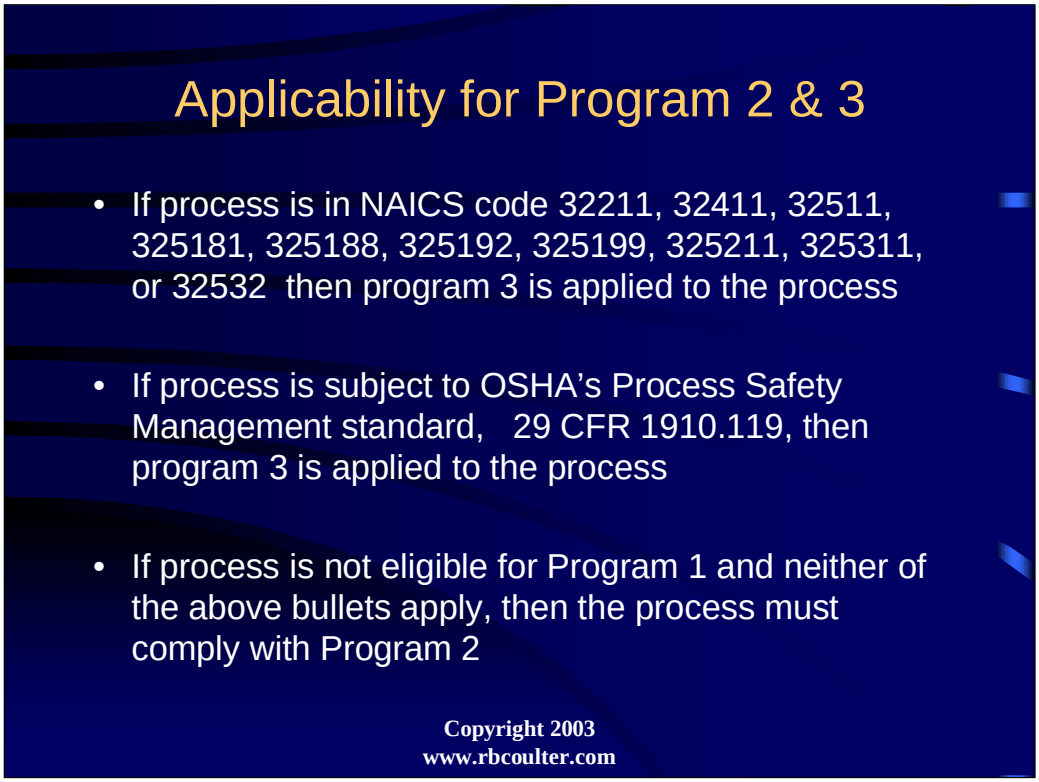


Program 1 eligibility is based on the owner / operator proving that the endpoint of the WCS for process is less than the distance to the nearest public receptor. A public receptor is a place of business, residence, school, park, etc.

Also the the process must have had no accidents that caused “offsite impacts” (death, injury, response/restoration activities to environmental receptors).

And -

The owner / operator must arrange with public (local) emergency responders on how to deal with an emergency involving the process. This plan should indicate HOW & WHO will handle a process emergency.

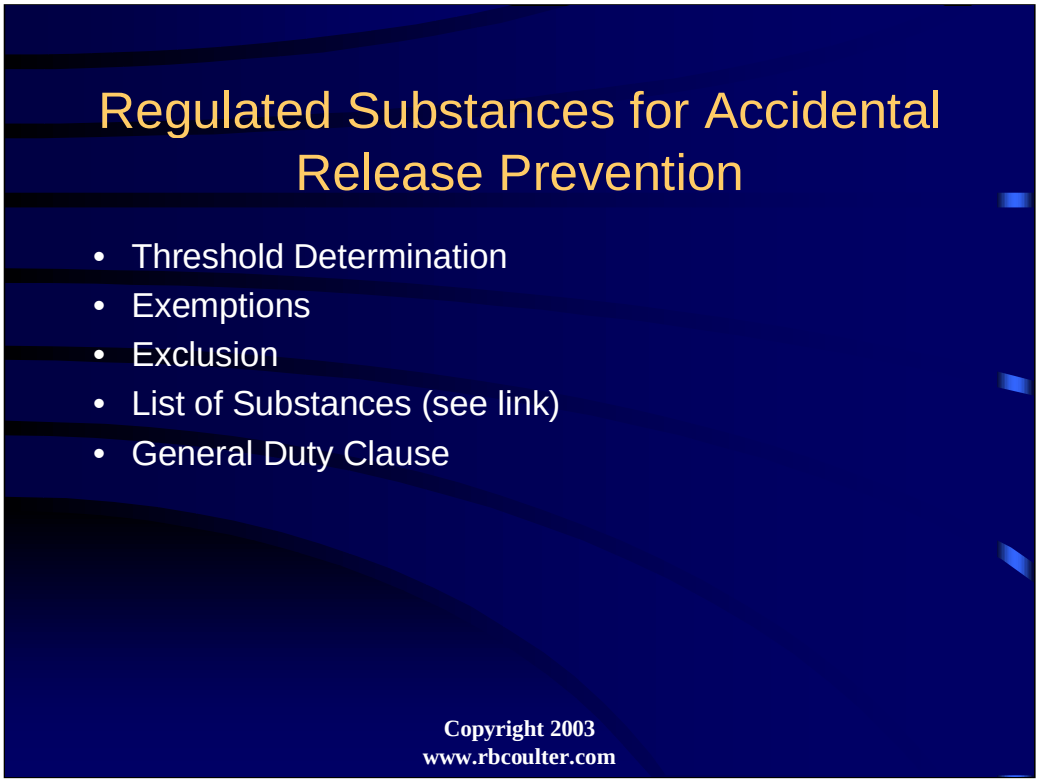


If process is in NAICS code 32211 (Pulp mills), 32411 (Petroleum Refineries, 32511(Petrochemical) , 325181(Alkalies & Chlorine), 325188(Inorganic Chemical), 325192(Cyclic Crude), 325199(Organic chemicals), 325211(Plastic Materials & Resin), 325311(Nitrogenous fertilizer), or 32532(Pesticides) then program 3 is applied to the process.

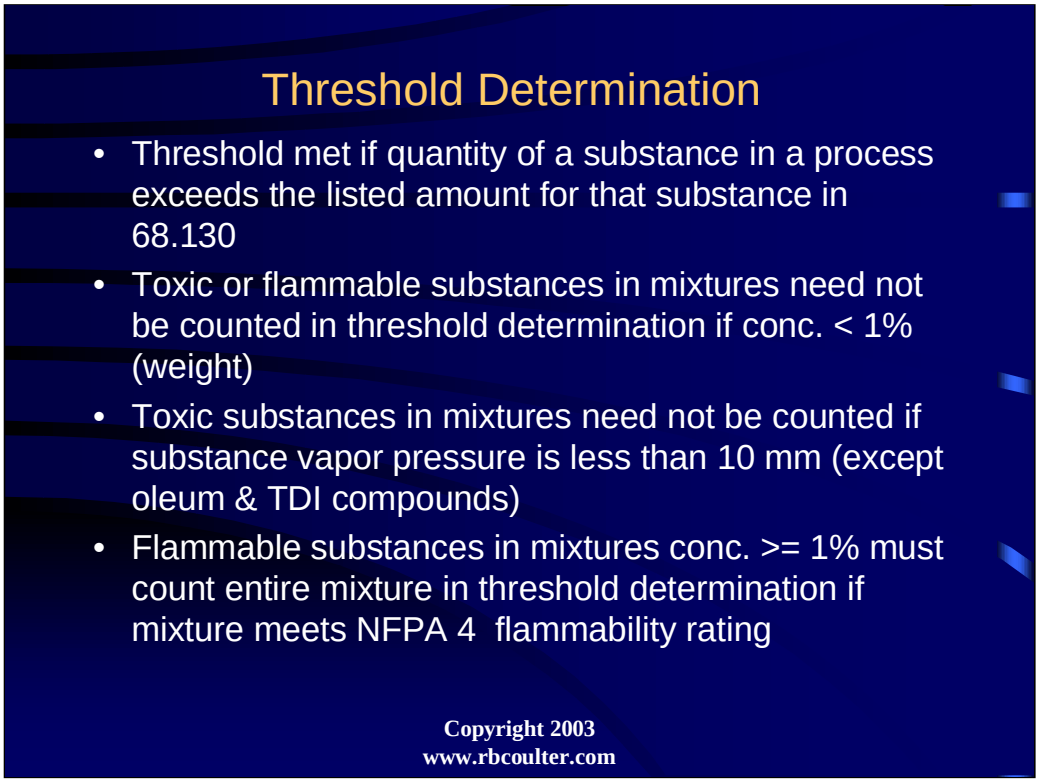
OR

If the process is subject to OSHA's Process Safety Management standard, 29 CFR 1910.119, then program 3 is applied to the process.

If process is not eligible for Program 1 and neither of the above bullets apply, then the process must comply with Program 2



In this section we will discuss the how threshold determinations are made, the exemptions & exclusions to the CAP rule, the list of substances (see the link below) and the General Duty Clause.

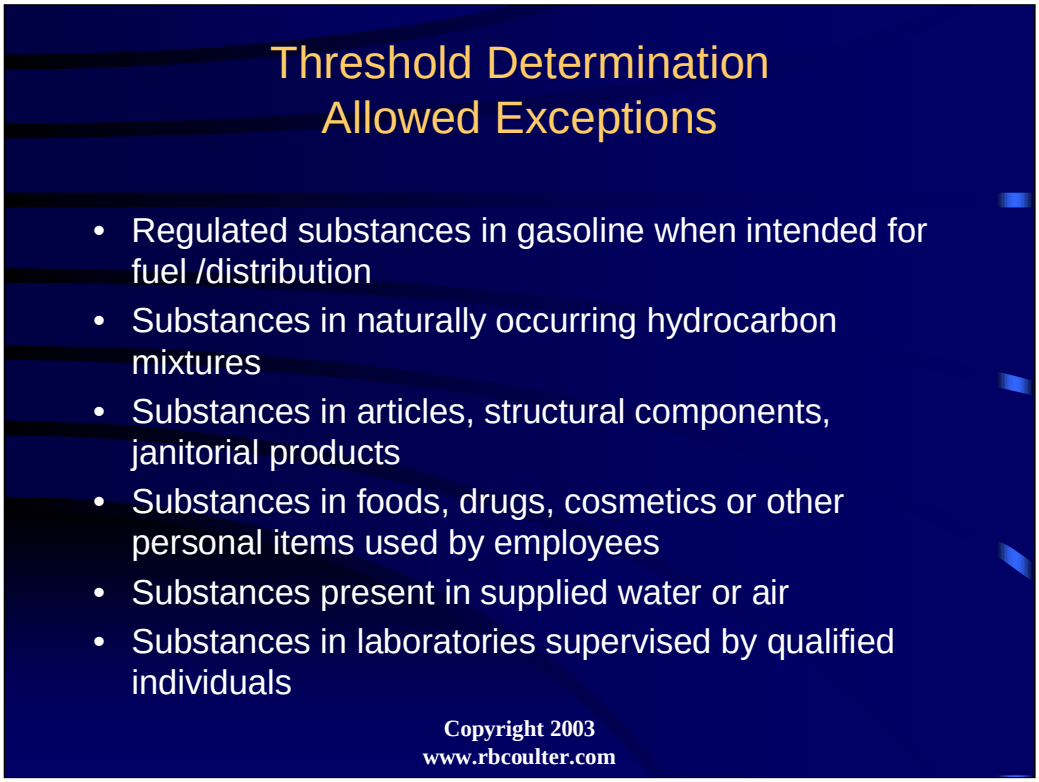


The threshold is met if the quantity of a substance in a process exceeds the listed amount for that substance in 68.130.

Toxic or flammable substances in mixtures need not be counted in the threshold determination if the substance conc.is < 1% (weight). Specifically, this means that that amount of the substance in these mixtures is considered ZERO and does not add to the quantities for that substance in other parts of the process.

Toxic substances in mixtures need not be counted if the substance vapor pressure is less than 10 mm (except oleum & TDI compounds). The owner / operator must prove in some way that this is true (by measurement or calculation).

Flammable substances in mixtures conc. >= 1% must count the entire mixture in the threshold determination if the mixture meets the NFPA 4 flammability rating. For example, a process having a mixture of 9000 lbs of butane and 1001 lbs of water would need to comply with CAP (Assuming that the entire mixture is meets NFPA 4). Note that this does not correspond with the threshold determination for flammable mixtures under OSHA's PSM rule (1910.119).



These substances are exempt from the CAP rule: Regulated substances in gasoline when intended for fuel /distribution. For example, butane in gasoline does not have to count toward the threshold determination.

Substances in naturally occurring hydrocarbon mixtures - This exempts crude oil and natural gas before being refined.

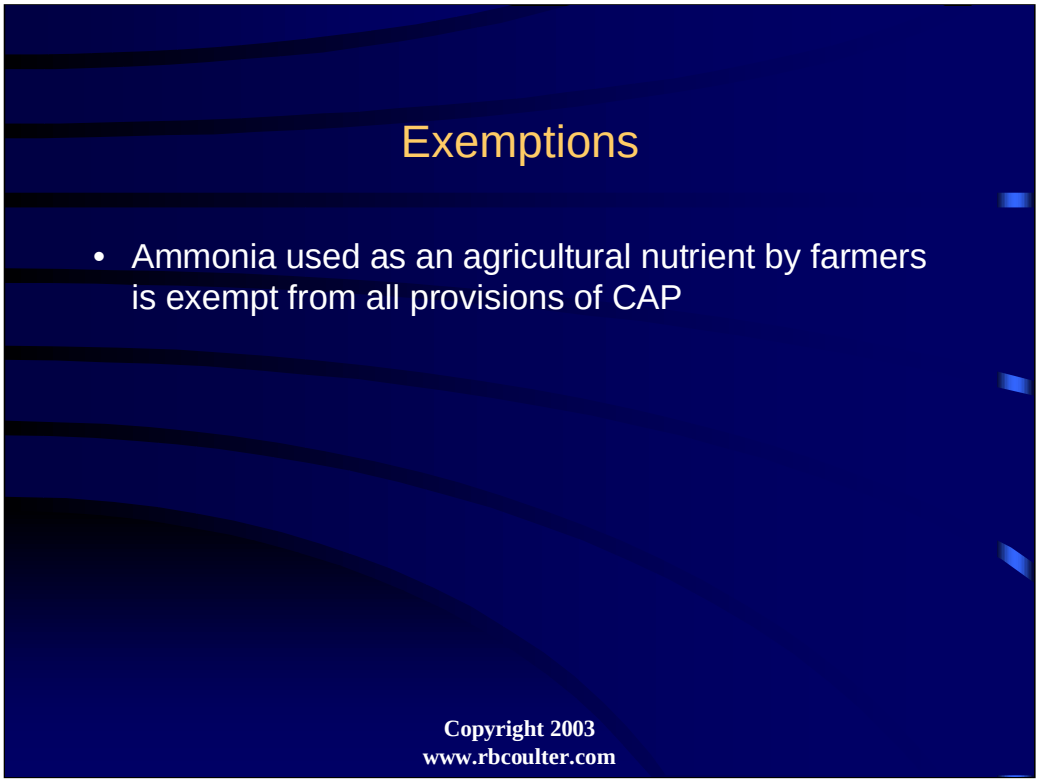
Substances in articles, structural components, janitorial products

Substances in foods, drugs, cosmetics or other personal items used by employees

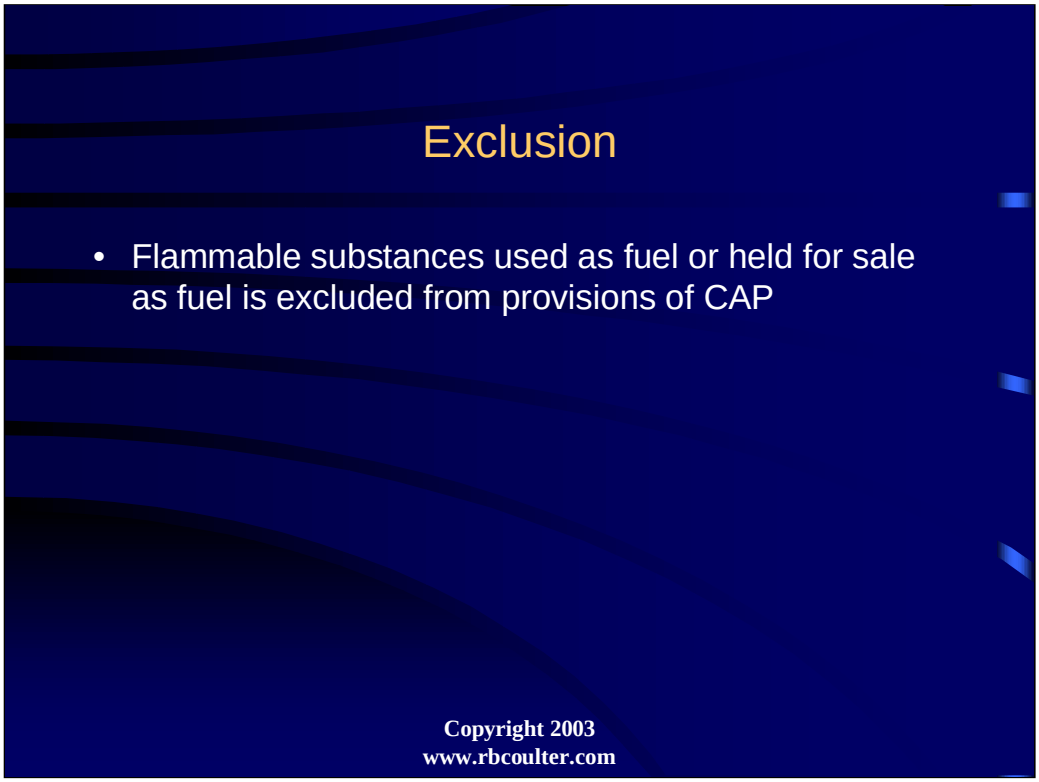
Substances present in supplied water or air - For example, contaminants that might be present in a plant's river water intake.

Substances in laboratories supervised by qualified individuals

The individual must meet the criteria in 40 CFR 720.3 (ee). This does not apply to specialty chemical manufacturing or activities outside of a lab.

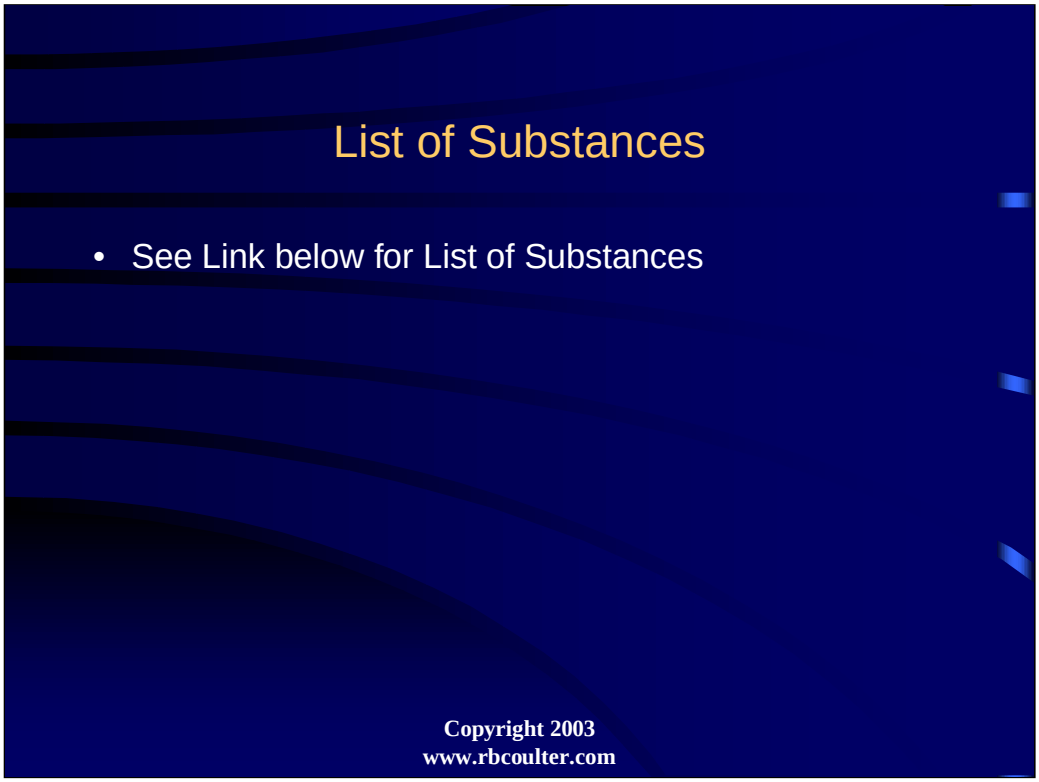


Ammonia used as an agricultural nutrient by farmers is exempt from all provisions of CAP.

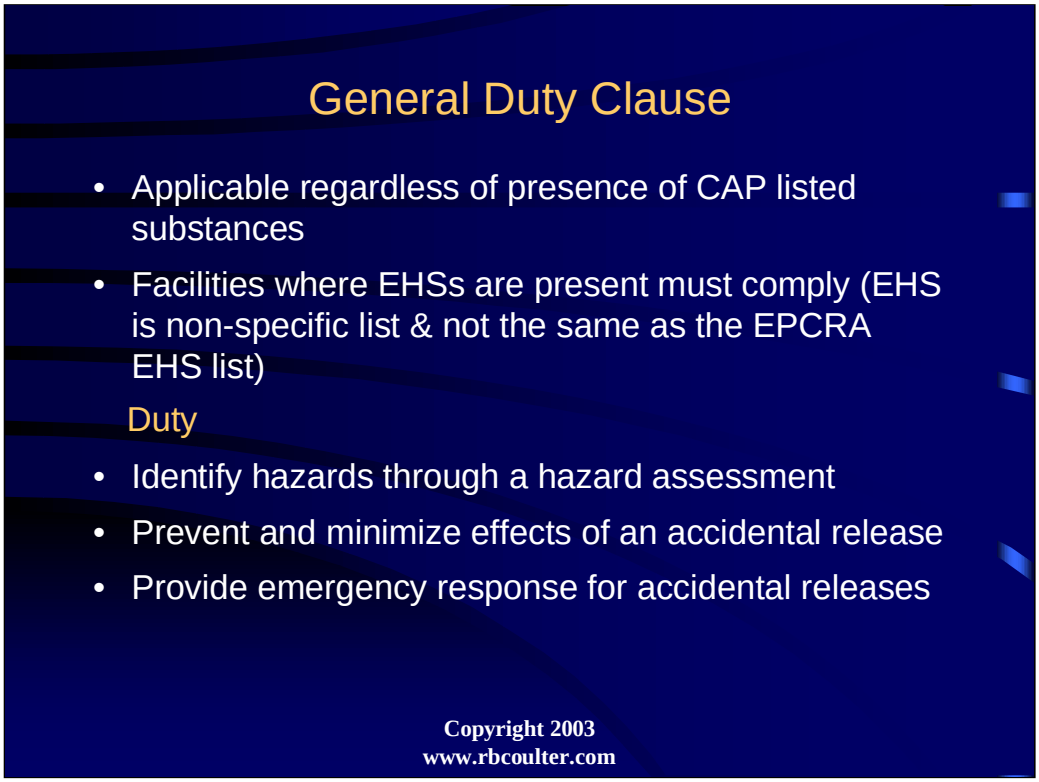


Flammable substances used as fuel or held for sale as fuel is excluded from provisions of the CAP rule.

For example, a tank holding more that 10,000 lbs of propane would be excluded if the propane is being used to fire a boiler or a heater. If; however, the propane is used as a feed stock to a chemical process, it would not be excluded.



A substance on the list may be labeled a "flammable" substances and or a "toxic" substances. A substance cannot be both so one need only to be concerned about one characteristic per substance when doing modeling (WCS or ARS calculations). The toxic substances may have varying thresholds depending on the chemical toxicity (LOC). Flammable substances tend to have all the same threshold - 10,000 lbs.



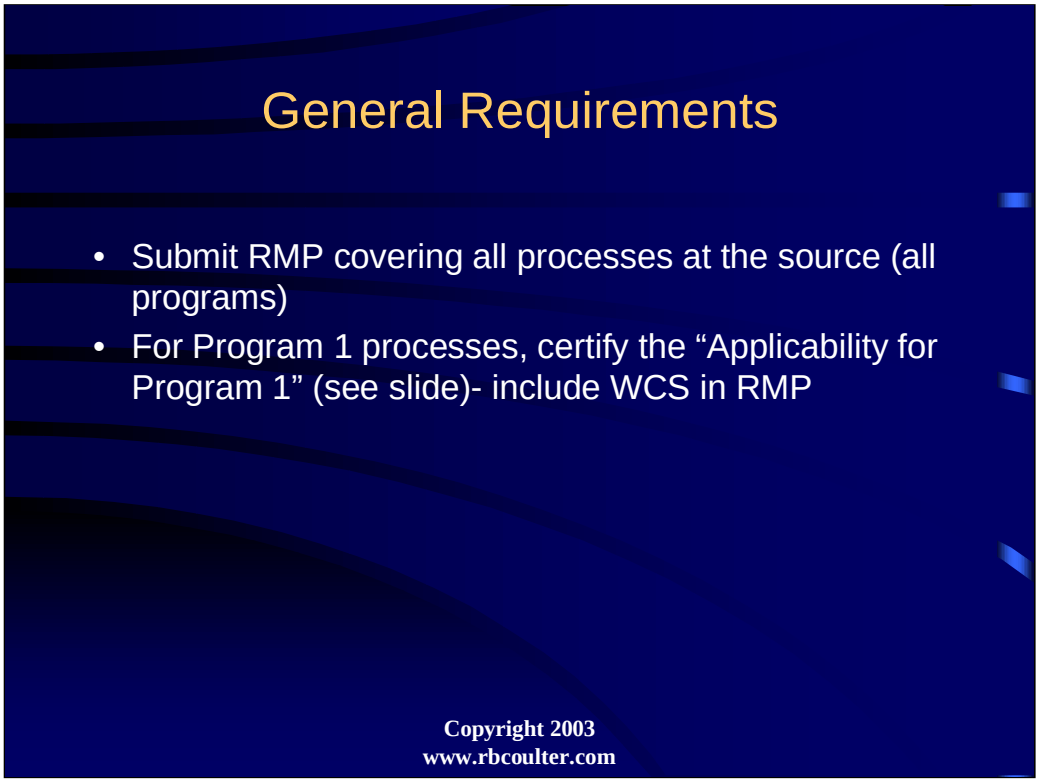
If a source does not meet the CAP applicability requirements, then one might assume that the source does not have to comply with the CAP requirements. This assumption is incorrect. There is a general duty clause within the CAA amendments that makes ANY facility that has the potential to release an EHS to take measures to prevent and/or mitigate the release.

The general duty clause is applicable regardless of presence of CAP listed substances. Facilities where any EHSs are present must comply with this clause. Also, to make matters more difficult, an EHS is non-specific substance not specified on a given list. It is not the same as the EPCRA EHS list.

The general duty clause implies many of the basic elements of CAP. A source needs to:

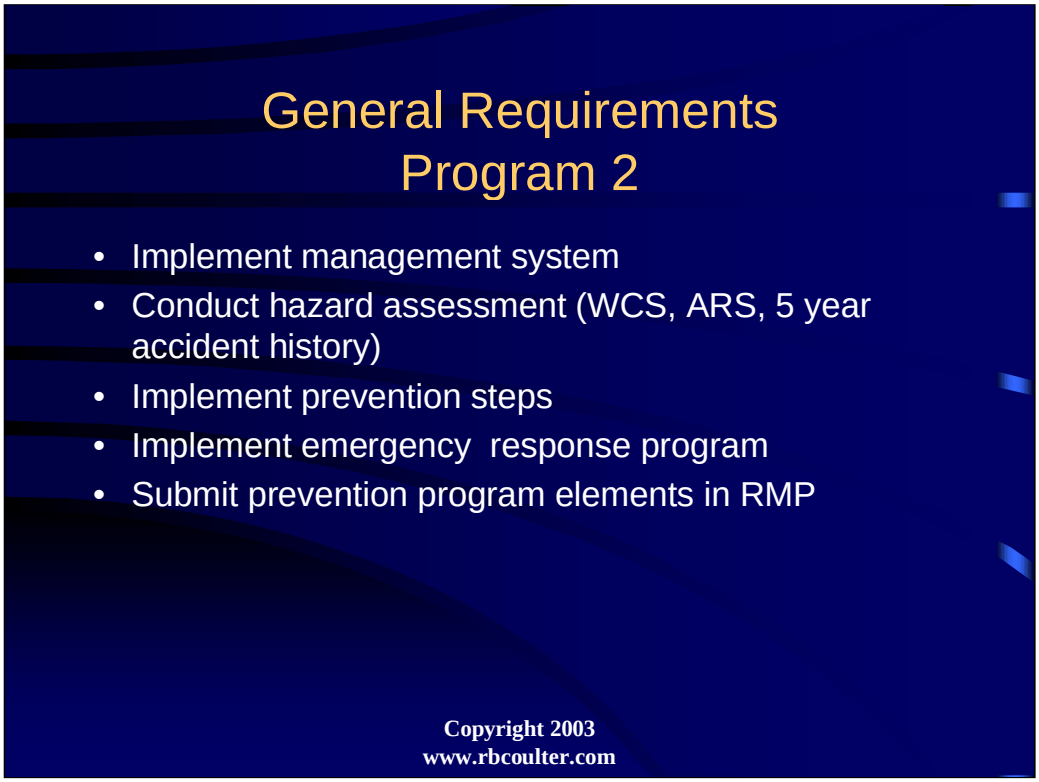
Identify hazards through a hazard assessment, prevent and minimize effects of an accidental release, and provide emergency response for accidental releases.

More detail on the CAA General Duty Clause, see the link below - Guidance For Implementation of the General Duty Clause Clean Air Act Section 112(r)(1).



The general requirements of CAP is to submit RMP (or Risk Management Plan). The RMP is submitted to the EPA or responsible authority and is basically a description of the elements that a source is undertaking to prevent & mitigate releases of listed substances. This RMP must coverall processes at the source (all programs)

For Program 1 processes, the source must certify the “Applicability for Program 1” (see previous slide near the beginning of this presentation) & include the WCS in the RMP. The point here is that for program 1 processes a source is demonstrating that a prevention program is not needed (which is not required for program). A prevention program, whether program 2 or 3, can demand significant resources at a facility.



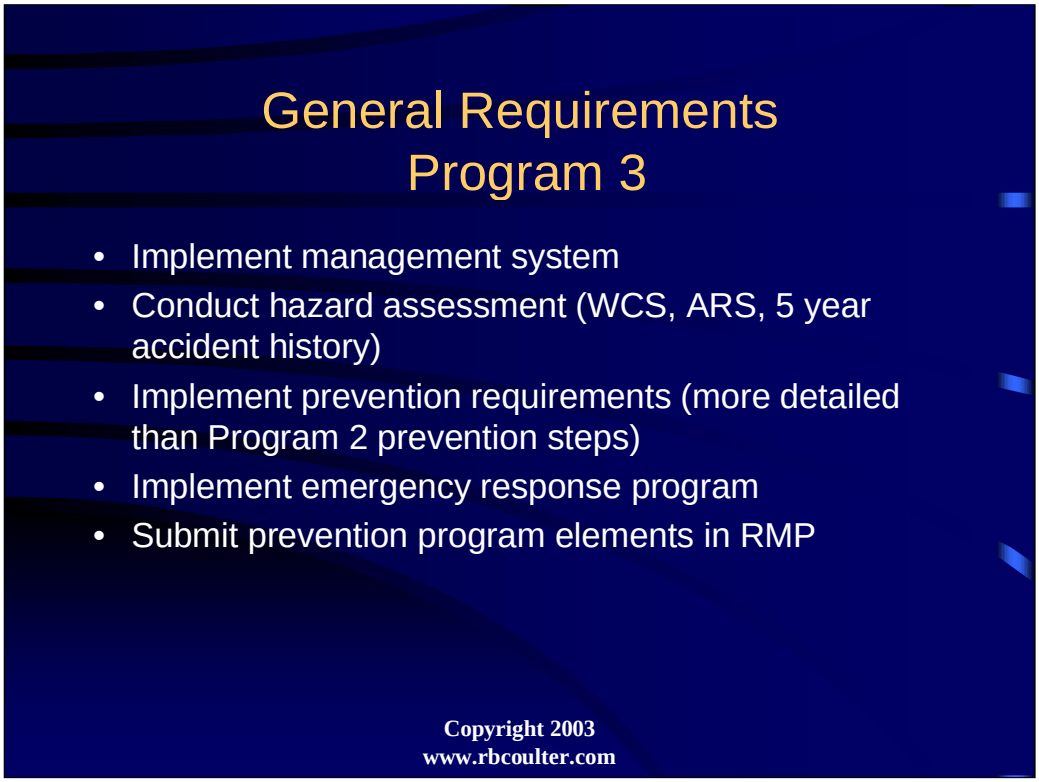
Program 2 requires a prevention & mitigation elements but is not as burdensome as program 3. The key points of program 3 are - Implement management system- This basically defines the responsibility person(s) at a facility for implementing the program and:

Conduct hazard assessment (WCS, ARS, 5 year accident history)

Implement prevention steps

Implement emergency response program

Submit prevention program elements in RMP



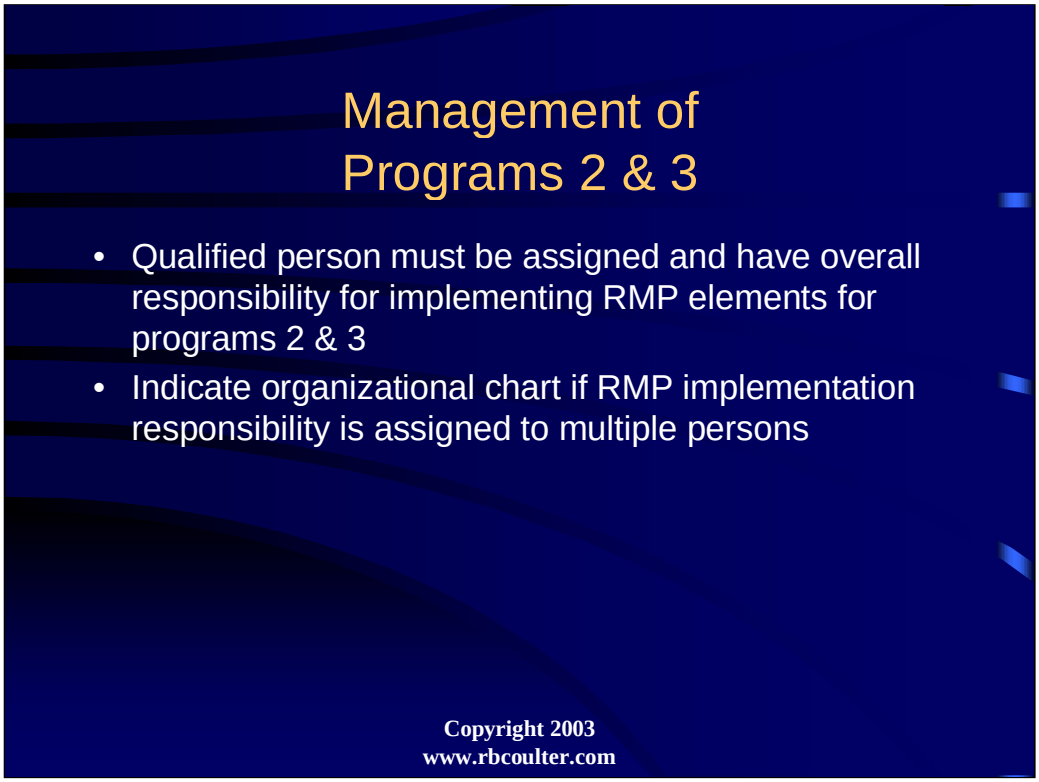
Program 3 requires the most resources and is very similar to the compliance provisions of OSHA's Process Safety Management Standard (29 CFR 1910.11) The elements for program 2 are: Implement a management system (like program 2)

Conduct hazard assessment (WCS, ARS, 5 year accident history)

Implement prevention requirements (This is where Program 3 is more complex than program 2 and is similar to PSM .

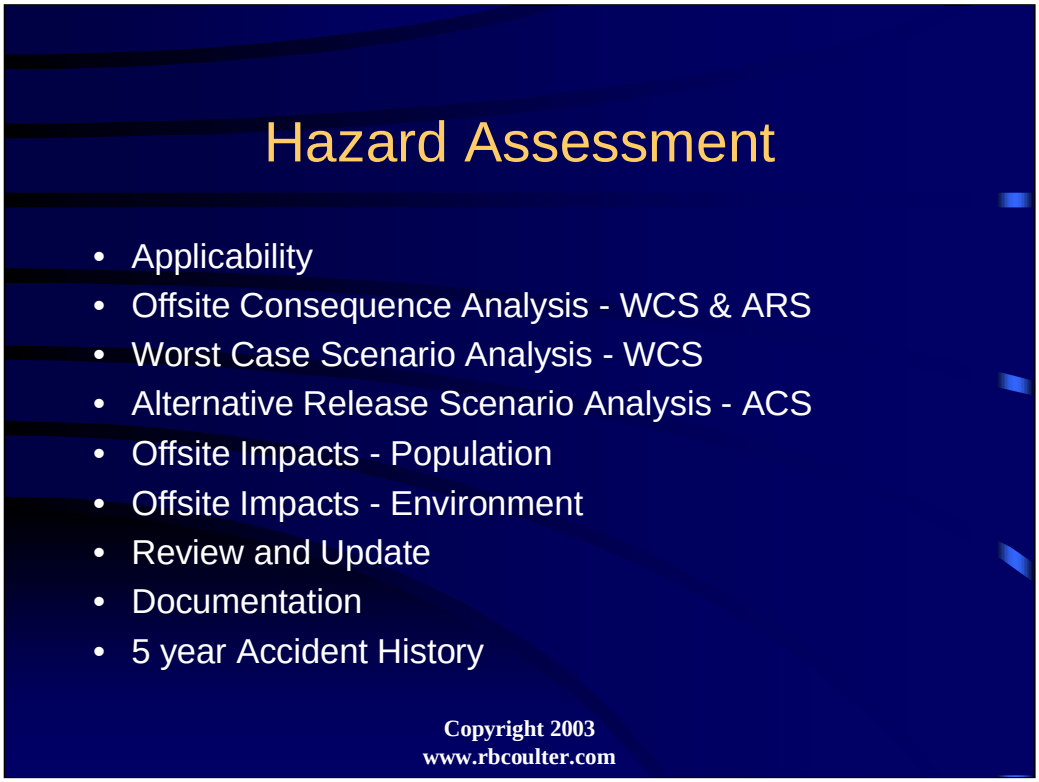
Implement emergency response program

Submit prevention program elements in RMP



Qualified person must be assigned and have overall responsibility for implementing RMP elements for programs 2 & 3. There is not a specific qualification or title that this person must have but simply designated & documented in some way that they are the responsible person for implementing RMP elements at a facility.

In some cases, like for very large facilities with multiple covered processes, there may need to be more that one person involved in ensuring RMP compliance. If this is done then an organizational chart should be made clearly outlining the persons responsibility and their responsible areas. For example, an engineering manager may be responsible for the management of change program. The maintenance manager of a facility may be responsible for the mechanical integrity program. The production leader may have responsibility for the entire program. Even with multiple persons responsible for compliance, 68.15(a), says that there must be one that has overall responsibility for the program.



A hazard assessment is an objective analysis of the effects of a release of a listed substance from a process. The heart of a hazard assessment is the modeling of WCSs & ARSs. These involve calculating the distance of projection of dispersion plumes, blast waves or radiant heat. This is then compared to sensitive receptors (public & environmental) that may be near the source or process. The hazard assessment in CAP involves:

Offsite Consequence Analysis - WCS & ARS

Worst Case Scenario Analysis - WCS

Alternative Release Scenario Analysis - ACS

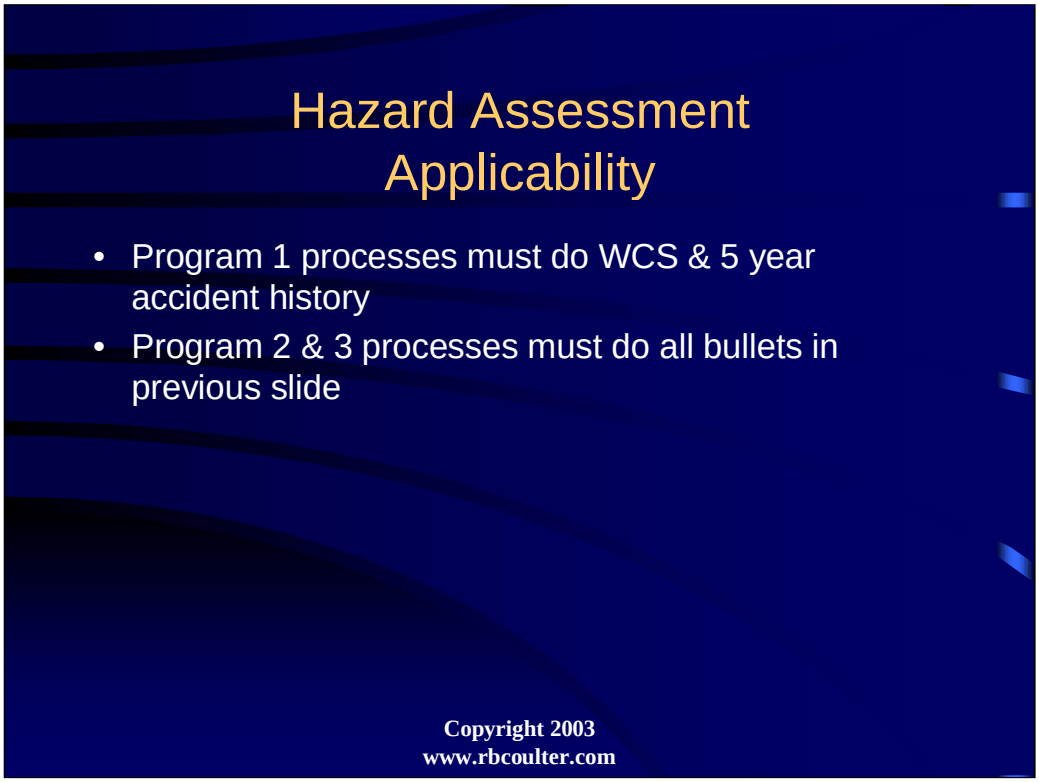
Offsite Impacts - Population

Offsite Impacts - Environment

Review and Update

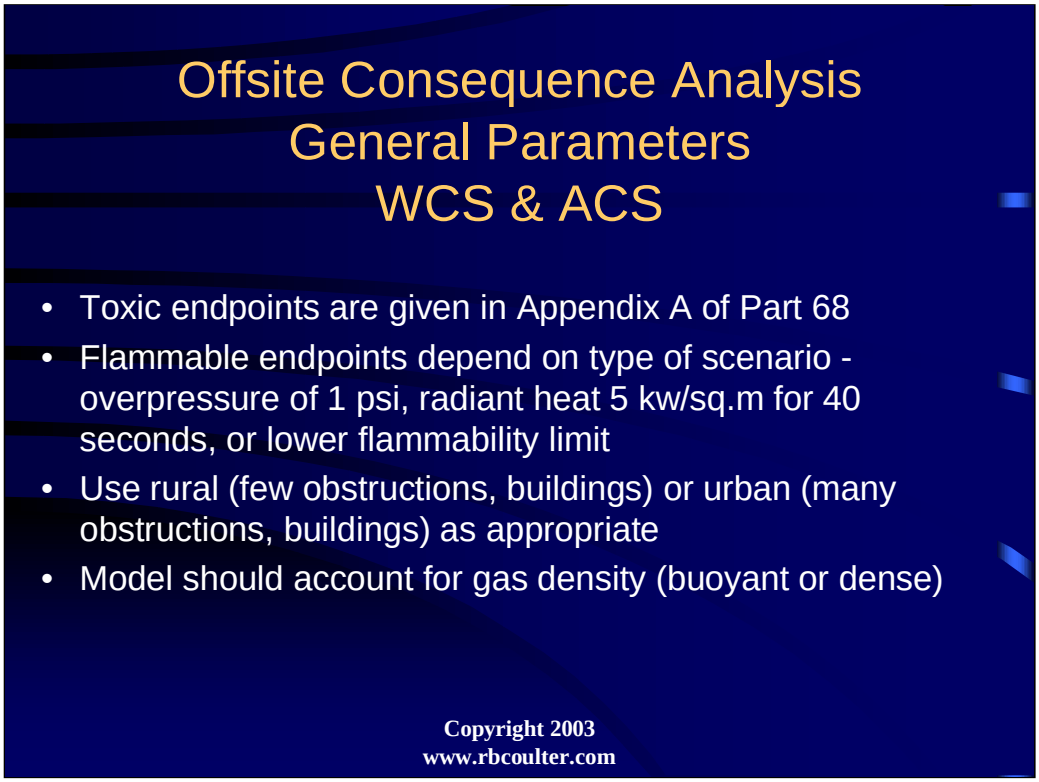
Documentation

5 year Accident History



Program 1 processes must do WCS & 5 year accident history. This is to prove that the WCS does not reach an offsite receptor. The 5 year accident history is a way of validating the WCS & ensuring that there was no accident in the past 5 years that reached a receptor.

Program 2 & 3 processes must do all bullets in previous slide.

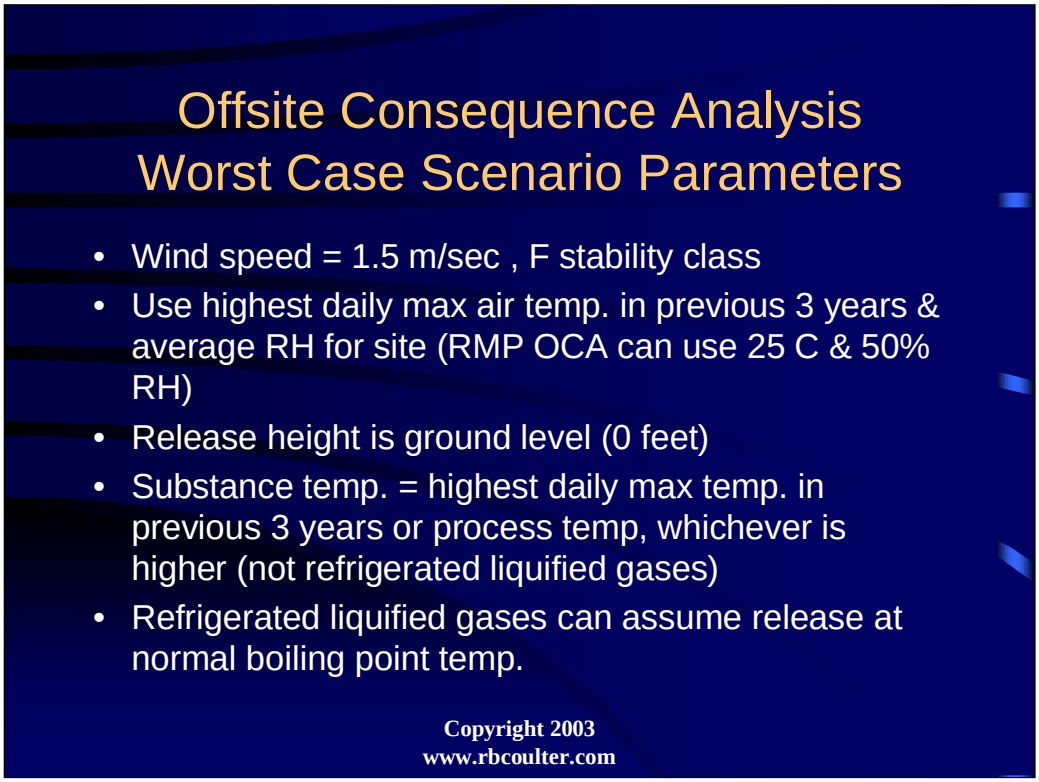


These are the basic inputs into the WCS & ACS models. Toxic endpoints are the LOC (see definitions slide) for a listed toxic substance and are shown in Appendix A of Part 68. Unlike flammable substances, the endpoints for toxic substances vary based on toxicity.

Flammable endpoints depend on type of scenario model. The typical model assumes an explosion with the endpoint being the distance to an overpressure of 1 psi. A radiant heat model has an endpoint of 5 kw/sq.m for 40 seconds. Or the lower flammability limit can be used as an endpoint of a flammability model.

The modeler has a choice of rural (few obstructions, buildings) or urban (many obstructions, buildings). Urban settings tend to disperse a cloud whereas a rural setting tends to allow a cloud to stay concentrated in a narrow cone.

The model should account for gas density (buoyant or dense). This is important to note because many models - (ARCHIE, etc) assume a buoyant (lighter than air) model for the release substance. Although the EPA does not seem to specifically discourage use of these models, it would appear that the results of these models could be questioned by a regulator. The EPA OCA guidance document appears to be the best reference for calculating these scenarios. (See the OCAGD link below).



WCS parameters (or input variables), by their nature, will cause the model to output its greatest endpoint distance. The wind speed of 1.5 m/sec , F stability class cause the least dispersion (or diluting) of substance and therefore are required by CAP for input into the WCS model.

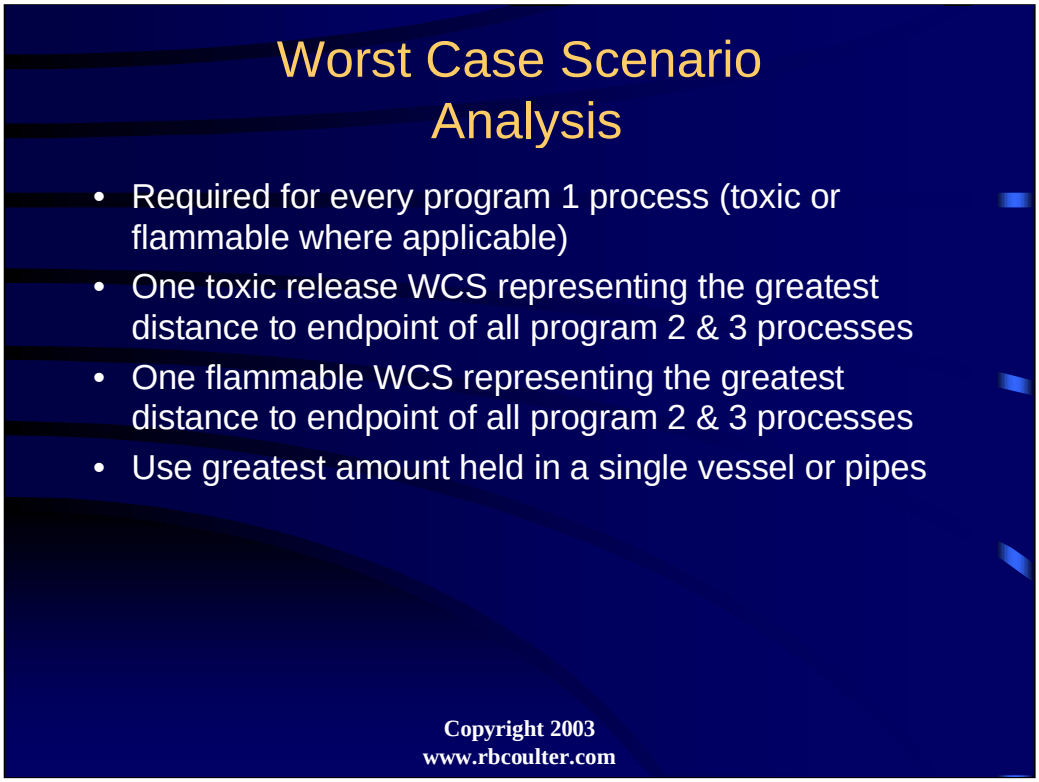
The other bullets on this slide also swing the results of the model to its maximum endpoint distance.

The WCS mode should use highest daily max air temp. in previous 3 years & average RH for the site. An interesting exception is that those who use RMP OCA guidance can use 25 C & 50% RH.

The WCS model should use a release height of ground level (0 feet).

The substance temp. should = the highest daily max temp. in the previous 3 years or the process temp, whichever is higher. This does not apply to refrigerated liquified gases.

Refrigerated liquified gases can assume release at normal boiling point temp. The assumption here, by the CAP rule, is that these liquified gases will only warm to their atmospheric boiling points upon loss of refrigeration.



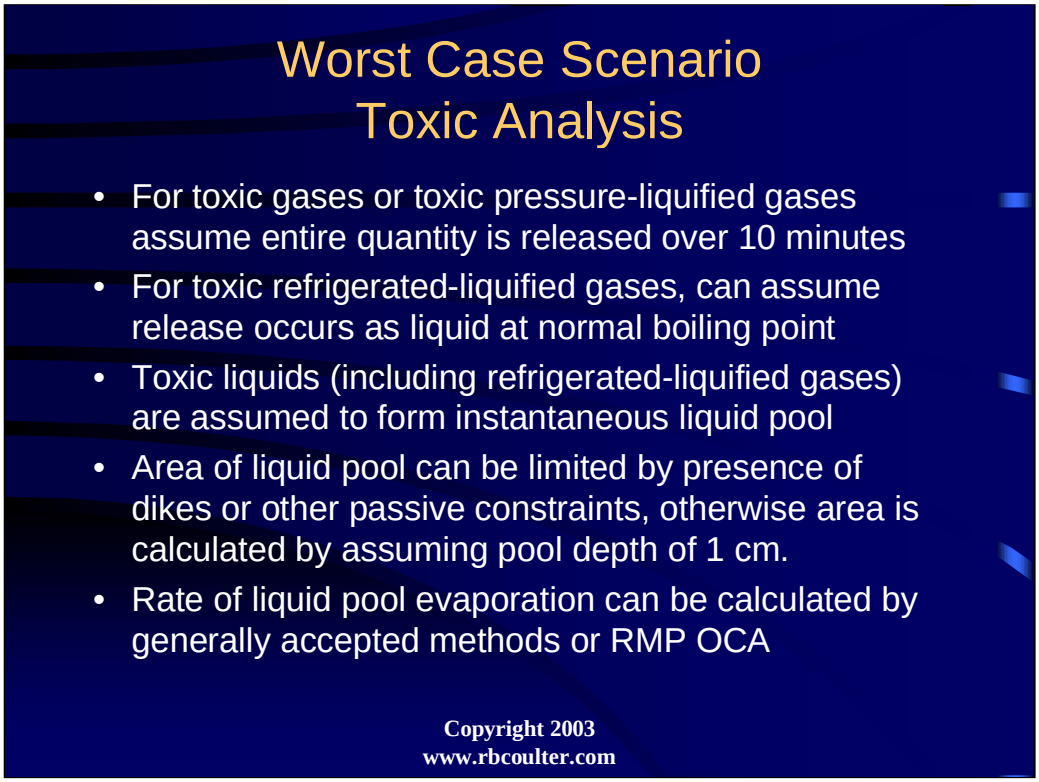
The number of WCS models required are as follows: One for every program 1 process (toxic or flammable where applicable) as mentioned earlier.

One toxic release WCS representing the greatest distance to endpoint of all program 2 & 3 processes

One flammable WCS representing the greatest distance to endpoint of all program 2 & 3 processes.

Note that a WCS does not have to be done for every covered process in program 2 or 3. For example, a facility may have seven covered processes under program 2 & 3. It very likely that only one WCS would need to be done that represents all these processes. Two would be required if there is a flammable covered process & a toxic covered process. In rare cases, an additional (third) WCS may need to be submitted for program 2 or 3 processes. This is required if for some reason the WCS for a covered process is not similar to the representative WCS.

The WCS must assume that the greatest amount held in a single vessel or pipe system is released.



For a WCS scenario involving the release of a toxic gas or toxic pressure-liquified gases, one must assume the entire quantity is released over 10 minutes. In this case the release rate is the quantity of toxic substance divided by 10 minutes.

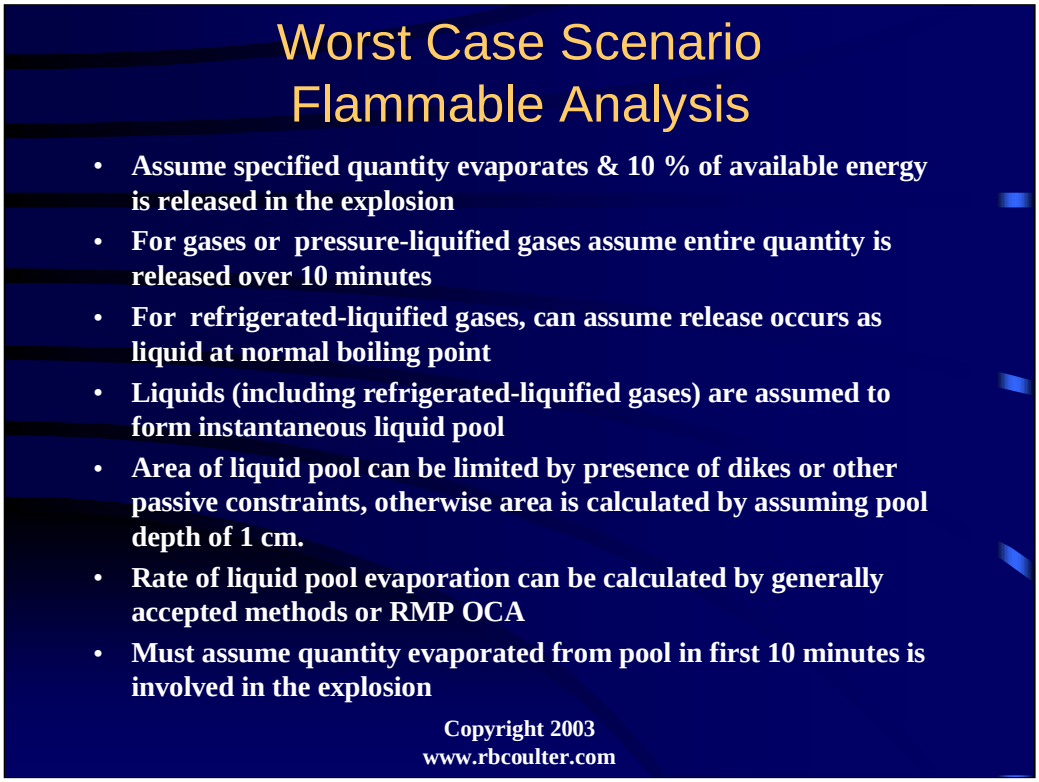
For a WCS scenario involving a toxic refrigerated-liquified gases, one can assume the release occurs as liquid at its normal boiling point. The release rate would be calculated as an evaporating liquid from a pool (as will be discussed below).

WCS toxic liquids (including refrigerated-liquified gases) are assumed to form instantaneous liquid pool. No time is granted for a substance to "leak" from a storage tank or process as would be allowed under an ARS.

The area of the liquid pool can be limited by presence of dikes or other passive constraints. A passive constraint is a physical non-active mitigation measure. Otherwise the pool area is calculated by assuming the liquid spreads out immediately and forms a pool depth of 1 cm. The area of the pool is therefore numerical equal to the volume of liquid released if vol = cubic centimeters and area = sq. centimeters.

Rate of the vapor released from the liquid pool can be calculated by generally accepted methods. EPA's RMP OCA guidance document is a good choice.

See link below.



For a flammable WCS one must assume the specified quantity (as indicated below) evaporates & 10 % of available energy is released in the explosion.

For gases or pressure-liquified gases one must assume that the entire quantity in the process is released over 10 minutes is ignited, and an explosion occurs.

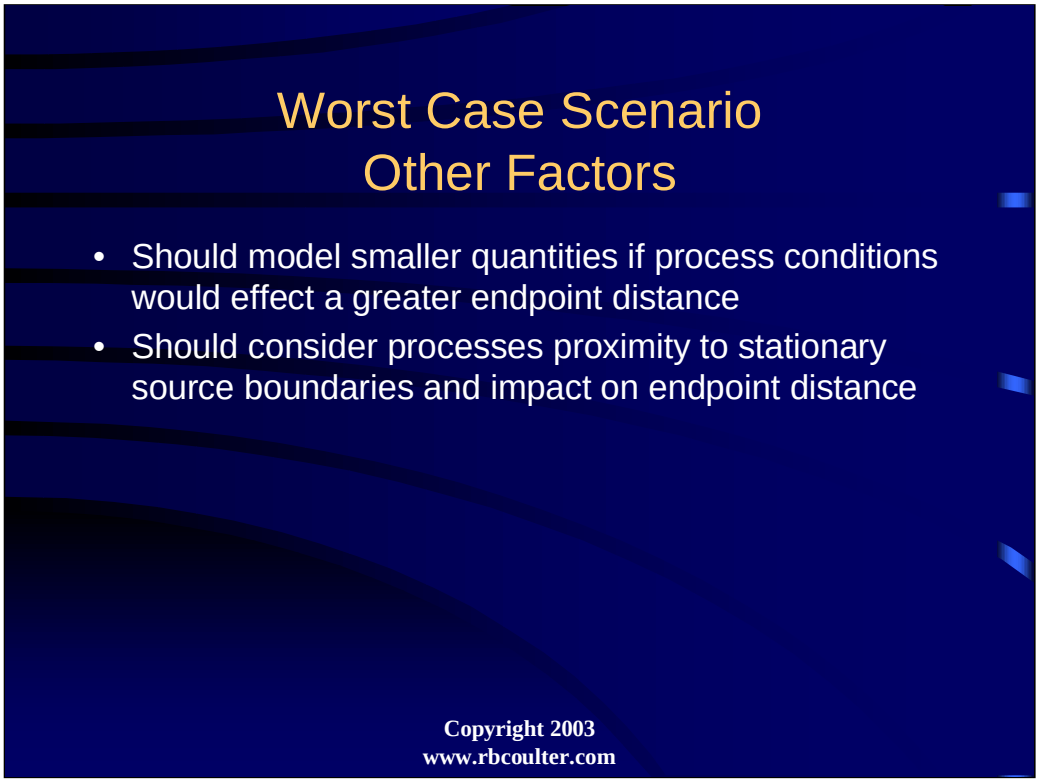
For refrigerated-liquified gases, can assume the release occurs as a liquid at normal boiling point. That is, one may calculate an evaporative release rate similar to a liquid.

Liquids (including refrigerated-liquified gases) are assumed to form instantaneous liquid pool.

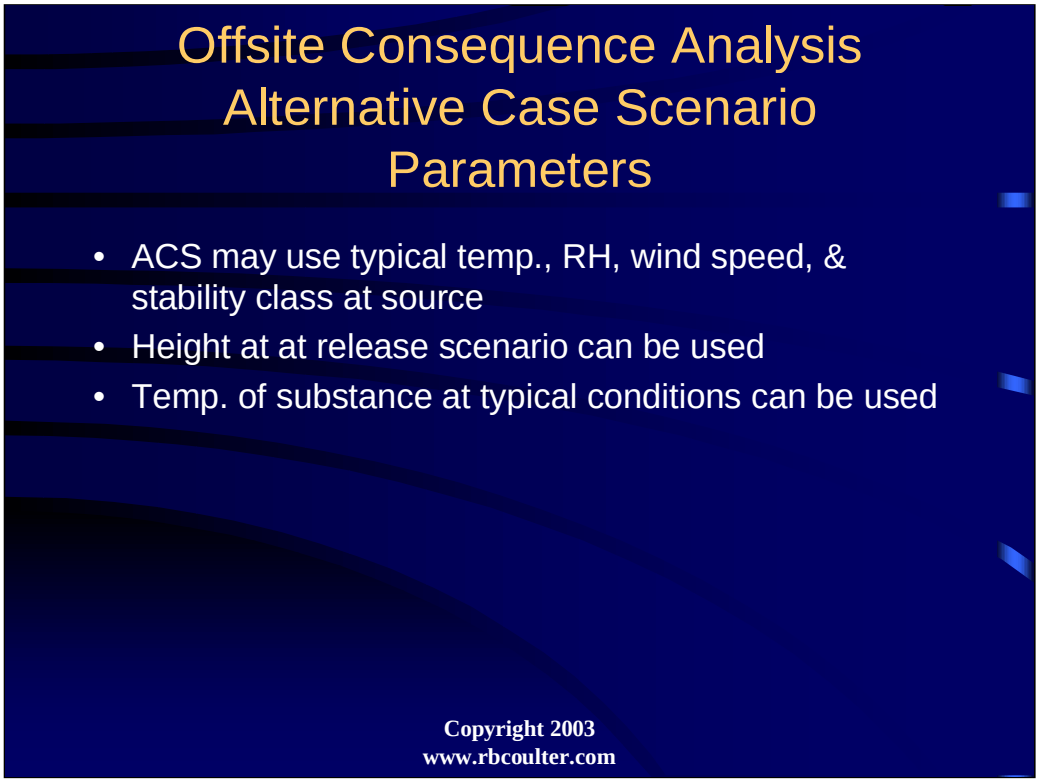
The area of the liquid pool can be limited by presence of dikes or other passive constraints, otherwise the area is calculated by assuming the pool depth of 1 cm. (Similar to the toxic pool calculation in the previous slide.)

The rate of liquid pool evaporation can be calculated by generally accepted methods or RMP OCA. See the OCA guidance link below.

For liquids one must assume the quantity evaporated from pool in the first 10 minutes is involved in the explosion. Note - it is then 10% of this that is assumed to contribute to the energy of the explosion.

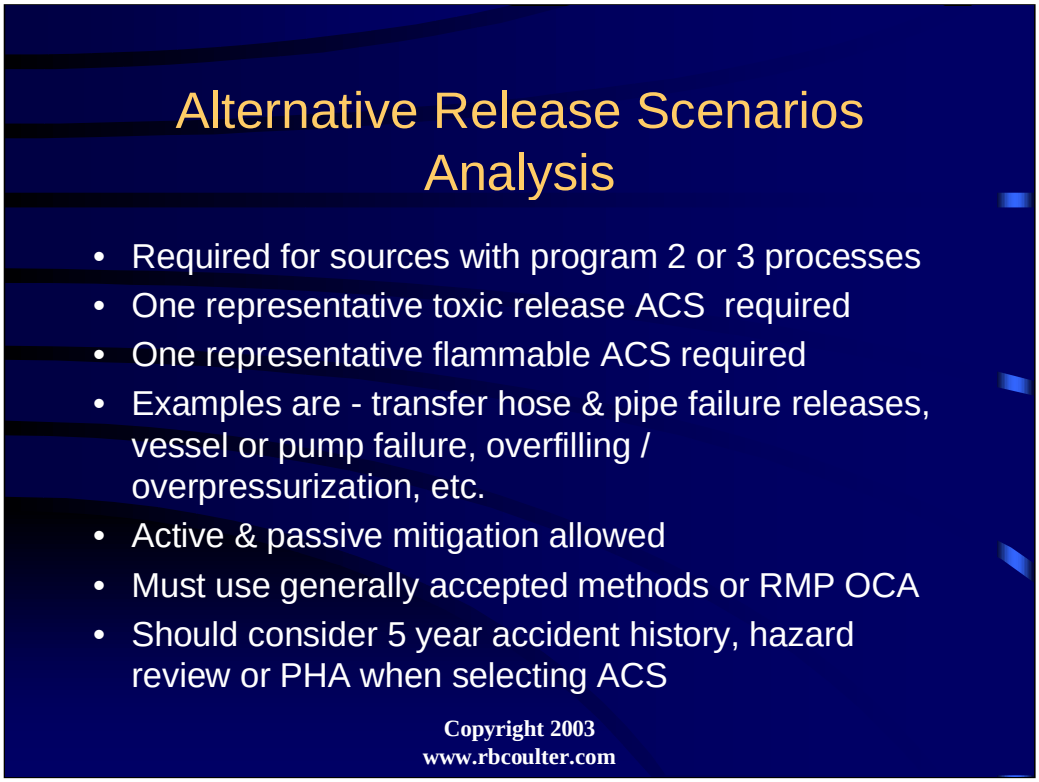


In some cases a process with a smaller amount of a substance may actually have a "worse" WCS than another process with a greater amount of the same or equivalent substance. For example, 11,000 pounds of propane being stored at ambient pressure & temperature may be a greater hazard than 15,000 pounds of propane stored as a refrigerated liquid. Also, a process with a smaller amount of substance can be a greater hazard if it located close to a plant boundary that neighbors a public receptor. In these cases, one is expected to model the smaller quantity process because of its greater potential impact on the public. This, of course, applies only to program 2 or 3 processes since ALL program 1 processes must have WCS models.



In doing a ACS much latitude is granted in deciding the input parameters to the model. Typical temp., RH, wind speed, & stability class at the location of the process may be used. The actual height of the release can be used (for example, a release from a 100 ft. flare stack)

The temp. of the substance at average conditions can be used.



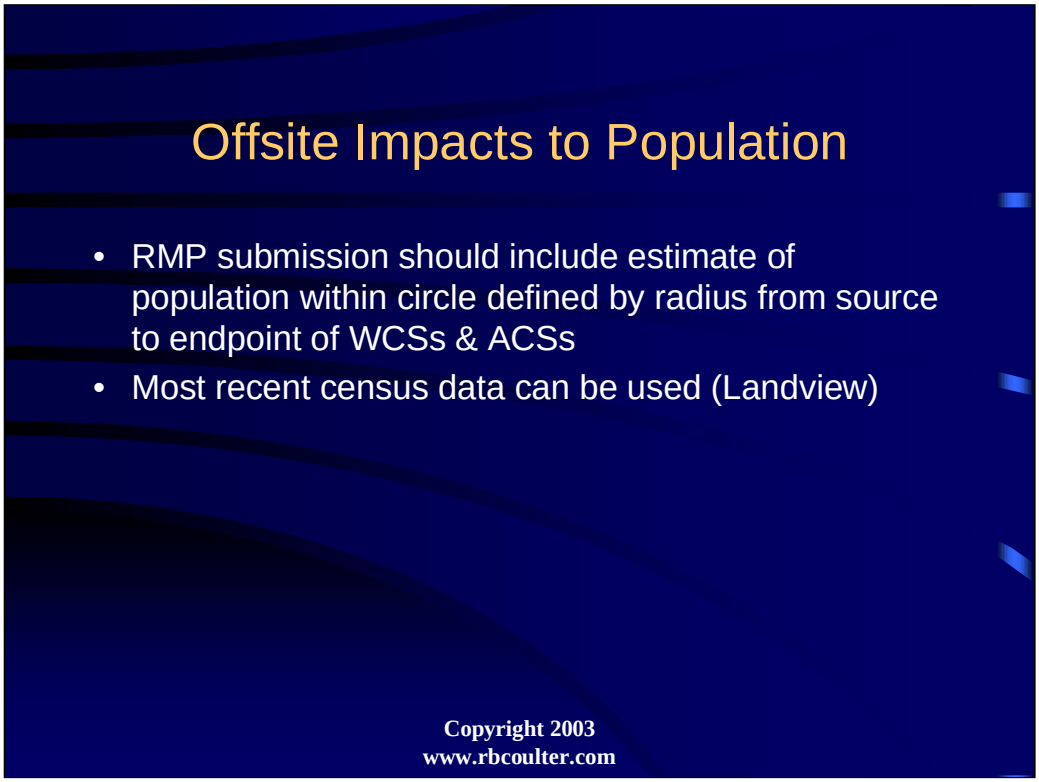
Similar to WCSs, ARSs are required for sources with program 2 or 3 processes. One representative toxic release ACS is required and one representative flammable ACS is required.

Many scenarios can be chosen. Typical scenarios involve transfer hose & pipe failure releases, vessel or pump failure, overfilling / overpressurization, etc.

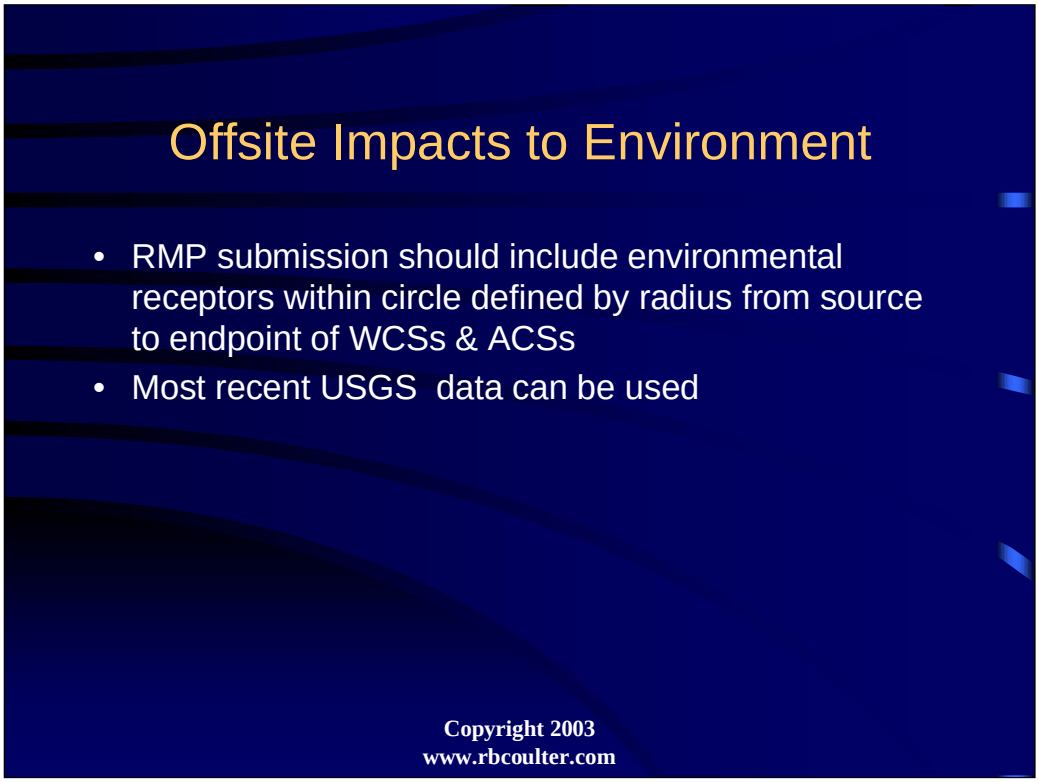
Active & passive mitigation is allowed. Examples of active mitigation are emergency shutdown systems and automatic sprinkler or deluge equipment.

One should use generally accepted methods or use the RMP OCA guidance document. See link below.

One should consider the 5 year accident history at the source, hazard review or PHA when selecting ACS.

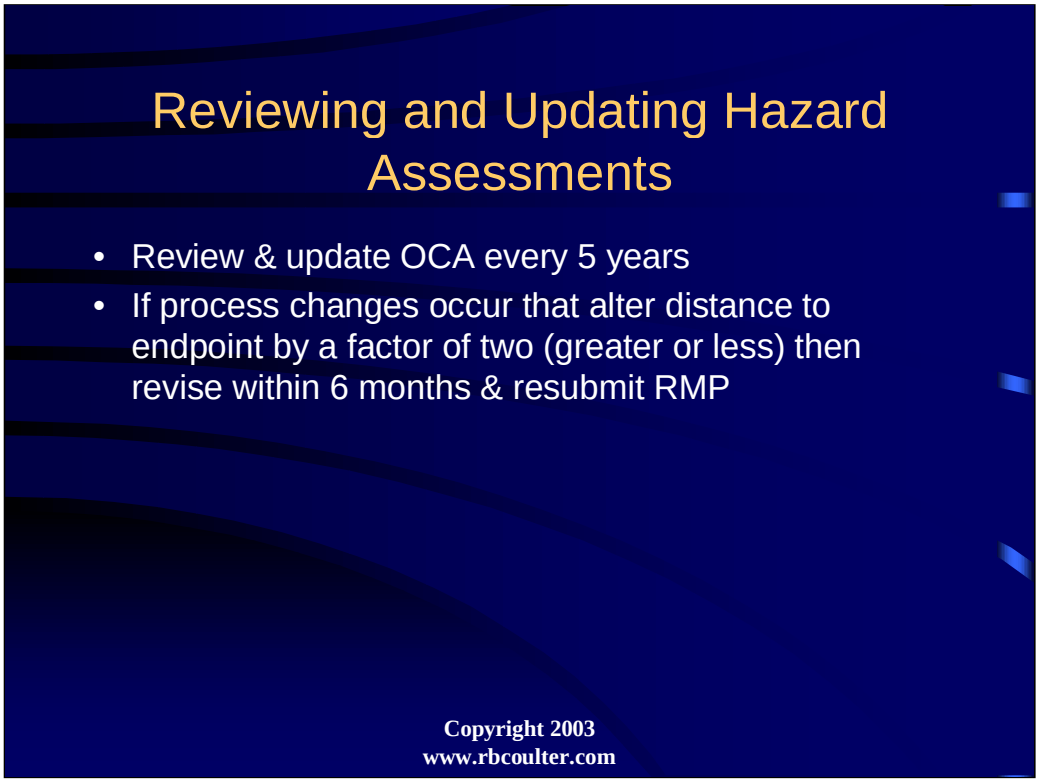


RMP submission should include estimate of the population within a circle defined by a radius drawn from the process to the endpoint determined by the WCS & ACS models. The most recent census data can be used. Some models (e.g. Landview) allow the user to simply click on a point on the computer screen and draw a line. A circle is then defined at which the program would automatically determine the population within the circle. The Landview link is listed below. Free sources of population data may be retrieved from the U.S. census bureau website link below.

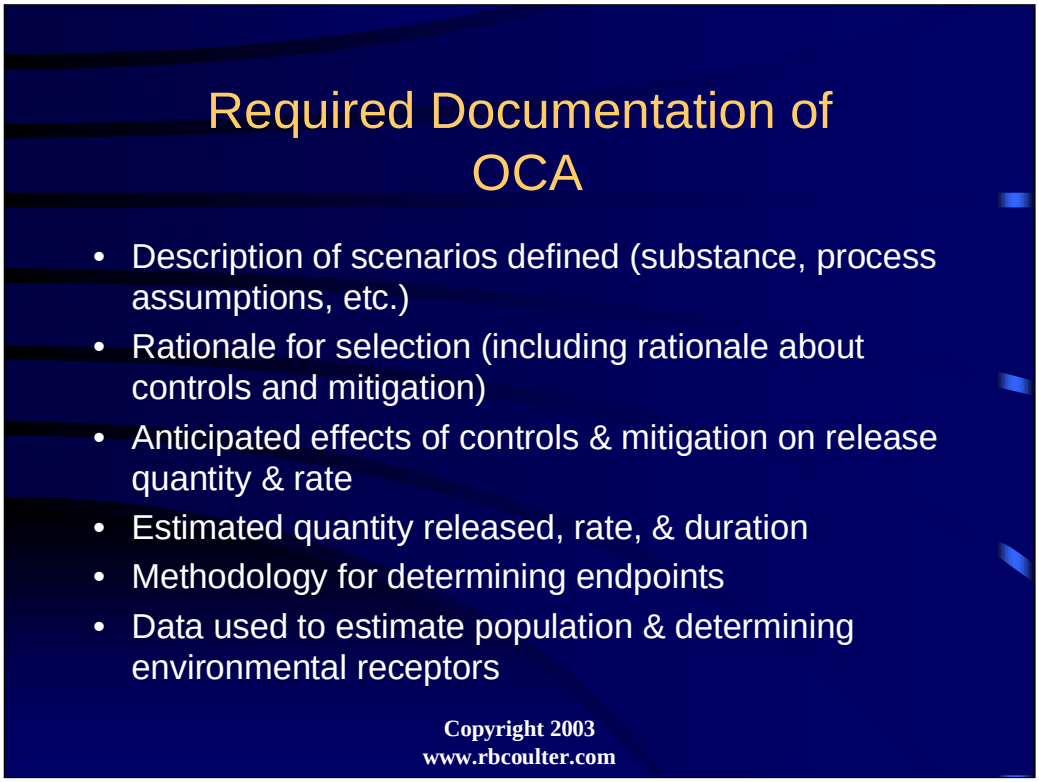


Also, the RMP submission should include the environmental receptors within circle defined by the radius drawn similar to the previous slide.

The USGS data can be used to determine the environmental receptors. The link to the USGS website is provided below.



Once the OCA have been performed they should be reviewed & updated every 5 years. If process changes occur that alter the distance to the endpoint by a factor of two (greater or less) then revise within 6 months & then resubmit the RMP. For example, if the endpoint distance for a model was 3 miles, then the RMP should be resubmitted if the endpoint distance increases to 6 miles are decreases to 1.5 miles.



The OCA documentation the must be retained are: the descriptions of scenarios defined (substance, process assumptions, etc.)

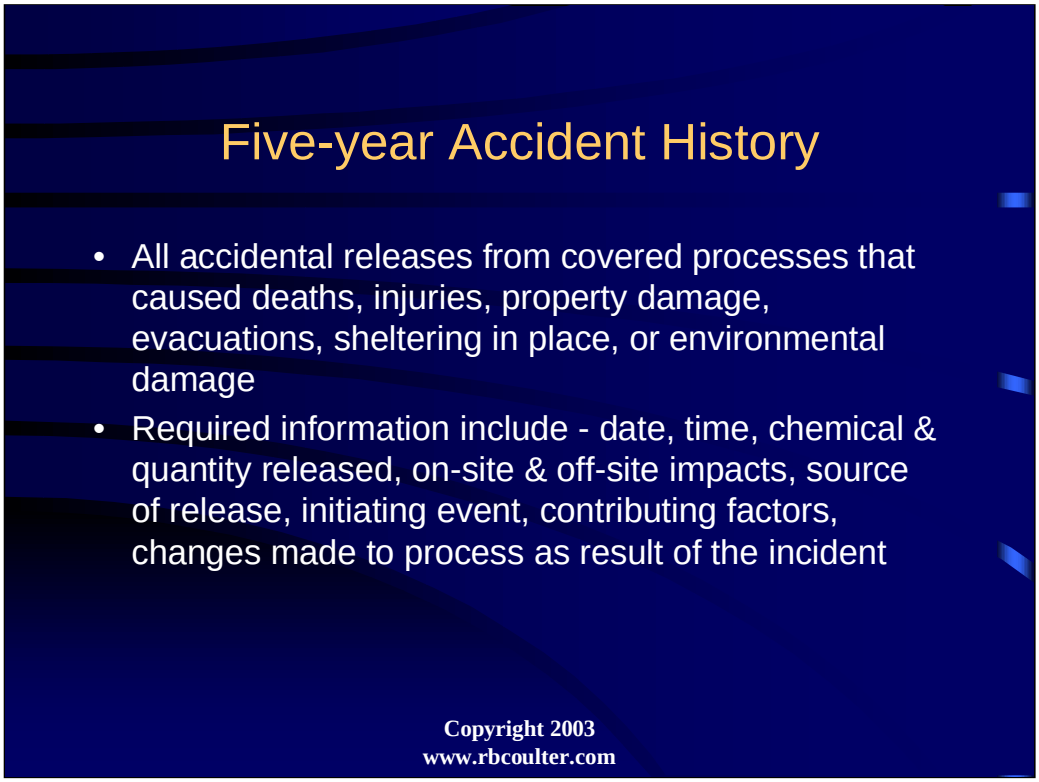
Rationale for selection of a models parameters (including rationale about controls and mitigation)

The anticipated effects (hazards to receptors) of controls & mitigation on the amount of substance released & the release rate.

The estimated quantity of substance released, the release rate, & duration of the release.

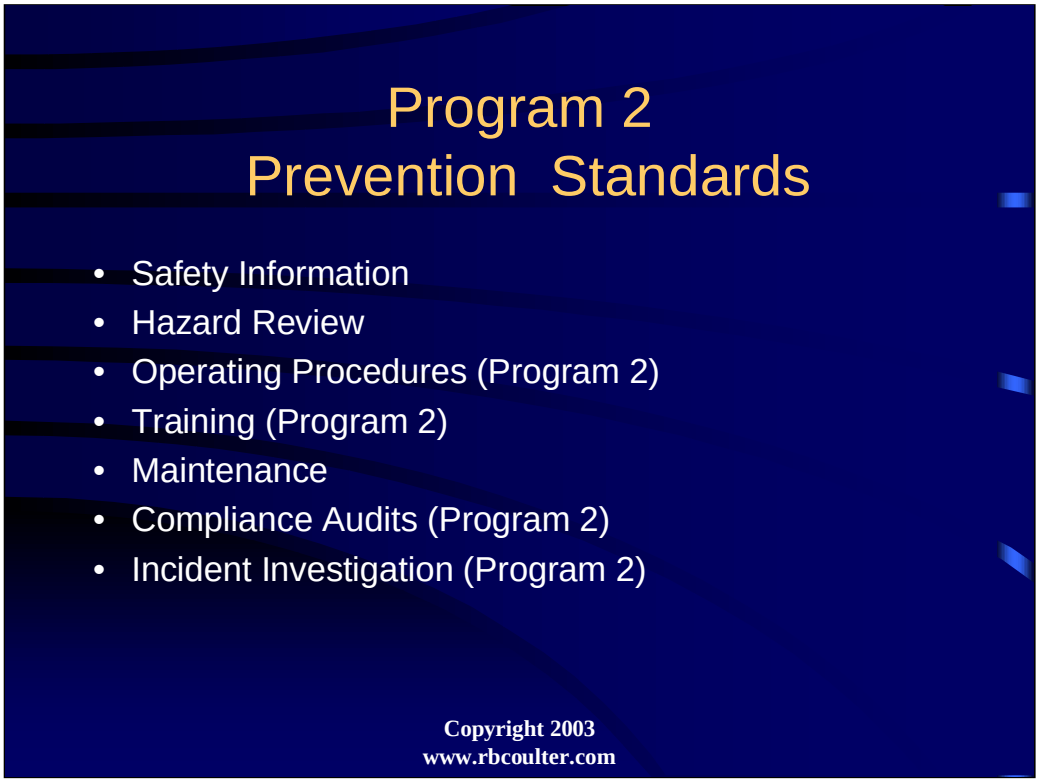
The methodology for determining the endpoints (proprietary models, OCA, etc.).

Data used to estimate the population & determining the environmental receptors within the circle defined by the source to endpoint radius.



The five year accident history is considered part of the hazard assessment. The criteria for this 5 year accident history is broader than the 5 year accident history criteria needed to qualify a process for program 1 (see previous slides concerning program 1). For example, an accident that resulted a sheltering in place response would need to be listed here but would not, in itself, exclude a process from qualifying for program 1. The accidents that need to be listed here are those from covered processes that caused deaths, injuries, property damage, evacuations, sheltering in place, or environmental damage.

The required information that needs to be included in the accident history are - date, time, chemical & quantity released, the on-site & off-site impacts, source of release, initiating event, contributing factors and the changes made to process as result of the incident.



The standards or elements required for program 2 hazard prevention are:

Safety Information

Hazard Review

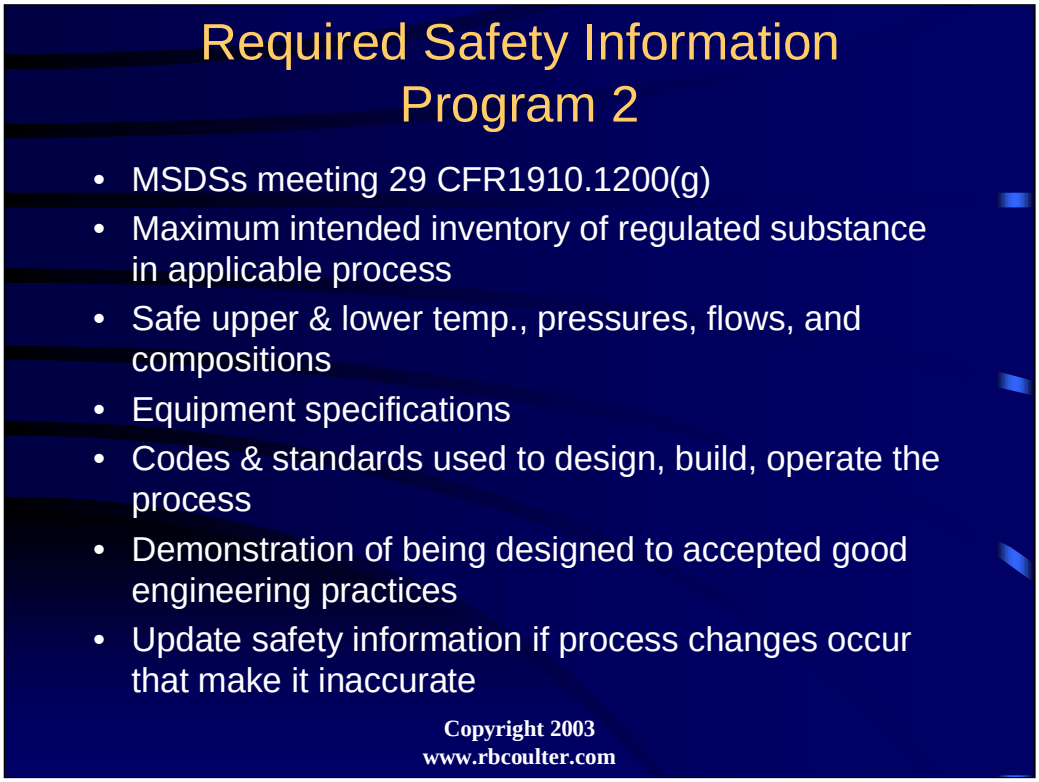
Operating Procedures (Program 2)

Training (Program 2)

Maintenance

Compliance Audits (Program 2)

Incident Investigation (Program 2)



MSDSs meeting 29 CFR1910.1200(g)

The maximum intended inventory of regulated substance in the applicable process.

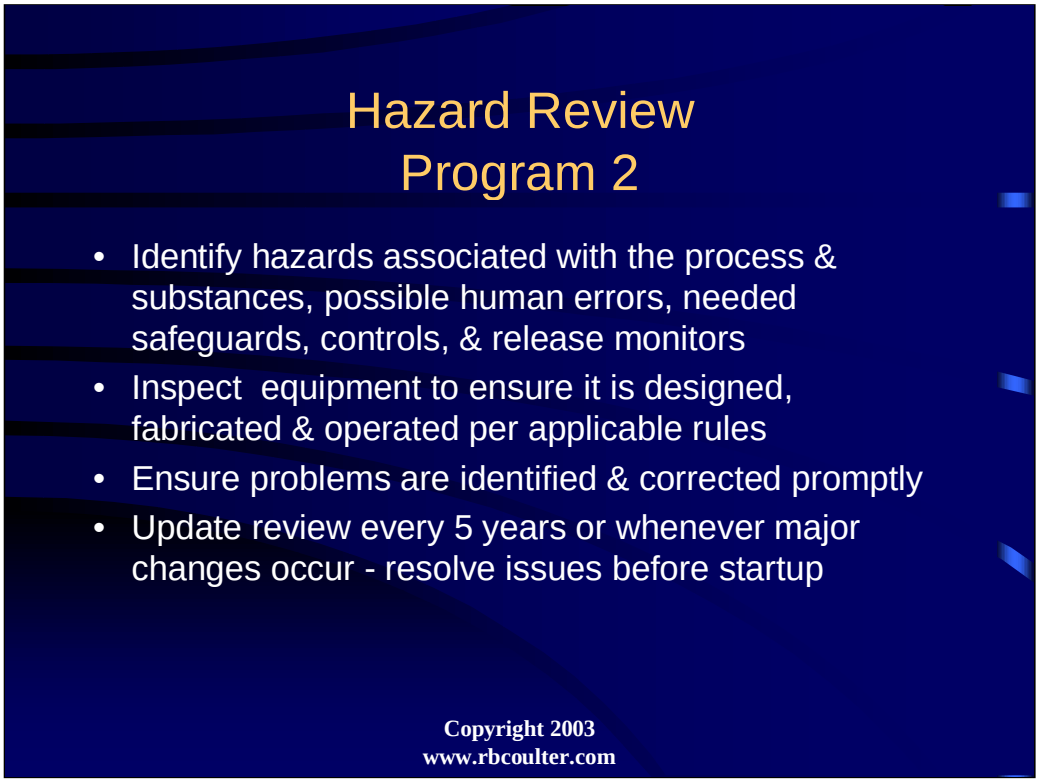
Safe upper & lower temp., pressures, flows, and compositions

Equipment specifications - This includes, for example, PIDs, tank drawings, make & model numbers, etc.

Codes & standards used to design, build, operate the process - Codes can come from organizations like ASME, API, UL, NFPA, industry groups or government agencies.

Demonstration of being designed to accepted good engineering practices - In most cases this means that the process is designed according industry practice.

Update the safety information if process changes occur that make it inaccurate.

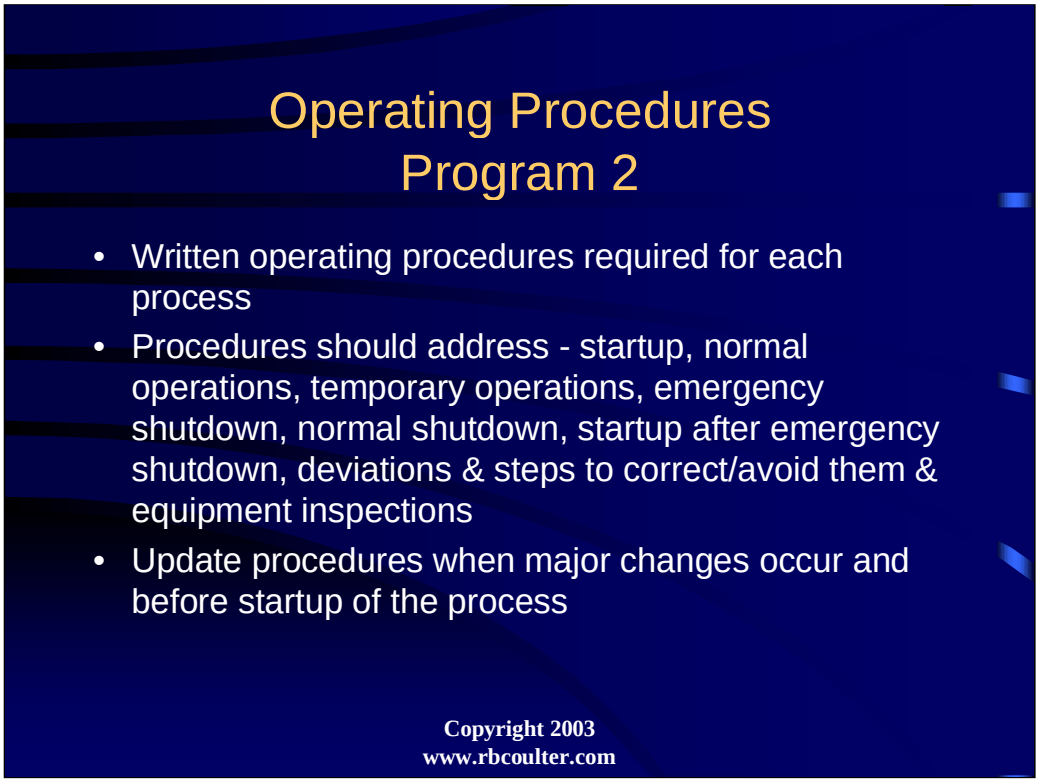


A hazard review should identify the hazards associated with the process & substances, possible human errors (for example, operator errors, operator fatigue)., needed safeguards & controls, & release monitoring.

Inspect equipment to ensure it is designed, fabricated & operated per applicable rules - This can be done with pre-formatted checklists.

Ensure problems are identified & corrected promptly - The results & recommendations of a hazard review should be documented.

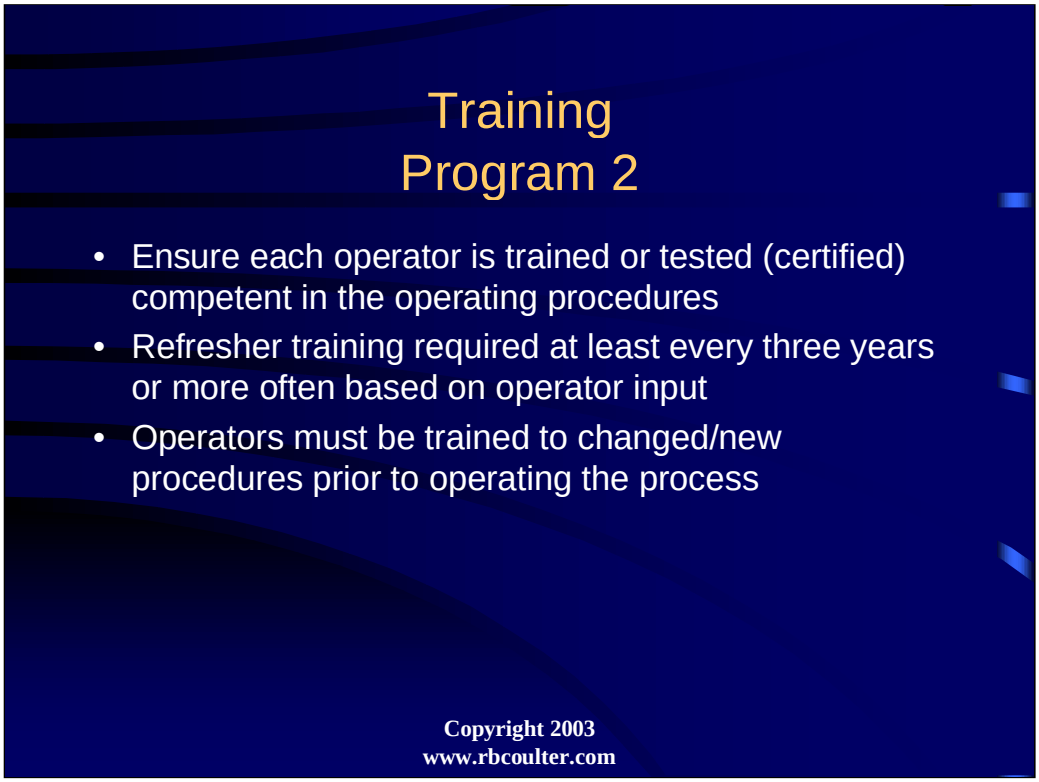
Update the hazard review every 5 years or whenever major changes occur. All issues must be resolved before starting up a process.



Written operating procedures required for each program 2 process.

Procedures should address - startup, normal operations, temporary operations, emergency shutdown, normal shutdown, startup after emergency shutdown. Also, any anticipated process deviations should be noted and the steps indicated on how to correct and/or avoid them. Procedures should also be developed for process equipment inspections.

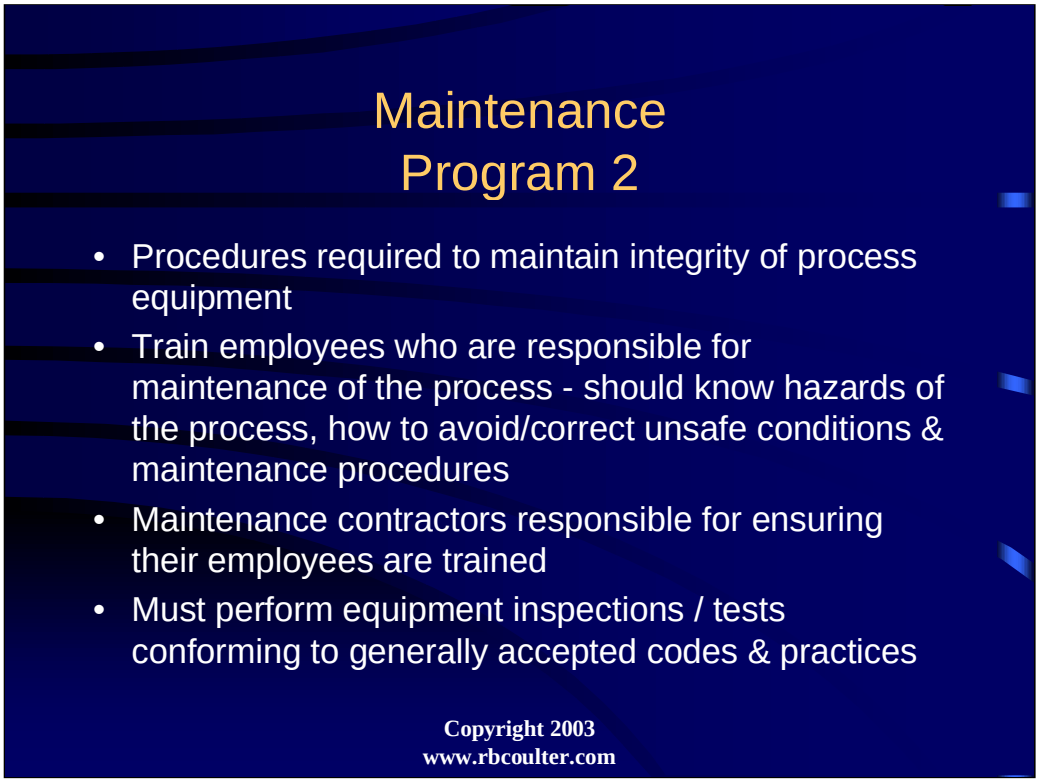
Update the procedures when major changes occur and before startup of the process.



The owner / operator must ensure that each operator responsible for a process is trained or tested (certified) competent in the operating procedures for that process. The operating procedures are those required in 68.52 (see previous slide).

Refresher training is required of the process operators at least every three years or more often based on operator input or surveys. The emphasis is to ensure that each operator follows the procedures relevant to the process.

Operators must be trained to new or revised procedures prior to operating the process whenever a *major* change to the process occurs.



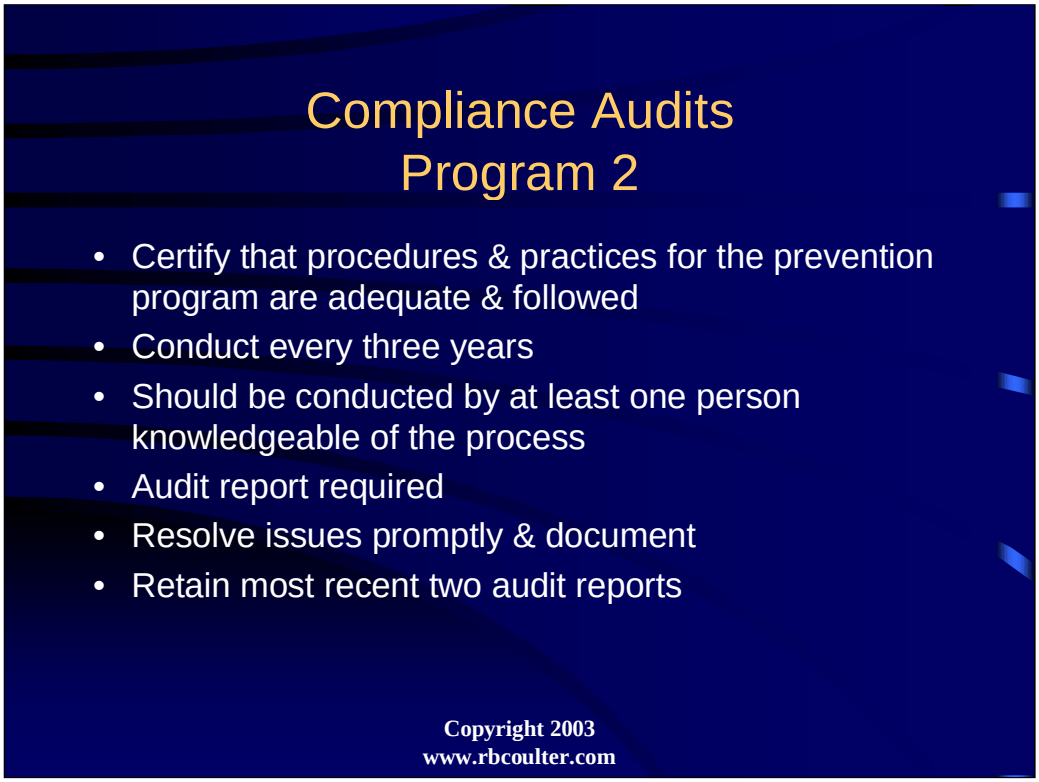
The owner / operator is required to generate and keep up-to-date procedures for maintaining the integrity of process equipment. These procedures are for maintenance personnel as operating procedures are for process operators.

Guidelines from industry groups or government agencies can be used as basis for a source to create their own process maintenance procedures.

Process maintenance personnel should be trained on the hazards of the process, how to avoid/correct unsafe conditions & the process maintenance procedures.

Maintenance contractors are responsible for ensuring their employees are trained in the applicable process maintenance procedures.

Equipment inspections / tests must conform to generally accepted codes & practices. This can be information provided by generally recognized organizations like ASME, API, Chlorine Institute, and government agencies.



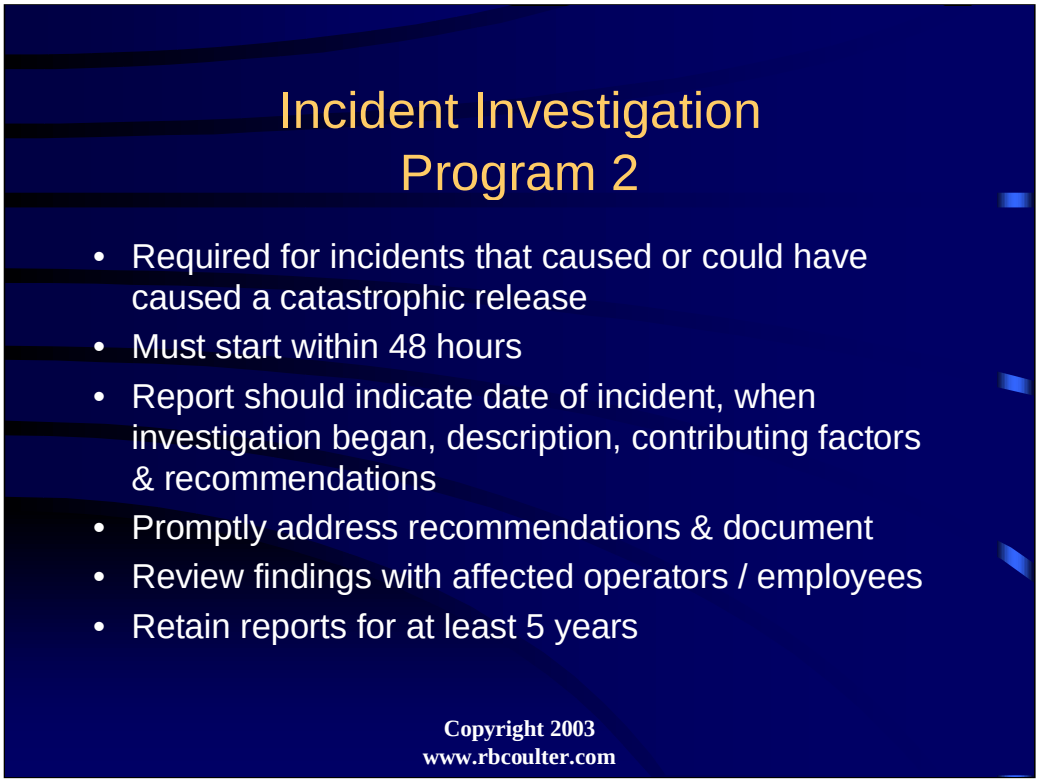
The owner / operator must Certify that procedures & practices for the prevention program are adequate & are followed

The audit should be conducted every three years and must have at least one person on the audit team who is knowledgeable of the covered process.

An audit report of the findings of the team is required.

All audit findings must be resolved promptly & documented.

The source shall retain the most recent two audit reports.



An incident investigation is required for all incidents related to the covered process that caused or could have caused a catastrophic release.

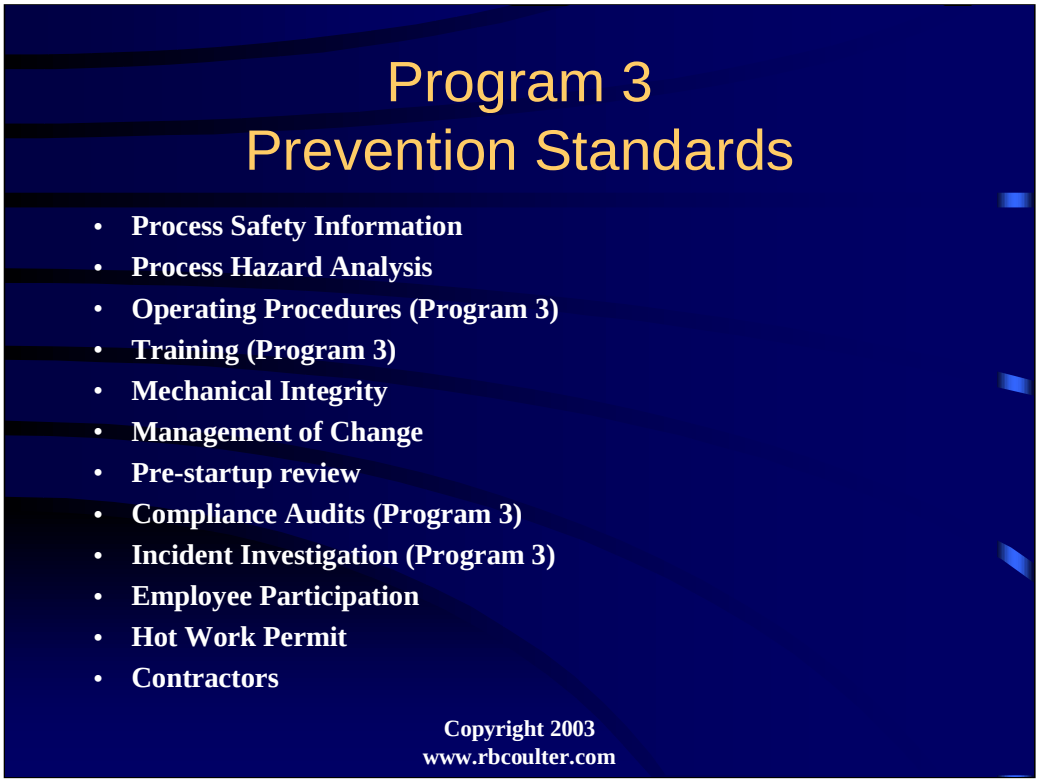
The investigation must start within 48 hours of the incident.

A summary or report should be made at the end of the investigation that indicates the date of the incident, when investigation began, description of the incident, contributing factors / causes & recommendations.

Similar to audits, recommendation must be promptly resolved & documented.

The findings of the report must be reviewed with affected employees. This will most likely include operators & maintenance personnel responsible for the process involved in the incident.

Incident investigation reports must be retained for at least 5 years.



The prevention standards for program 3 processes are more detailed than program 2. There are also more standards (elements) in the program The standards (elements) are:

Process Safety Information - This is divided into three areas - Hazards of the Regulated Substances, Technology of the Process, Equipment in the Process

Process Hazard Analysis

Operating Procedures (Program 3)

Training (Program 3)

Mechanical Integrity

Management of Change

Pre-startup review

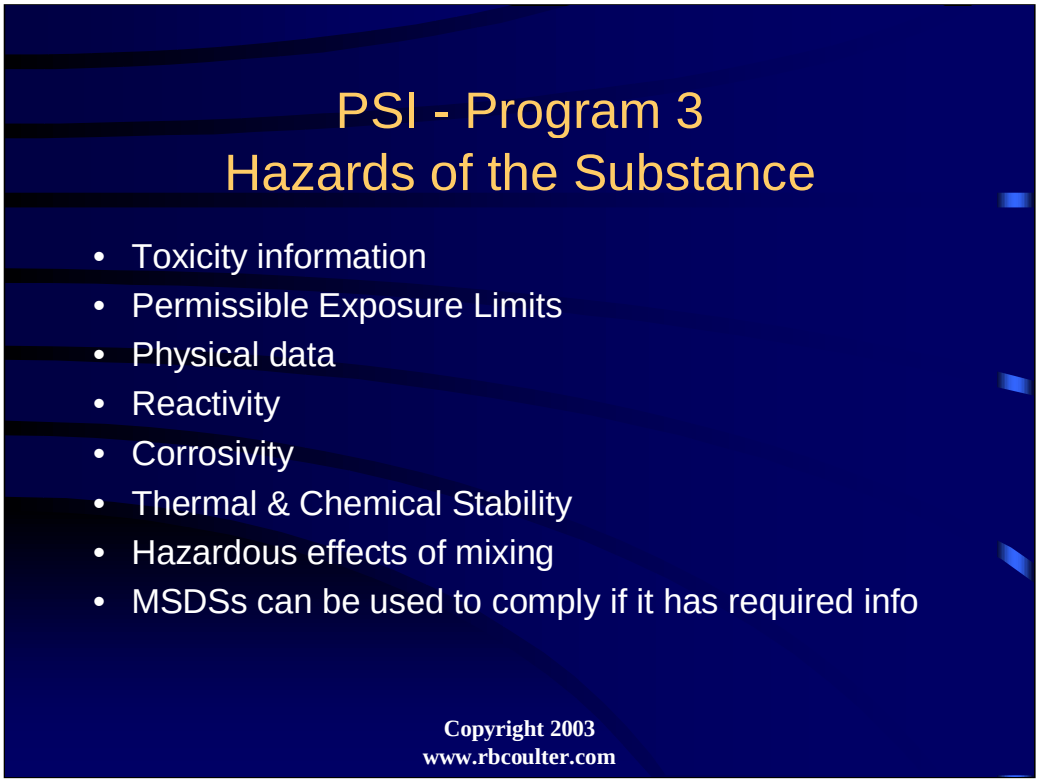
Compliance Audits (Program 3)

Incident Investigation (Program 3)

Employee Participation

Hot Work Permit

Contractors



In program 3 the following hazard data concerning the listed substance(s) must be generated & retained. Whereas in program 2 it sufficed to have an MSDS, in program 3 the MSDS is solely allowed only if it provides all the data listed here:

Toxicity information

Permissible Exposure Limits

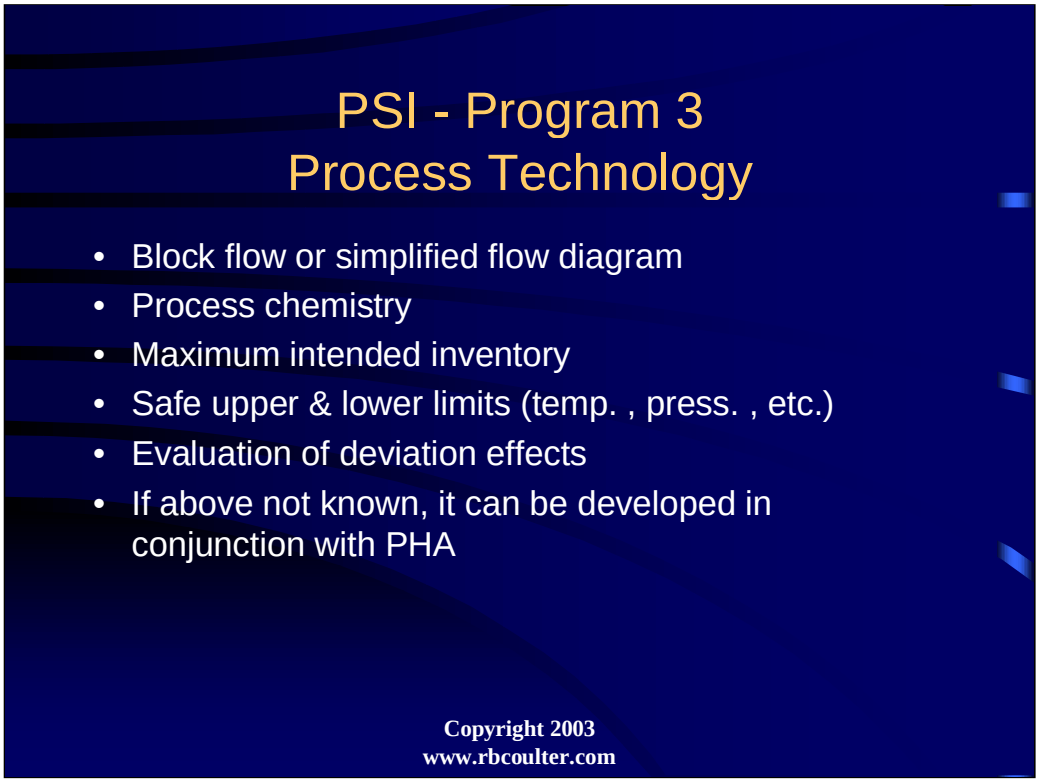
Physical data

Reactivity

Corrosivity

Thermal & Chemical Stability

Hazardous effects of mixing



The following information is process technology information is required:

Block flow or simplified flow diagram

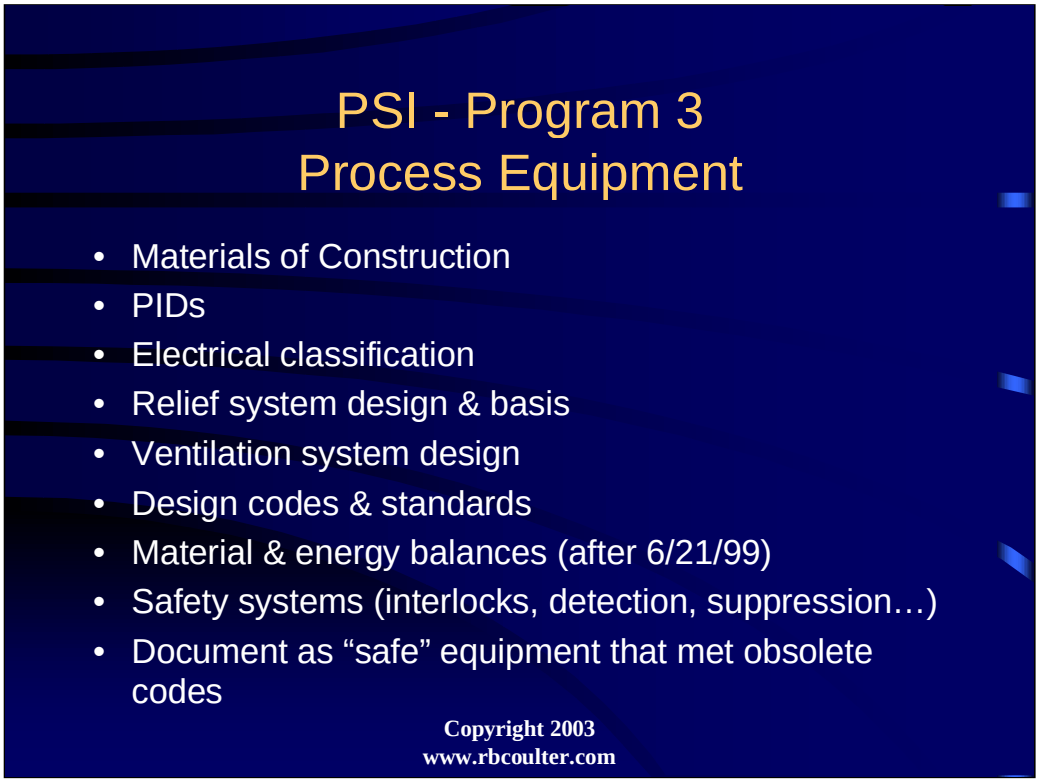
Process chemistry - Chemical reactions occurring, theoretical heat release, etc.

Maximum intended inventory of the listed substance

Safe upper & lower limits (temp. , press. , etc.)

Evaluation of process deviations and their hazardous effects

If above information is not known, it can be developed in conjunction with the PHA.



The following information is required for PSI (Process Equipment):

Materials of Construction -

PIDs

Electrical classification - This would be for example, Class I, Division I, Group C, etc.

Relief system design & basis - This should indicate the model used for designing the relief valve and the calculations that determined its specifications (for example, orifice size, pressure setting, etc.)

Ventilation system design - Do not confuse this with relief valves. This refers to the air surrounding the process, especially if it is enclosed in a building.

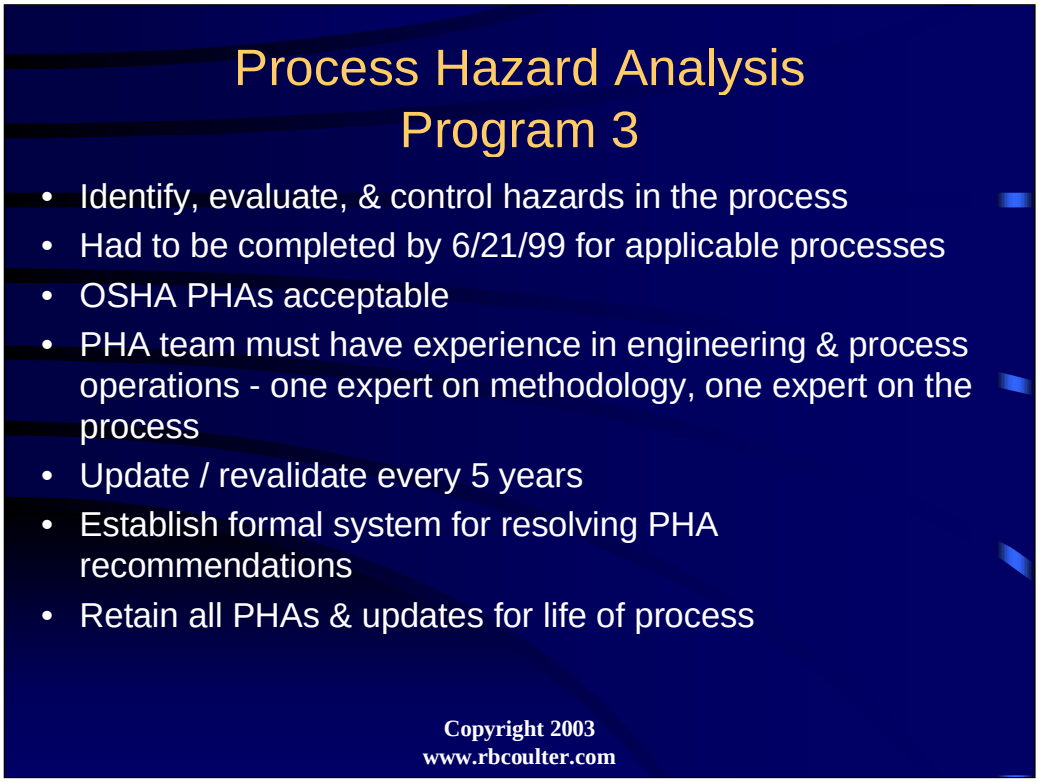
Design codes & standards - For example, ASME, API, UL, etc.

Material & energy balances - This is for processes designed and installed after 6/21/99.

Safety systems (interlocks, detection, suppression…)

Document as "safe" equipment that met obsolete codes - Some type of "certification" must be done for old equipment designed under obsolete codes.

It is recommended that whenever possible that old equipment should be upgraded to meet current codes.



The purpose of the PHA is to identify, evaluate, & control hazards in the process.

Covered processes operating on 6/21/99 had to have their PHAs completed on that date.

Covered processes that had to meet the OSHA PSM standard prior to 6/21/99 most likely had PHAs performed already. These processes do not need to repeat their PHAs for CAP compliance.

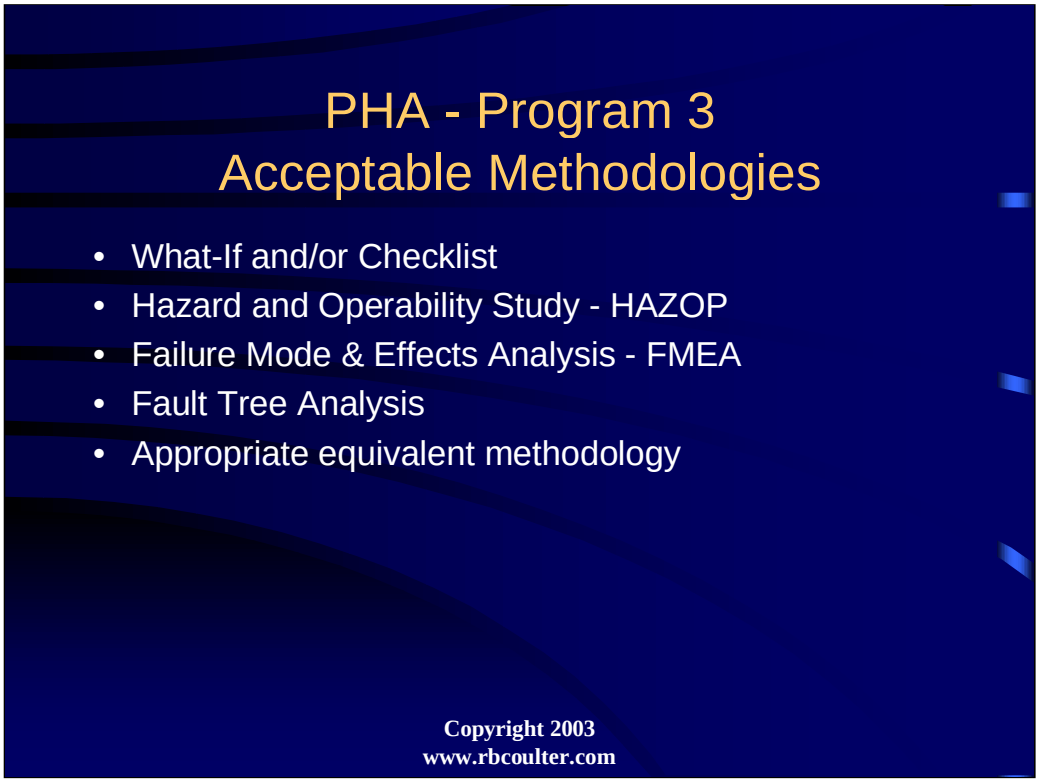
The PHA team must have experience in engineering & process operations. There must be one person who is familiar with the PHA methodology and one person knowledgeable of the process.

The PHAs must be updated / revalidated every 5 years.

A formal system for resolving PHA recommendations must be established.

Again this is similar to "resolve & document" applicable to audits & incident investigations. In fact, it is possible, and probably more efficient, to use the same documentation system for resolving recommendations from these three areas.

Retain all PHAs & updates for the life of the process.



A PHA can be performed using one of the following methodologies:

What-If and/or Checklist

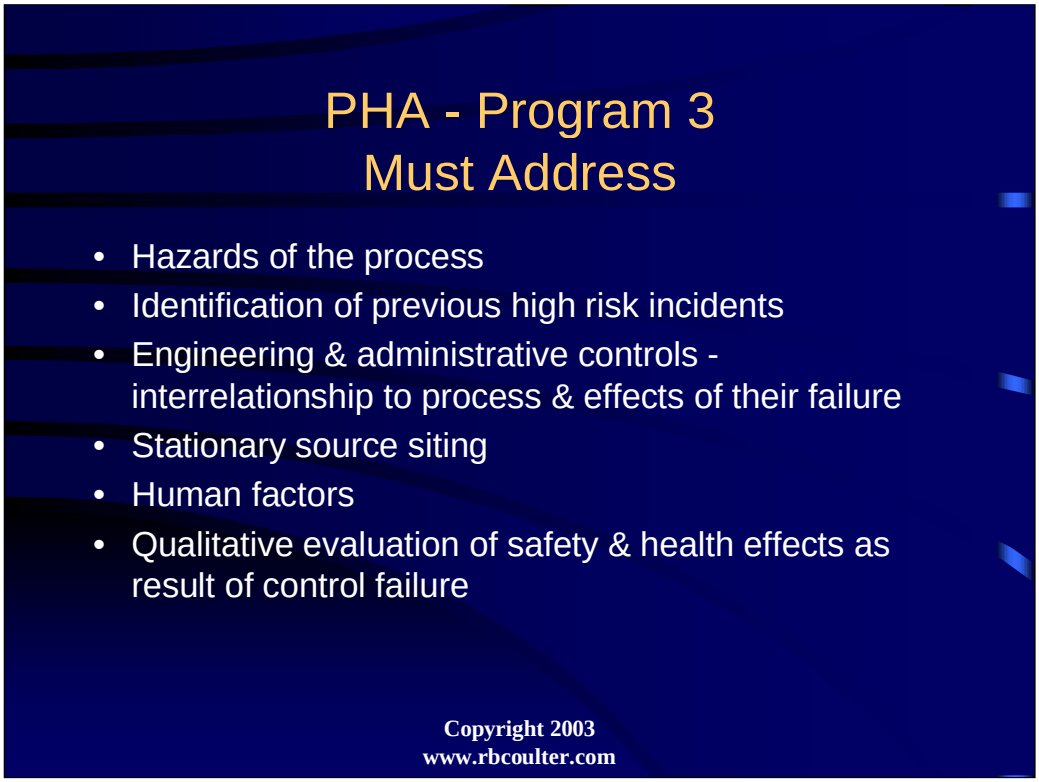
Hazard and Operability Study - HAZOP

Failure Mode & Effects Analysis - FMEA

Fault Tree Analysis

Appropriate equivalent methodology

A more detailed discussion of these methodologies can be found at the link below:



During the PHA the following must be addressed:

Hazards of the process - These are the specific events that are hazardous - for example, tank overfilling, tank overpressurizing, wrong chemical pumped into tank, etc.

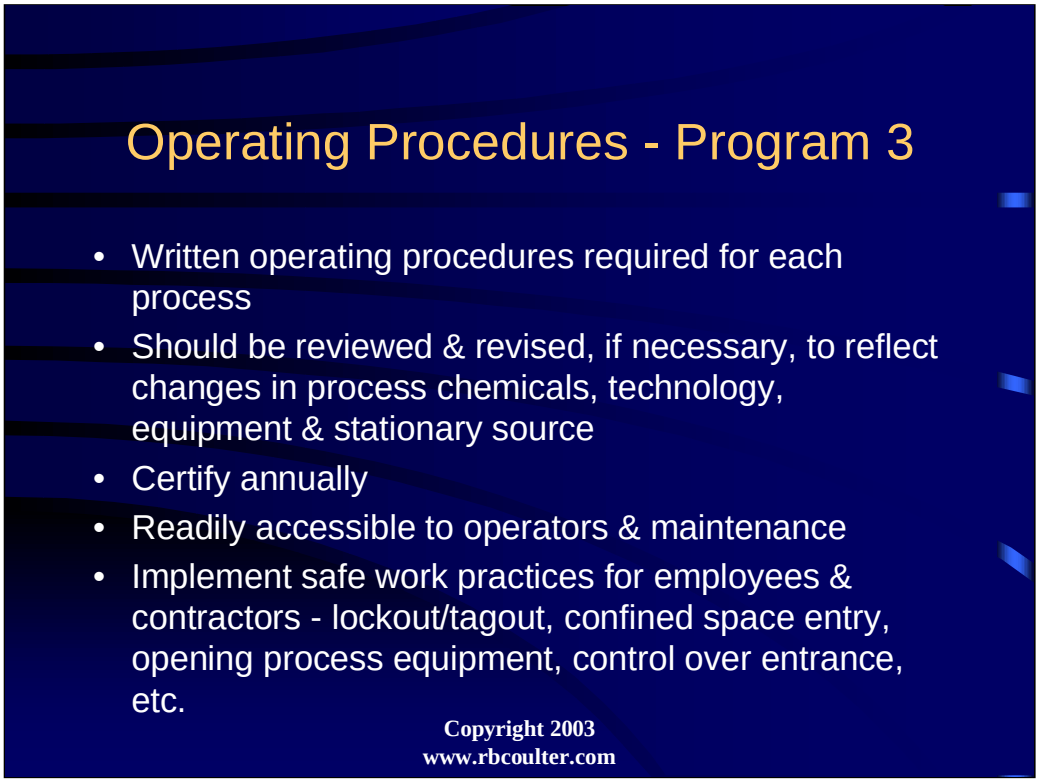
Identification of previous high risk incidents - The PHA team should review the history of the process (that is, previous incident reports) in determining likely hazards.

The PHA team should determine the interrelationship of engineering & administrative controls on the process & the effects (negative outcome) of their failure. For example, a sprinkler system is an engineering control designed to minimize the hazard of a fire. An emergency response plan is an administrative control also meant to minimize the hazard of a fire. The team should include in its analysis the hazards associated with the *failures* of the sprinkler system and emergency response plan .

Stationary source siting - This should examine the relationship between process location, process hazards, and public receptors.

Human factors - This should look at the hazards associated with operator error, operator fatigue & ergonomics.

Qualitative evaluation of safety & health effects as result of control failure - When listing hazards, it is important to describe the actual negative effects that could result to a public receptors.



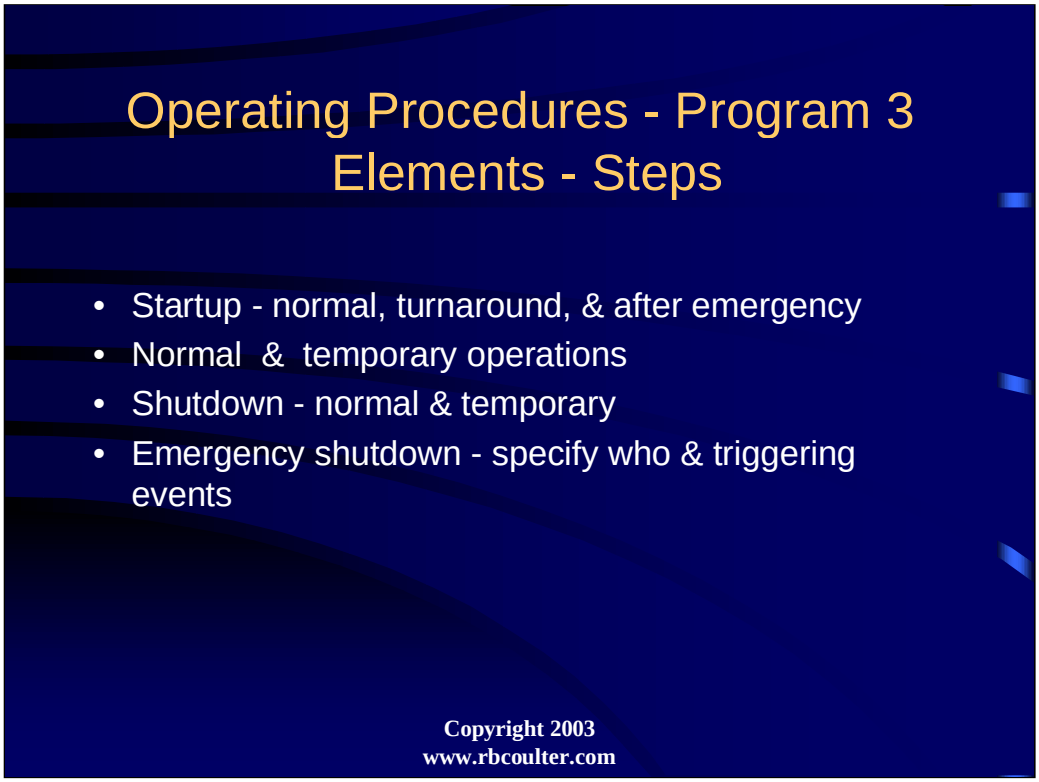
Written operating procedures are required for each program 3 process.

They should be reviewed & revised, if necessary, to reflect changes in process chemicals, technology, equipment & changes to the stationary source.

They must be certified annually stating that they are complete & accurate.

The procedures must be readily accessible to operators & maintenance personnel.

Implement safe work practices for employees & contractors. This should include lockout/tagout, confined space entry, opening process equipment, control over entrance, etc. Most of these are required by law.



The basic steps of a program 3 procedure is

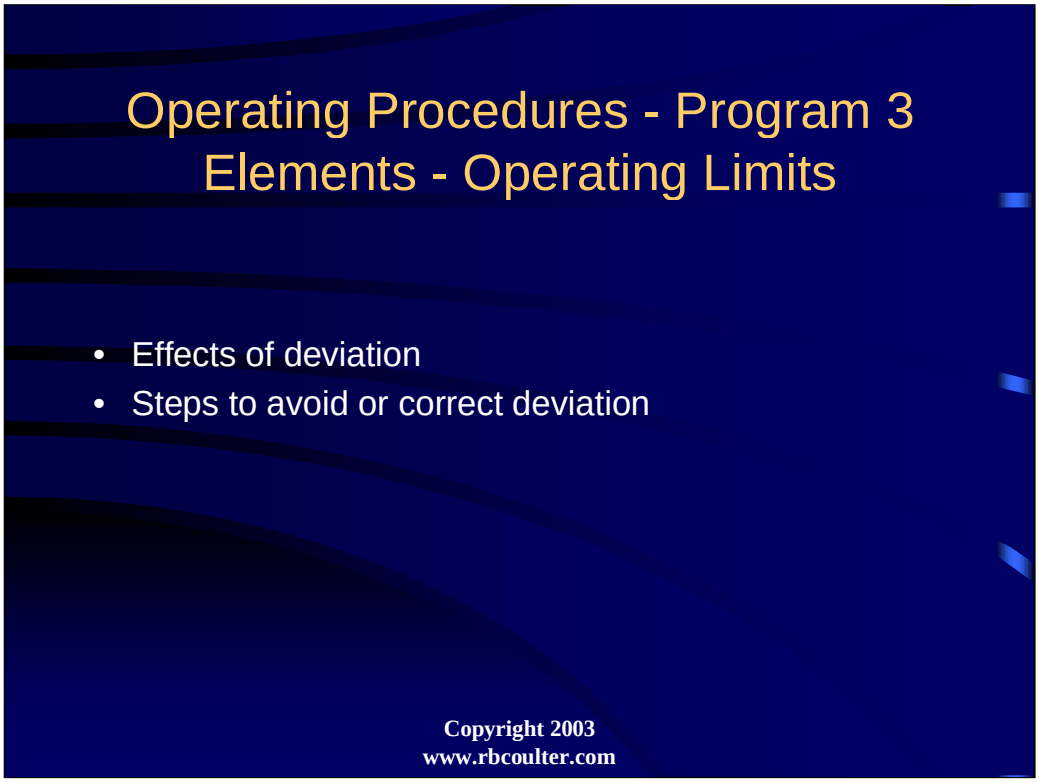
Startup - normal, turnaround, & after emergency

Normal & temporary operations

Shutdown - normal & temporary

Emergency shutdown - specify who & triggering events

This is similar to program 2 operating procedures.



Effects of deviation

Steps to avoid or correct deviation

Again this is not much different than program 2.

This portion of program 3 procedures is different than program 2. Much of this information can usually be obtained from the MSDS for the covered substance.

Properties & hazards of chemicals

Precautions to prevent exposure - PPE & controls

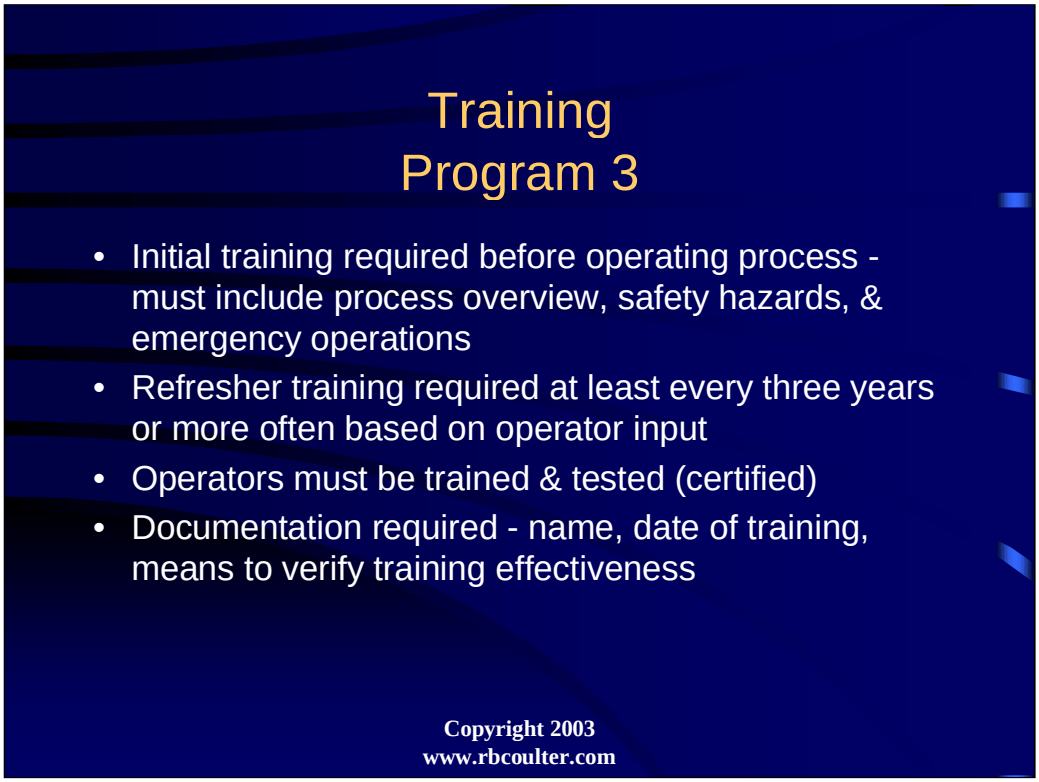
Control measures in the event of exposure

Quality & inventory control of chemicals

Special or unique hazards

Safety systems (interlocks, etc.)

Much of this information can be found in the PSI.

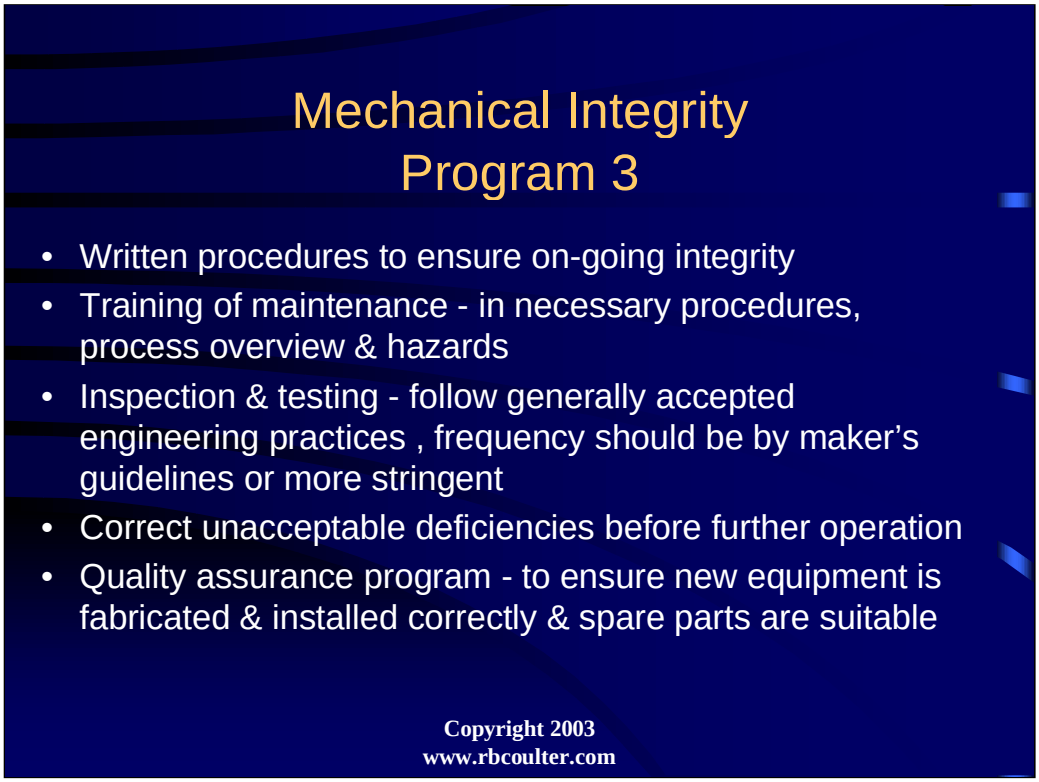


Initial training is required of any operator before being allowed to operate the process. This must include a process overview, safety hazards & emergency operations training.

Refresher training is required at least every three years or more often based on operator input. (like program 2)

Operators must be trained & tested (certified) (like program 2).

The following must be documented when operator training is performed - name, date of training, means to verify training effectiveness (testing, etc.) Note that this is more specific requirement than what is allowed in program 2.



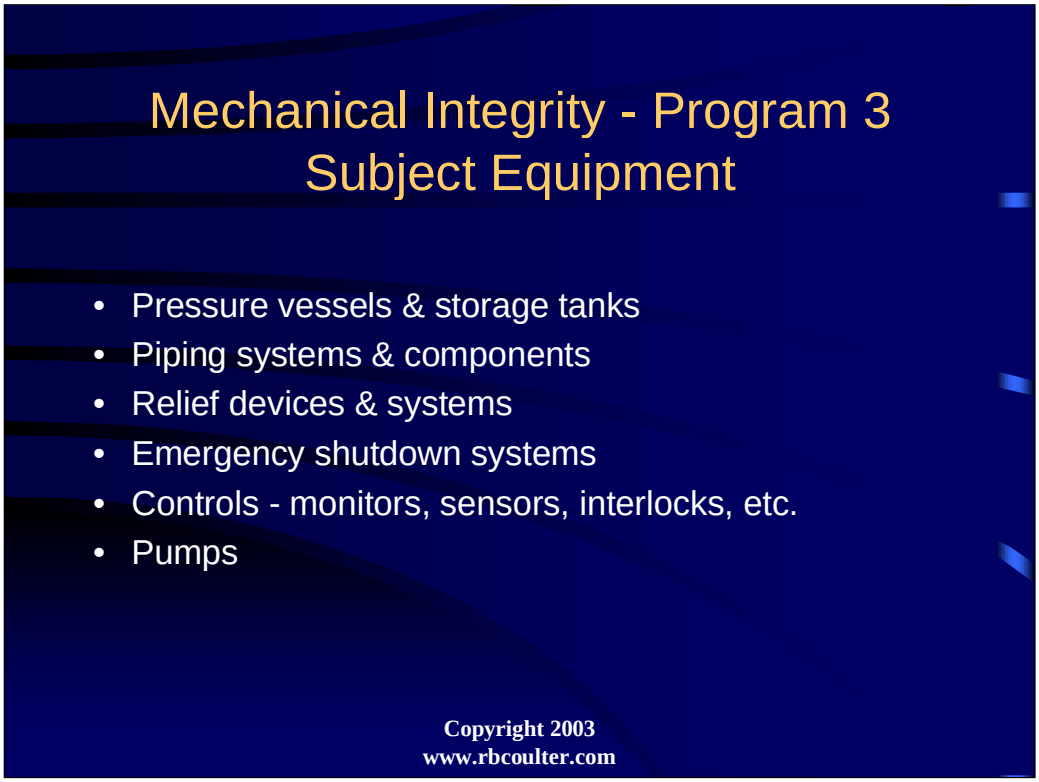
The owner / operator shall must generate and keep up-to-date written maintenance procedures to ensure on-going integrity of certain critical process equipment.

Like program 2, the maintenance personnel responsible for this equipment must be trained in these written procedures, process overview & the process hazards.

The written inspection & testing procedures should follow generally accepted engineering practices. The frequency of inspection & testing should be by maker's guidelines or more stringent.

Any unacceptable deficiencies found related to a process must be corrected before further operation of the process.

Quality assurance program - to ensure new equipment is fabricated & installed correctly & spare parts are suitable



The following are the critical equipment in the covered process that is required to have a mechanical integrity program subject to the provisions in the previous slide:

Pressure vessels & storage tanks

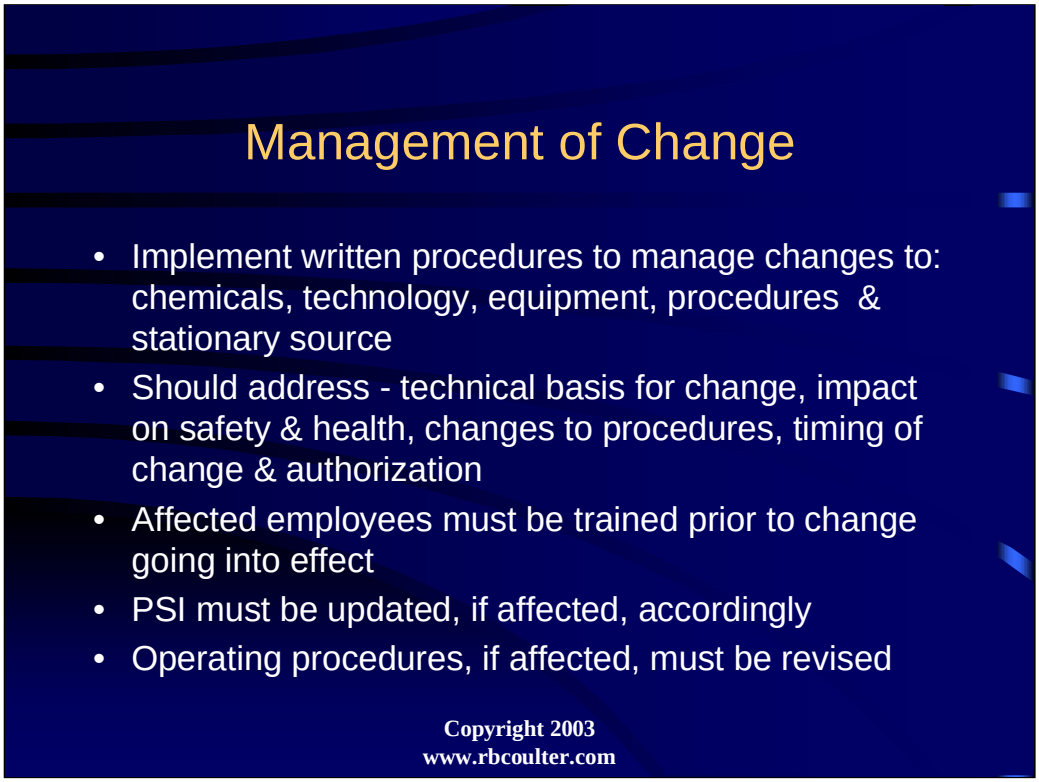
Piping systems & components - This includes valves

Relief devices & systems

Emergency shutdown systems

Controls - monitors, sensors, interlocks, etc.

Pumps



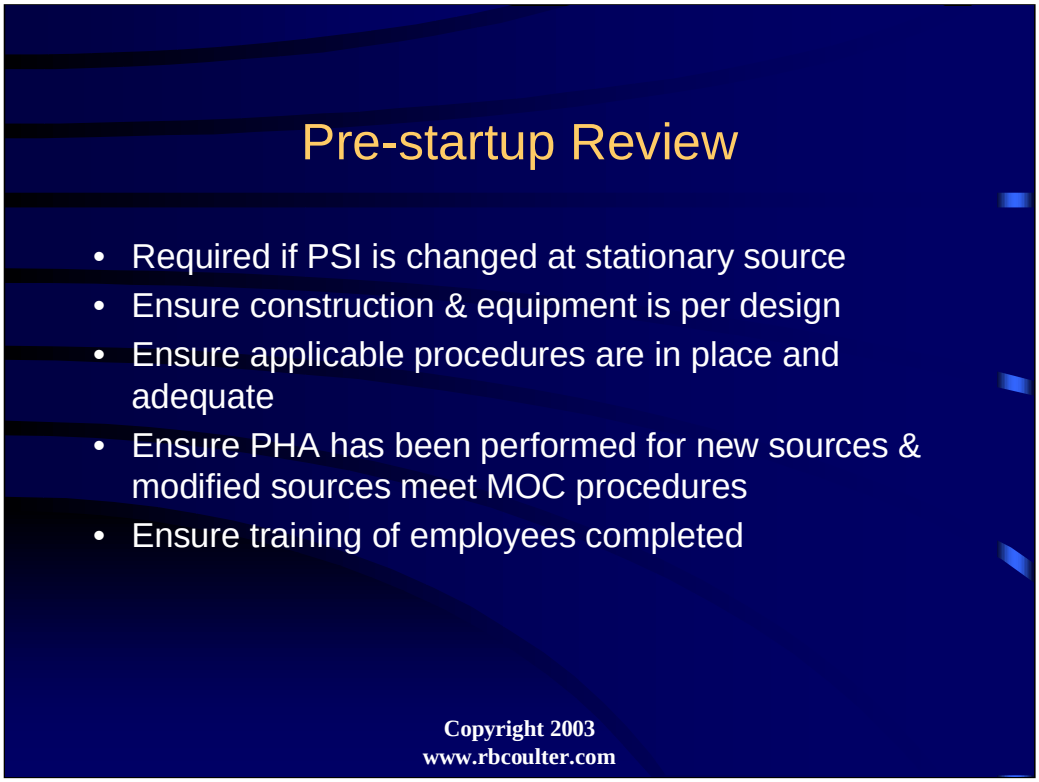
A written management of change (MOC) program is required to pre-authorize any changes to the process. MOC is a documented administrative program for ensuring that changes to a process are done to ensure the safe operation of the process. A management of change should be activated whenever process modifications are proposed that change the covered process chemicals, technology, equipment, procedures or the stationary source. Normal maintenance is not required to be done under an MOC as long as the parts are replaced "in-kind" (parts are approved by existing specifications) and existing maintenance procedures are used.

The MOC program should address the technical basis for change, impact on safety & health, changes to procedures, timing of the change (when does it go into effect, duration, is change permanent or temporary, date change is no longer in effect, etc.) & authorization (who approves the changes).

All employees affected by the change (operators, maintenance personnel, etc.) must be trained prior to a change going into effect if the change affects their job function.

If a change occurs that modifies the PSI, then it must be updated accordingly.

Process operating procedures must be revised if affected by the MOC.



A pre-startup review is a administrative procedure to ensure that a new process or a process that has undergone a major change is installed & started up as intended (per the design). The review usually consists of preformatted checklists that are completed prior to startup of the process. A pre-startup review is required of a process whenever the process PSI is changed at stationary source.

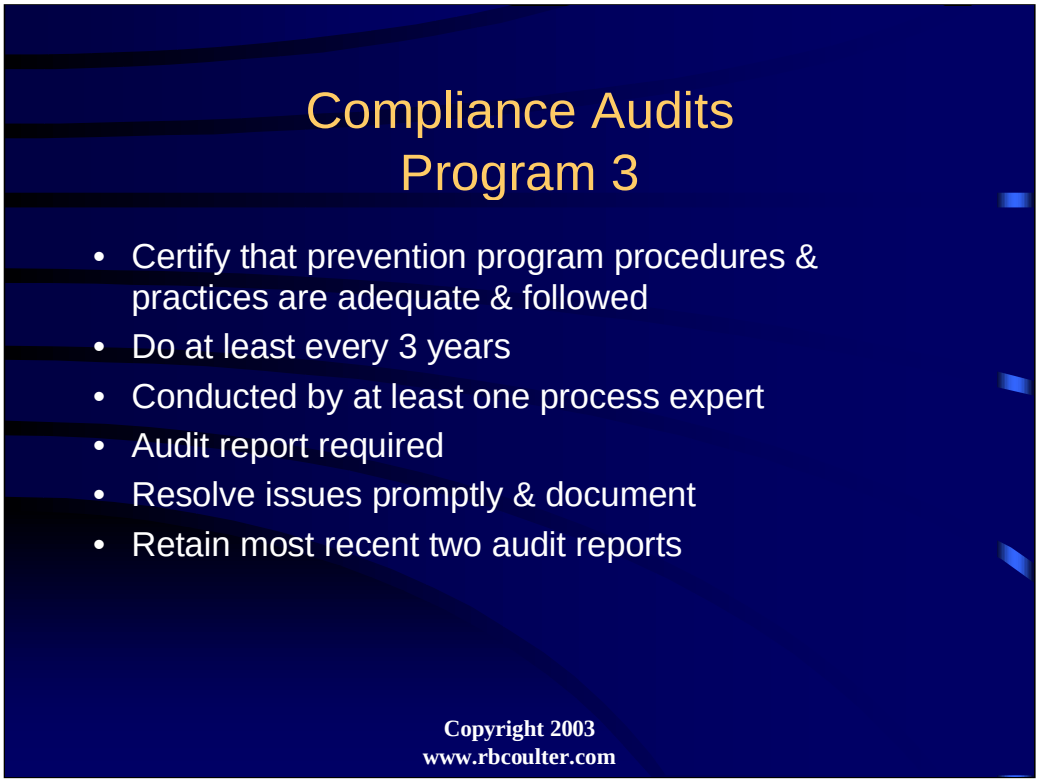
The main items that a pre-startup review should cover are:

Ensure the process construction & equipment is installed as designed

Ensure that applicable procedures are in place and adequate

Ensure that PHA has been performed for new sources & that modified sources meet MOC procedures. Ensure that all PHA recommendations have been resolved prior to startup.

Ensure training of applicable employees completed.



The audit requirements for program 3 are similar to program 2.

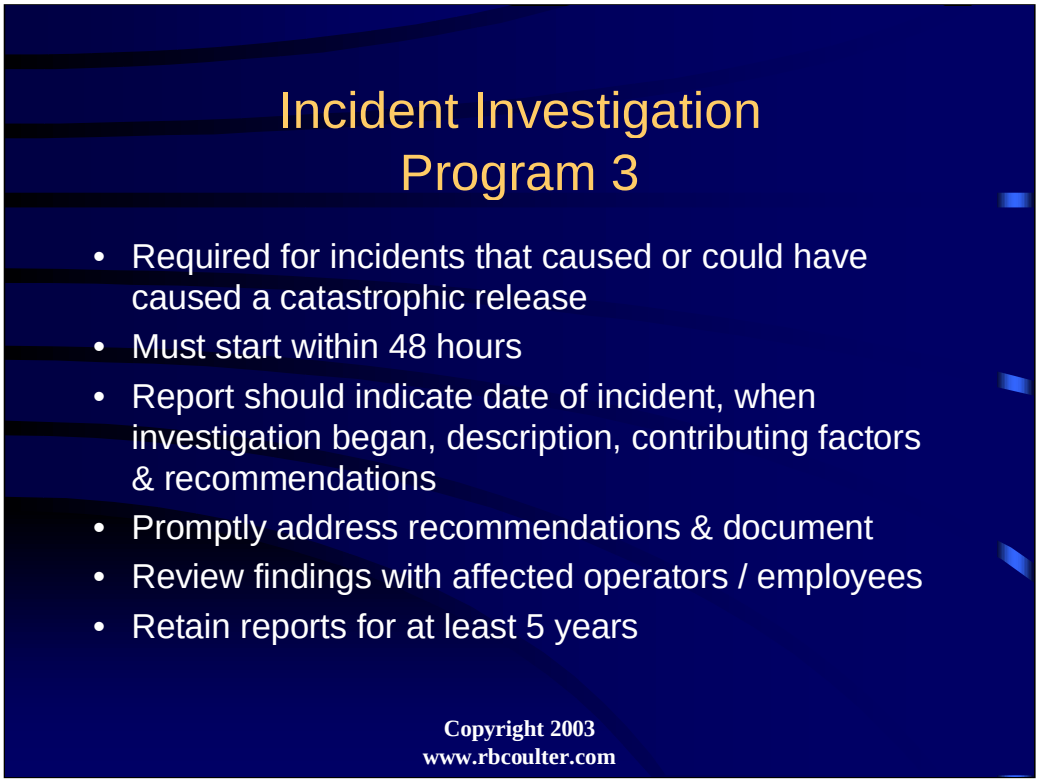
The owner / operator must certify that procedures & practices for the prevention program are adequate & are followed.

The audit should be conducted every three years and must have at least one person on the audit team who is knowledgeable of the covered process.

An audit report of the findings of the team is required.

All audit findings must be resolved promptly & documented.

The source shall retain the most recent two audit reports.



An incident investigation is required for all incidents related to the covered process that caused or could have caused a catastrophic release.

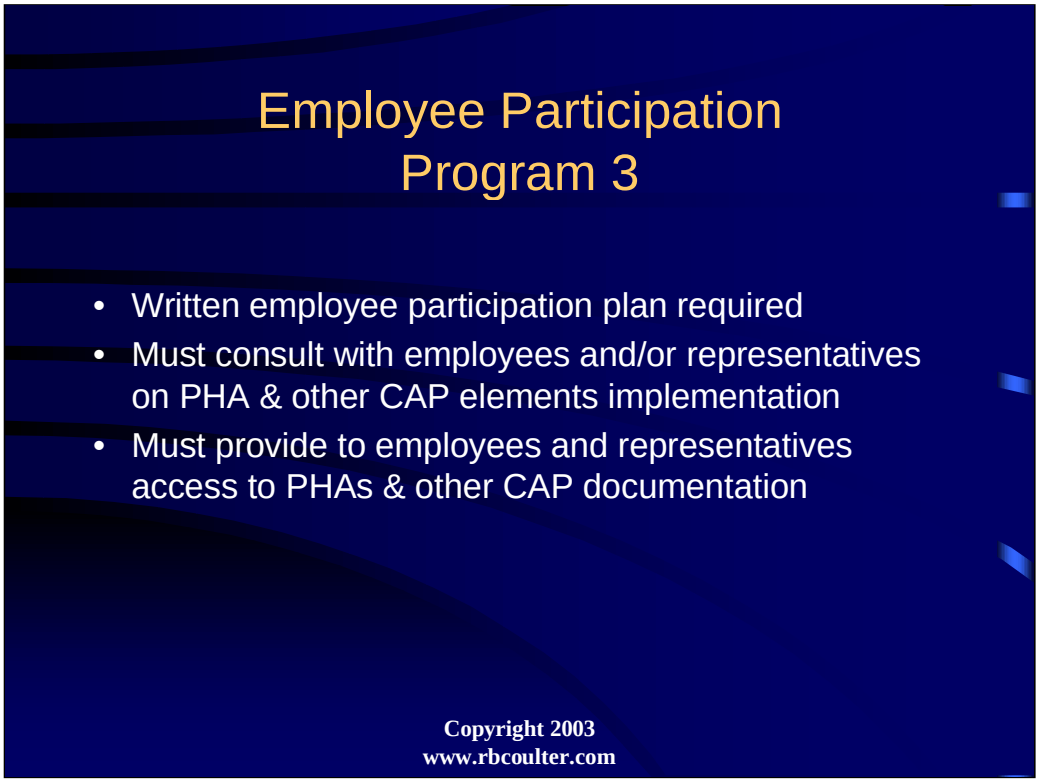
The investigation must start within 48 hours of the incident.

A summary or report should be made at the end of the investigation that indicates the date of the incident, when investigation began, description of the incident, contributing factors / causes & recommendations.

Recommendation must be promptly resolved & documented. Unlike program 2, the source must have instituted a formalized recommendation resolution system or other administrative protocol for resolving incident investigation recommendations.

The findings of the report must be reviewed with affected employees. This will most likely include operators & maintenance personnel responsible for the process involved in the incident.

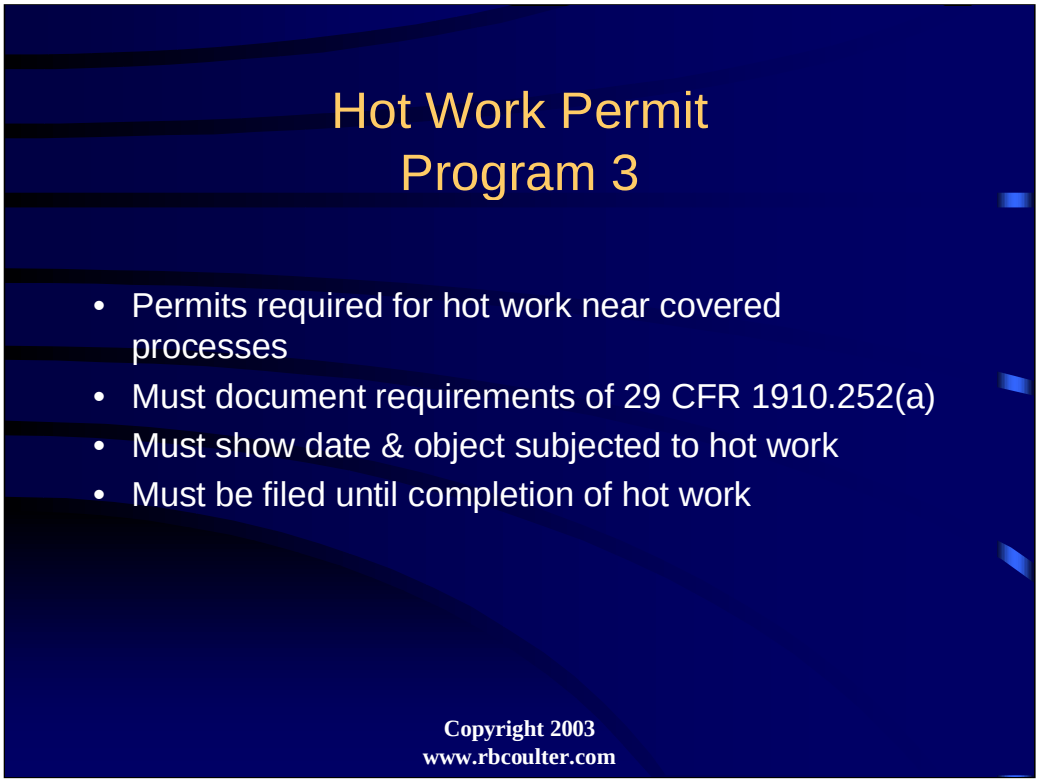
Incident investigation reports must be retained for at least 5 years.



The employer must develop a written employee participation plan that outlines the role of employees, who work with a covered process, in the development of the prevention program and other required elements of the CAP rule - particularly employee participation on PHAs.

Employers *must* consult with employees and/or representatives on PHA & other CAP elements implementation.

Employers must also provide to employees and representatives access to PHAs & other CAP documentation.



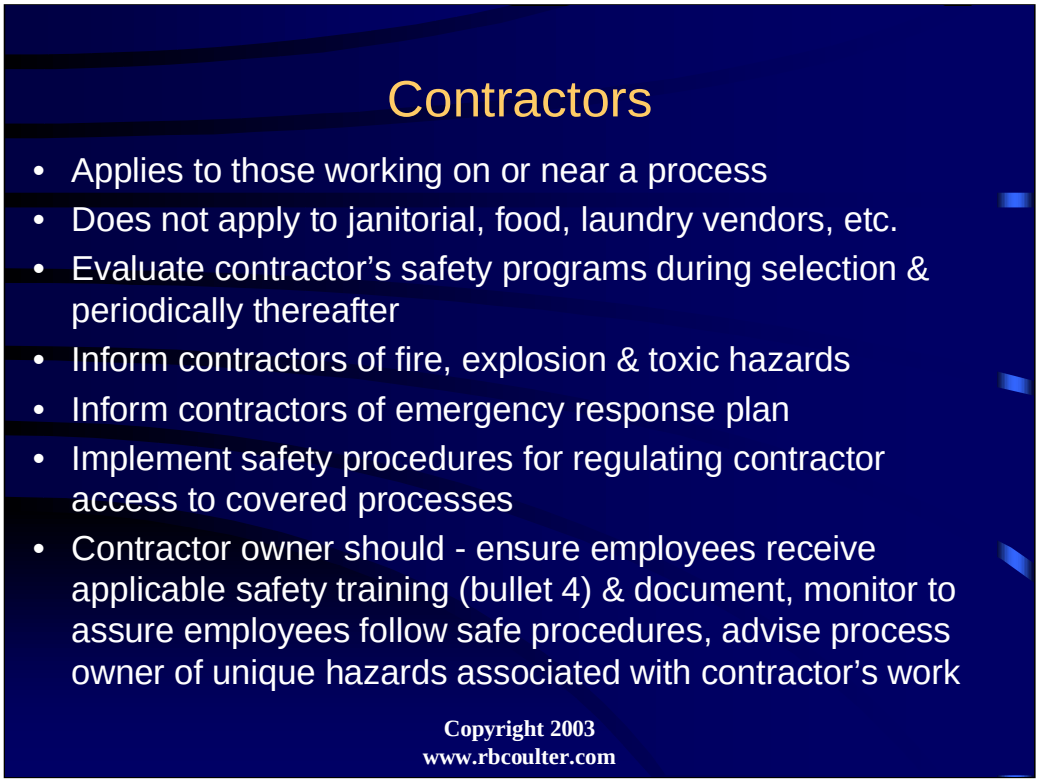
The owner / operator must implement a permitting system to regulate the performance of hot work near covered processes.

The OSHA rule in 29 CFR 1910.252(a) requires certain safety precautions whenever hot work is performed in areas where flammable materials are near.

A permitting system documents that any pertinent safety precautions are done prior to starting the hot work. This covers items like when should the hot work be done, which processes should be shutdown or evacuated, when should the hot work be finished, who is responsible for the hot work, etc.

The hot work permit must show the date & object that is subjected to the hot work.

The permit must be filed until completion of the hot work.



This element applies to contractor working on or near a covered process.

It does not apply to janitorial, food, laundry vendors, etc.

The owner / operator must evaluate a contractor's safety programs when selecting a contractor for work involving a covered process. The contractor's safety program must be evaluated periodically thereafter.

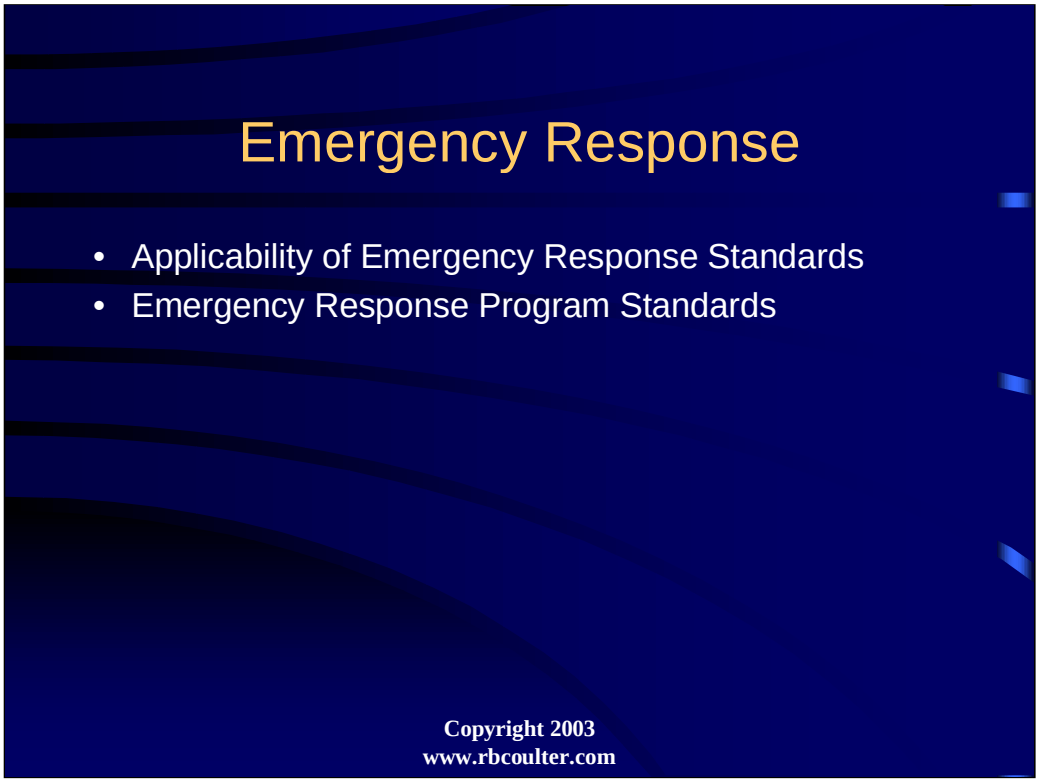
The other requirements for the owner / operator are:

Inform the contractor of any fire, explosion & toxic hazards associated with a covered process.

Inform the contractor of the emergency response plan applicable to the process and stationary source.

Implement safety procedures for regulating contractor access to covered processes.

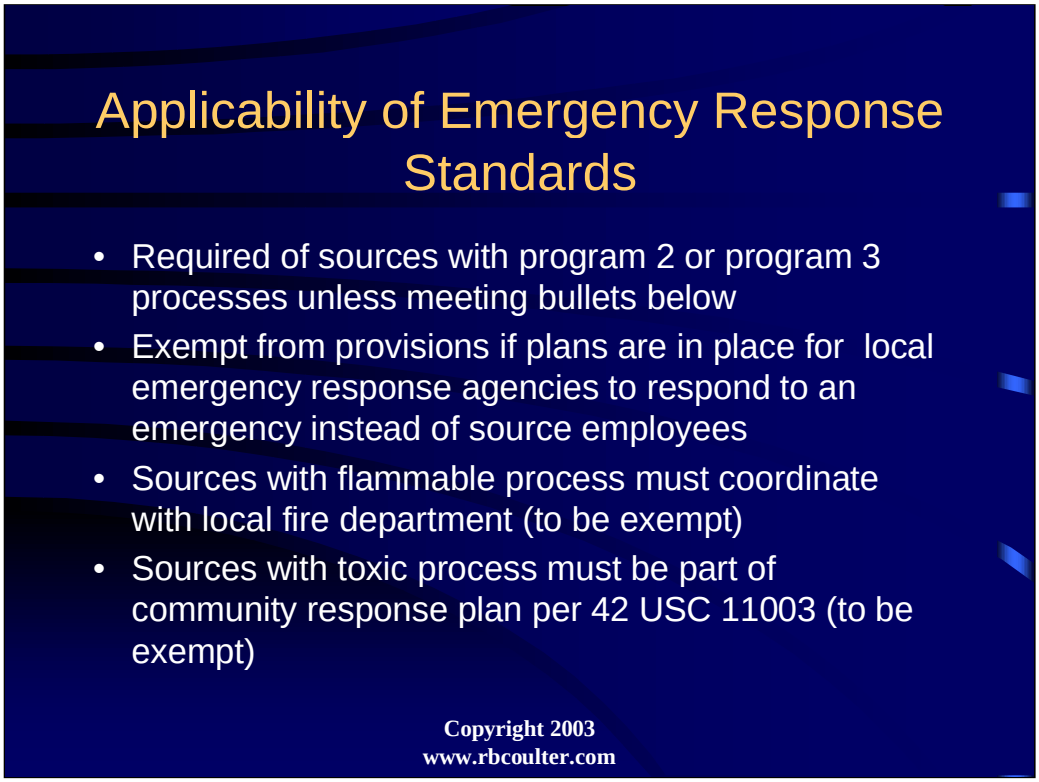
Contractor owner should ensure that its employees receive the applicable safety training concerning the customer's (owner/operator) fire, explosion, and toxicity hazards. The contractor should document this training and monitor its safety programs to ensure that employees follow safe procedures. The contractor should advise the process owner of unique hazards associated with the contractor's work.



We will now discuss the emergency response provisions of CAP.

Applicability of Emergency Response Standards

Emergency Response Program Standards



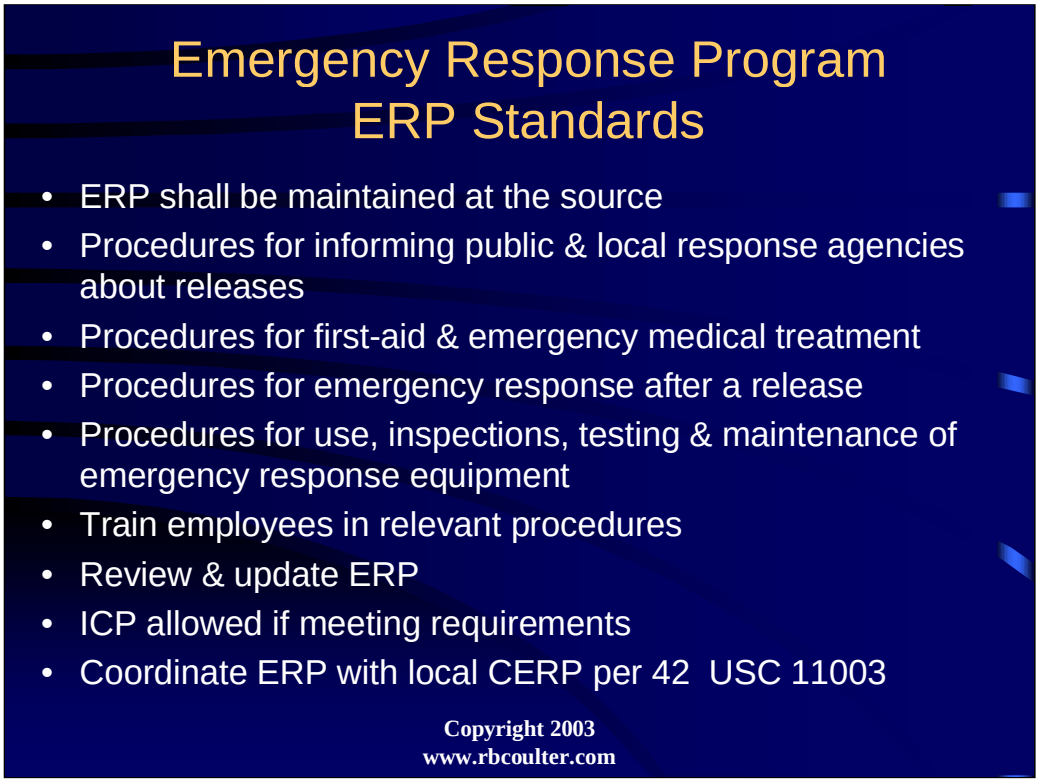
The emergency response provision in this sub-part (E) are required of sources with program 2 or program 3 processes unless meeting all the bullets below:

There are plans are in place for local emergency response agencies to respond to an emergencies instead of source employees.

Sources with flammable processes must coordinate response to emergencies with the local local fire department.

Sources with toxic processes must be part of the community response plan per 42 USC 11003.

Please note that meeting the above exemption criteria does not necessarily exclude a source from having in place an emergency evacuation plan.



The owner / operator must develop an ERP to protect the public & the environment. It shall be maintained at the source and include:

Procedures for informing public & local response agencies about releases

Procedures for first-aid & emergency medical treatment of listed substances

Procedures for emergency response after a release of a listed substance

Procedures for use, inspections, testing & maintenance of emergency response equipment

The owner / operator must also train employees on their applicable roles in the ERP.

Review & update ERP and ensure employees are trained & updated on any ERP changes.

The source can integrate the ER criteria above into an ICP.

The ERP must be coordinate with the local CERP per 42 USC 11003. The owner / operator must provide any relevant information to local officials in regards to the development of the CERP.

The RMP is the overall program that defines a source's compliance with the CAP rule. It also refers to the required submission to EPA of the following RMP elements that summarize a source's CAP compliance. The portion that is submitted is best done with the software package RMP*Submit obtained from EPA's website. See the link below.

The basic RMP elements are:

Submission

Confidential Business Information

Executive Summary

Offsite Consequence Analysis

Five-year Accident History

Prevention (Program 2)

Prevention (Program 3)

Emergency Response

Certification

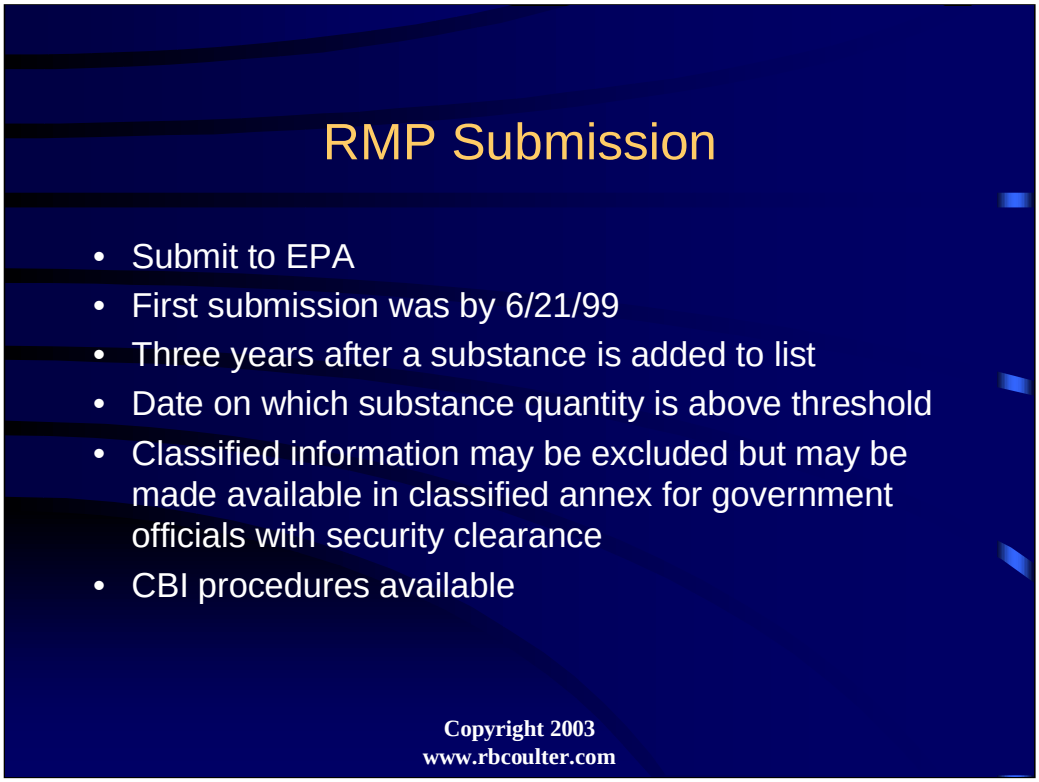
Updates

Recordkeeping

Availability of Information to the Public

Permit Content

Audits



The rules for RMP submission mirror the compliance with the CAP rule.

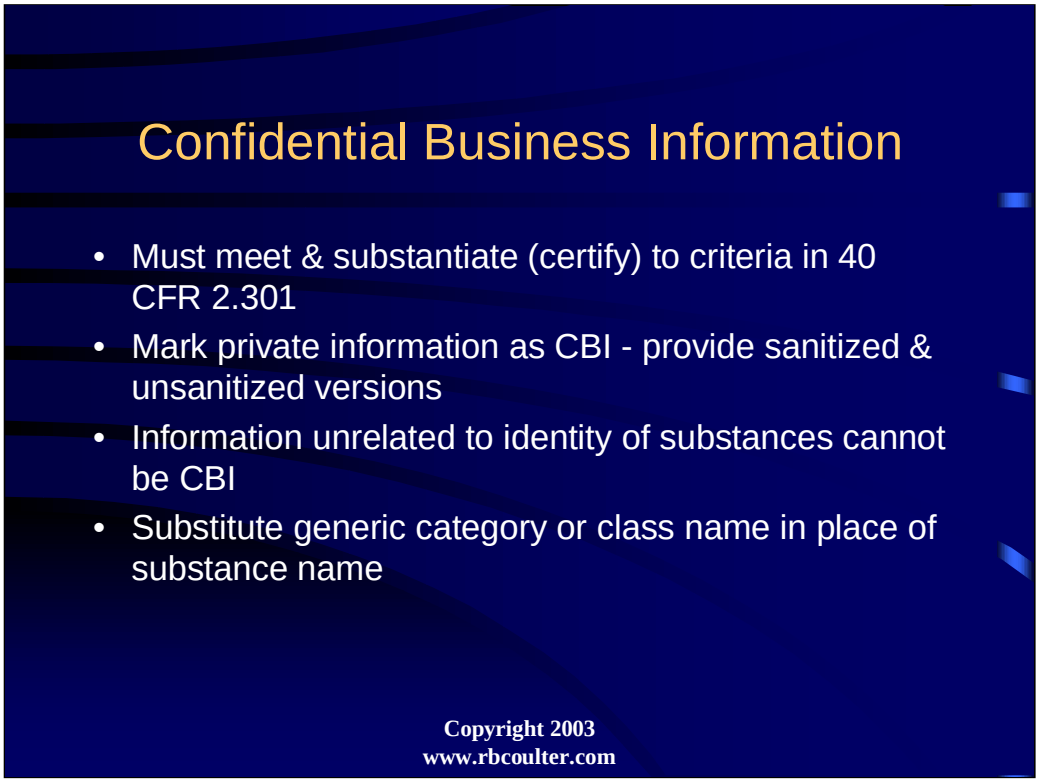
The RMP submission portion is to be submitted to the EPA (or designated authority)

The first submission was by 6/21/99 for covered processes on that date.

RMP submissions are required within three years after a substance is added to list OR immediately when a substance quantity exceeds the listed threshold.

Classified information may be excluded from the RMP but may be made available in classified annex for government officials with security clearance (This mainly for government agencies like the DOE.)

CBI procedures available for those owners /operators wishing to protect competitively sensitive information.

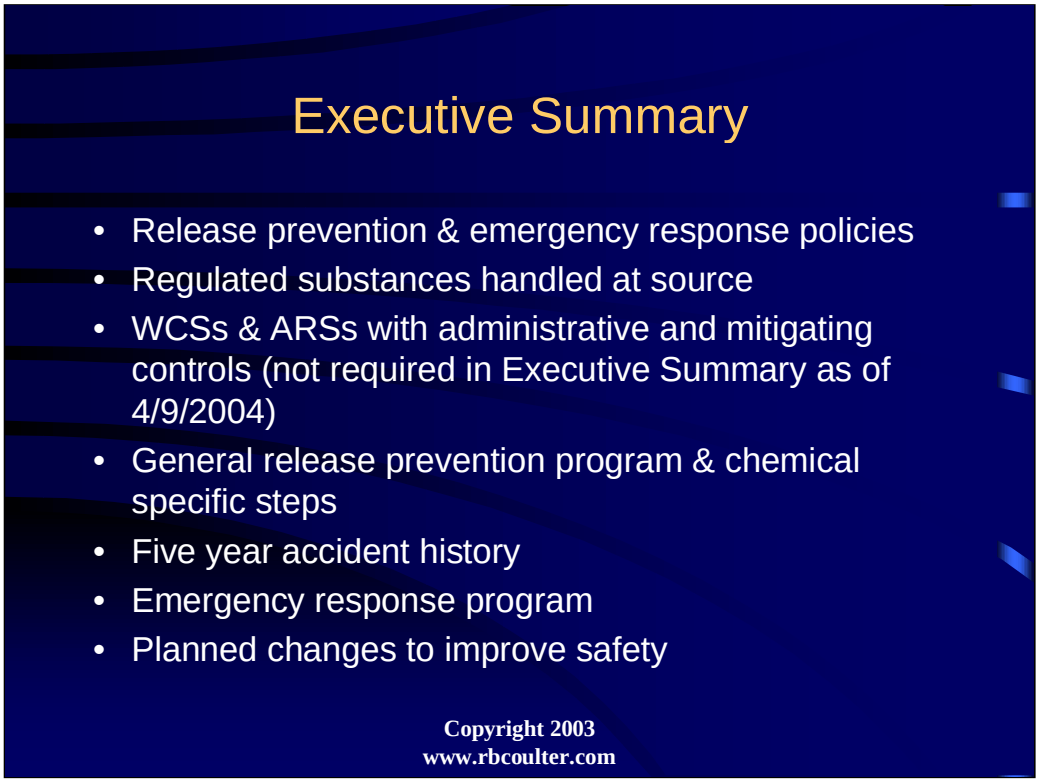


For information to qualify for CBI it must be certified to comply with the criteria in 40 CFR 2.301. The basic procedure for submitting CBI is as follows:

The owner / operator must mark private information as CBI - and submit sanitized & unsanitized versions. The sanitized versions (CBI marked version) can be viewed by the public.

Information unrelated to the identity of listed substances cannot be marked as CBI.

Substitute the generic category or class name in place of the listed substance name.



The executive summary is a brief description of a source's prevention program & its hazard assessment. The executive summary should discuss the:

Release prevention & emergency response policies

Description of the source & the regulated substances handled at the source

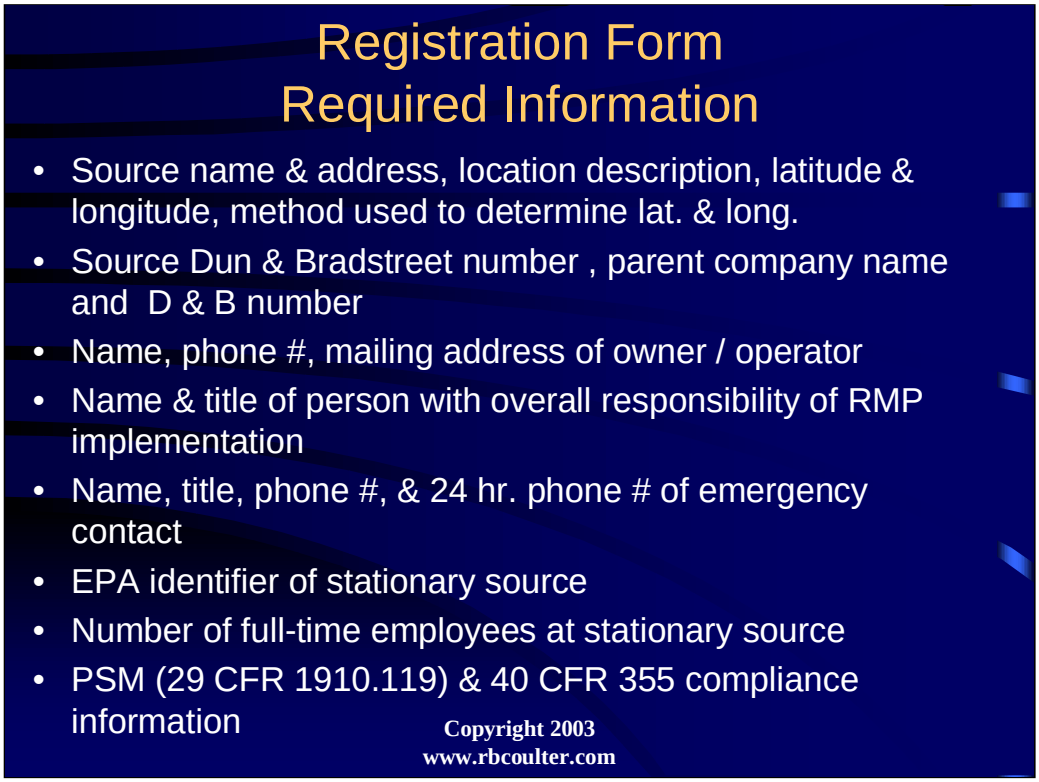
WCSs & ARSs and a description of administrative controls and mitigating measures are not required in the Executive Summary (as of 4/9/2004).

General release prevention program & chemical specific prevention steps

Five year accident history

Emergency response program

Planned changes to improve safety



Basic registration information required for the RMP submissions is:

Source name & address, location description, latitude & longitude, and the method used to determine the lat. & long.

Source Dun & Bradstreet number , parent company name and parent D & B number

Name, phone #, mailing address of owner / operator

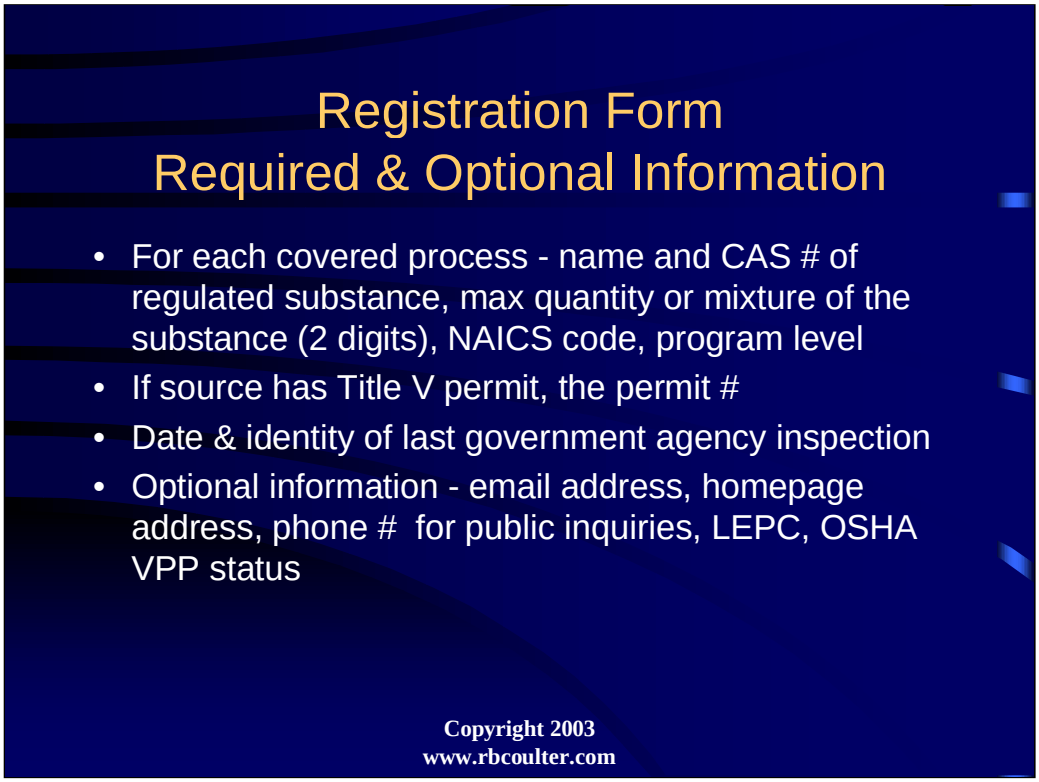
Name & title of person with overall responsibility of for the RMP implementation

Name, title, phone #, & 24 hr. phone # of the emergency contact

EPA identifier of stationary source

Number of full-time employees at the stationary source

PSM (29 CFR 1910.119) & 40 CFR 355 compliance information

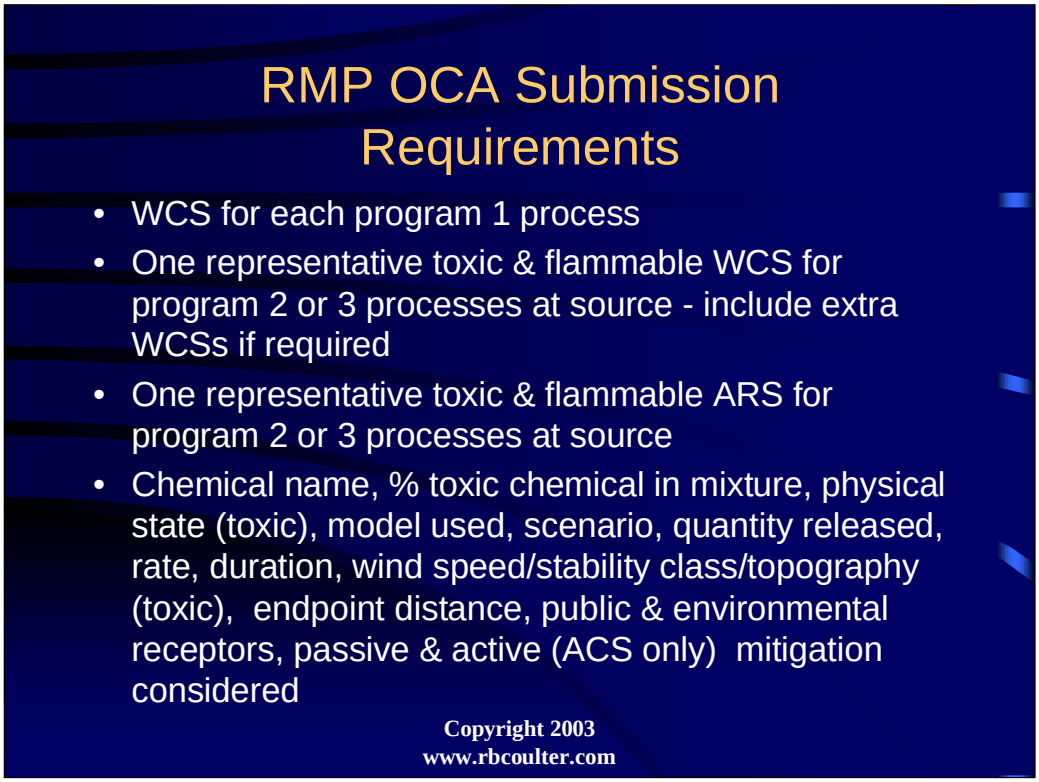


For each covered process provide the name and CAS # of the regulated substance, the max quantity or mixture of the substance (specify to 2 significant digits), NAICS code, and the applicable program level.

If source has a Title V permit, the permit # should be provided.

Specify the date & identity of the last government agency inspection.

The following are optional items to include - email address, homepage address, phone # for public inquiries, LEPC, OSHA VPP (Voluntary Protection Program) status.



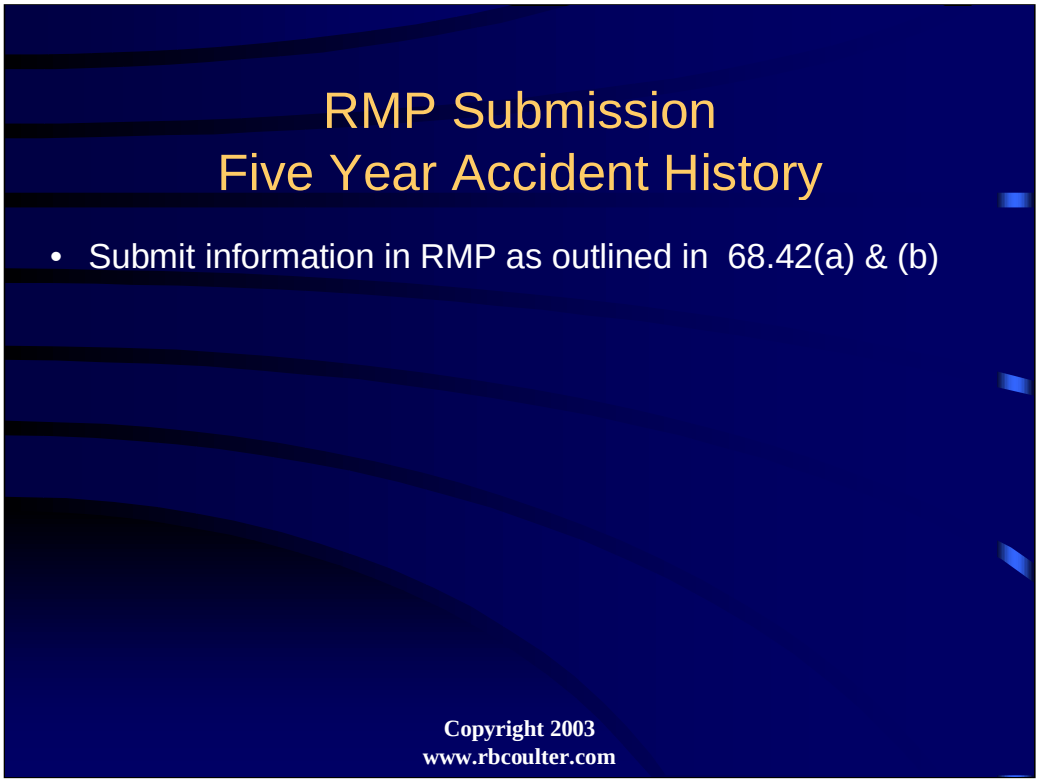
The following are the required RMP submission items concerning OCA:

Submit one WCS for each program 1 process. In other words, if there are five program 1 processes at a source, FIVE WCSs should be submitted.

One representative toxic & flammable WCS for program 2 or 3 processes at the source. Other WCS may need to be submitted in some cases for program 2 or 3 processes (see slides on OCA at beginning of the presentation).

One representative toxic & flammable ARS for program 2 or 3 processes at source.

Chemical name, % toxic chemical in the mixture, physical state if the substance is toxic, model used, scenario, the quantity released, the release rate, duration of the release, wind speed/stability class/topography used for the scenario(s) (for toxic substances), distance to the endpoint, public & environmental receptors affected by the model, passive & active (ACS only) mitigation controls / measures considered.



Submit the information on the five year accident history as outlined in 68.42(a) & (b).

NAICS code, chemical name(s), date of last safety information review & list of applicable regulations, standards, and/or design codes for the process

Date of completion of the most recent hazard review, major hazards identified, changes since the last hazard review and the expected completion date of any recommendations from the review

Process controls, mitigation, monitoring, detection systems currently in use

Date of last review/ revision of the process operating procedures & training program

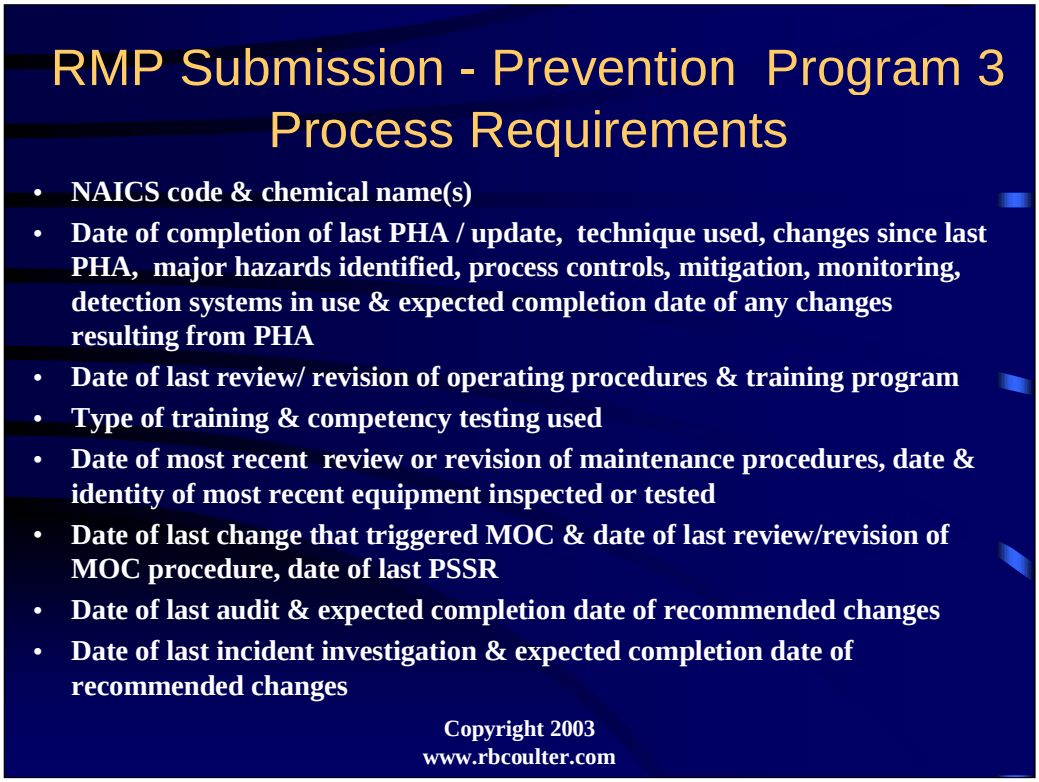
Type of training & competency testing used for process employees

Date of most recent review or revision of maintenance procedures, date of the last equipment inspection and identity of equipment tested

Date of the last audit & expected completion date of recommended changes resulting from the audit

Date of last incident investigation & expected completion date of recommended changes resulting from the incident investigation

Date of last changes that triggered review/revision of the safety information, hazard review, operating or maintenance procedures, or training



NAICS code & chemical name(s)

Date of completion of last PHA / update, technique used for PHA (or methodology), changes since last the PHA, major hazards identified in the last PHA, process controls, mitigation, monitoring, detection systems in use on the process & expected completion date of any changes resulting from the PHA

Date of last review/ revision of the process operating procedures & training program

Type of training & competency testing used

Date of most recent review or revision of maintenance procedures, date & identity of the last equipment inspected or tested

Date of that last change that triggered a MOC & date of last review/revision of MOC procedure and date of the last PSSR

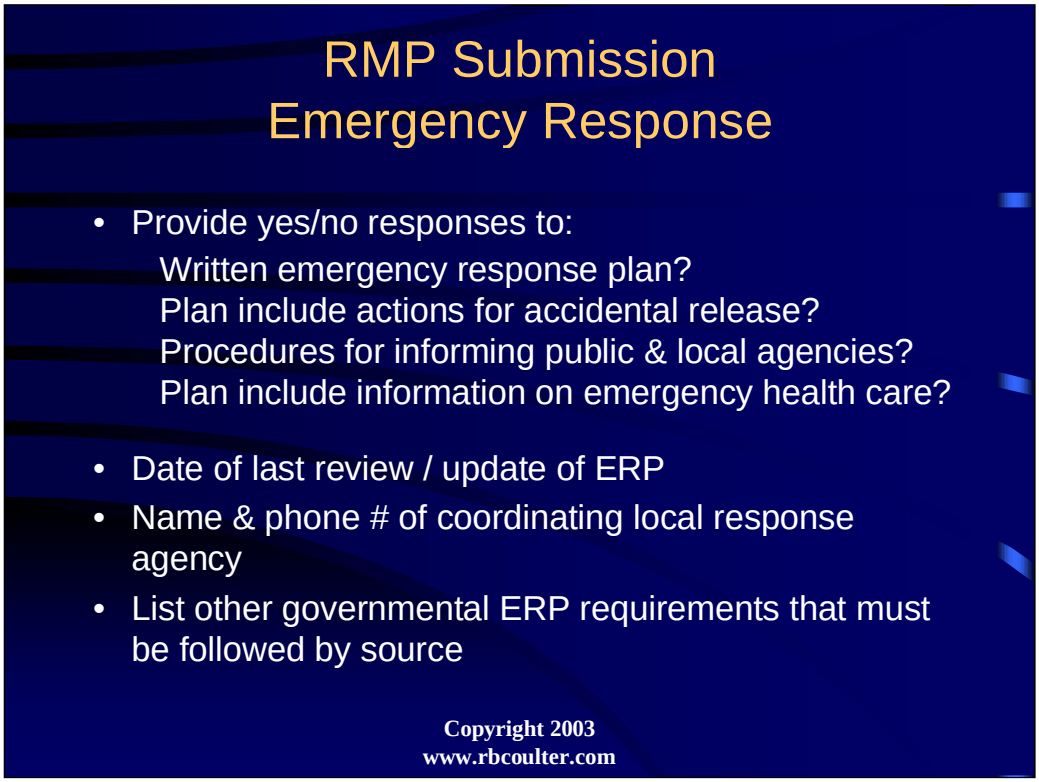
Date of the last audit & expected completion date of recommended changes resulting from the audit.

Date of the last incident investigation & expected completion date of recommended changes resulting from the incident investigation

Date of the last review / revision of the employee participation plan

Date of the last review / revision of the hot work permit procedures

Date of the last review / revision of the contractor safety procedures & the evaluation of contractor safety performance



Provide yes/no responses to the following questions:

Written emergency response plan?

Plan include actions for accidental release?

Procedures for informing public & local agencies?

Plan include information on emergency health care?

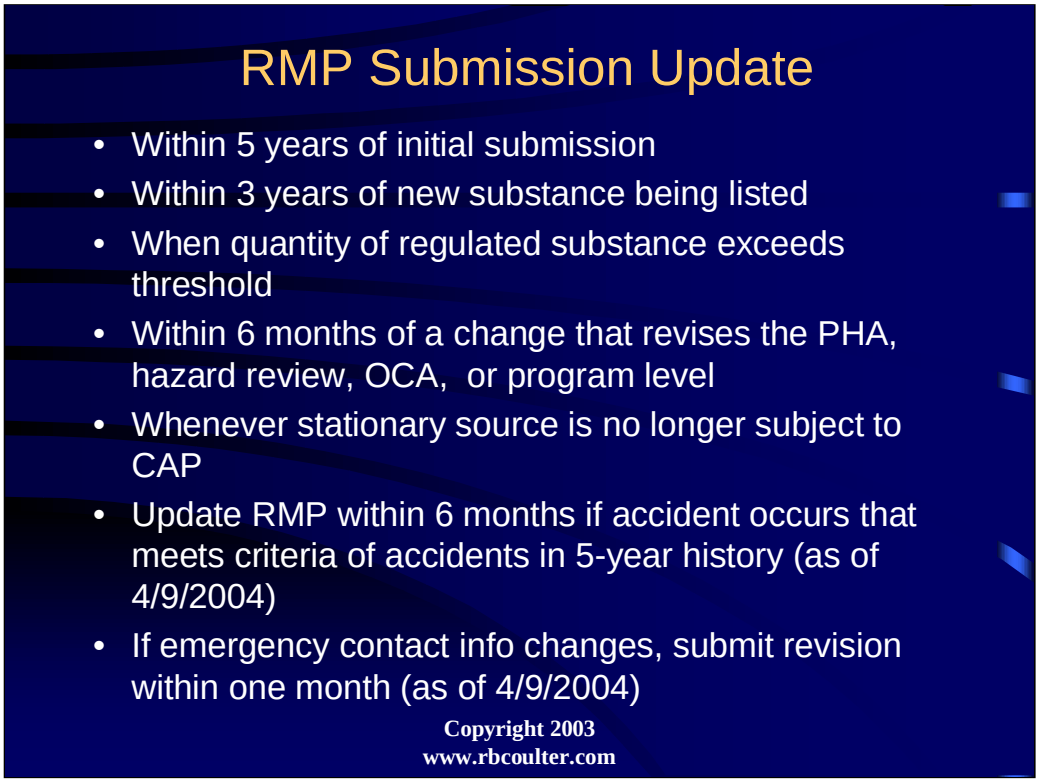
Date of the last review / update of the ERP

Name & phone # of local response agency coordinating emergency response activities with the source

List other governmental ERP requirements that must be followed by the stationary source

For program 1 processes, submit the statement provided in 68.12(b)(4) that certifies public receptors are beyond the endpoint distance for the WCS.

For the other program processes, certify the RMP as being true, accurate, & complete



The RMP should be revised:

Within 5 years of the initial submission

Within 3 years of EPA adding a new substance to the list (and the source has the new substance above the threshold quantity)

When the quantity of regulated substance exceeds its listed threshold

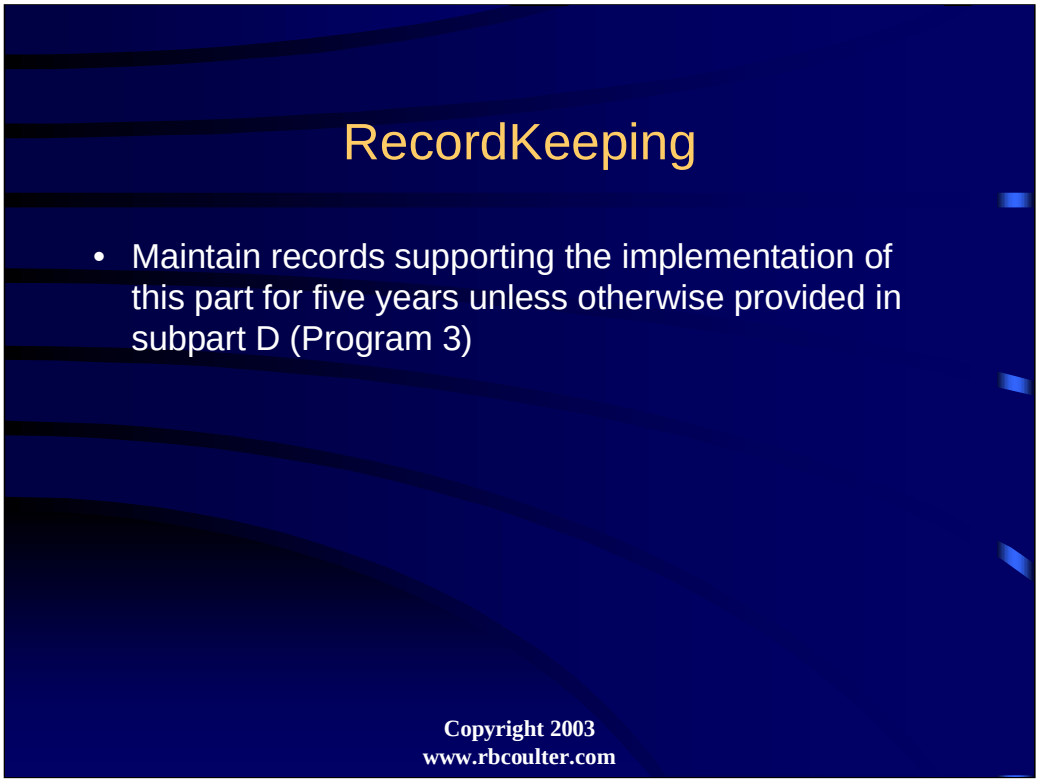
Within 6 months of a change that revises the PHA, hazard review, OCA, or program level of a process

Whenever the stationary source is no longer subject to CAP

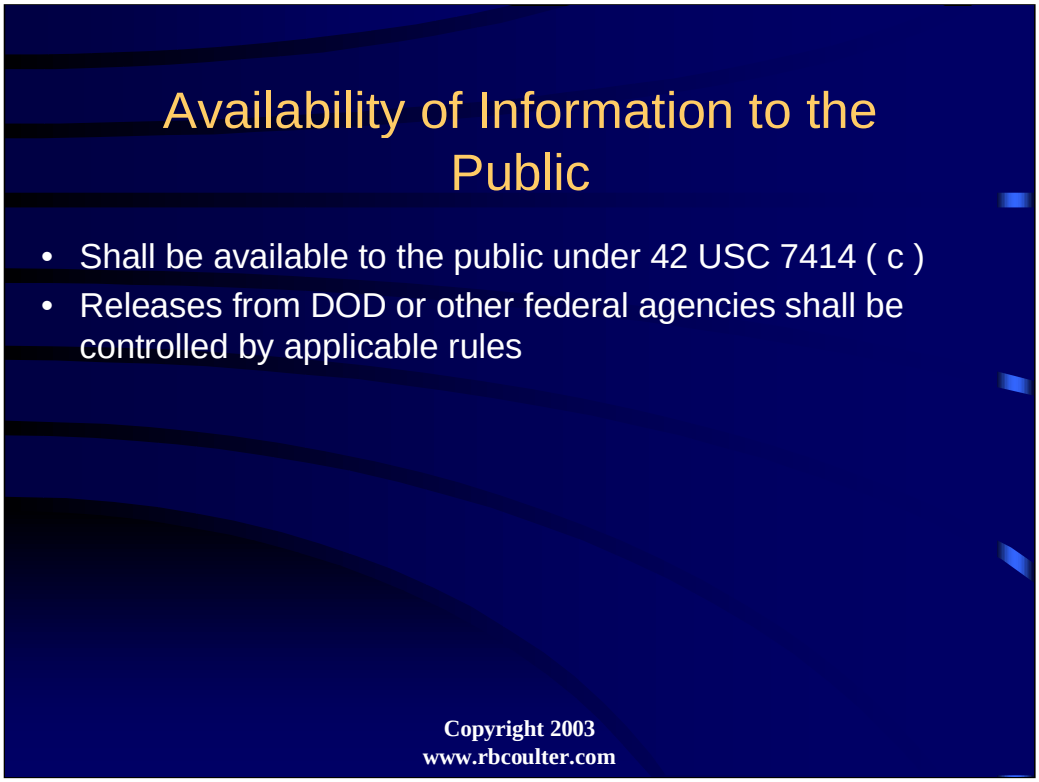
The RMP must be updated within 6 months to reflect any accident that occurs that meets the criteria of accidents in the 5-year history. This was affective

4/9/2004.

Also, if the emergency contact information changes at the facility then this information must be updated in the RMP within one month (as of 4/9/2004).

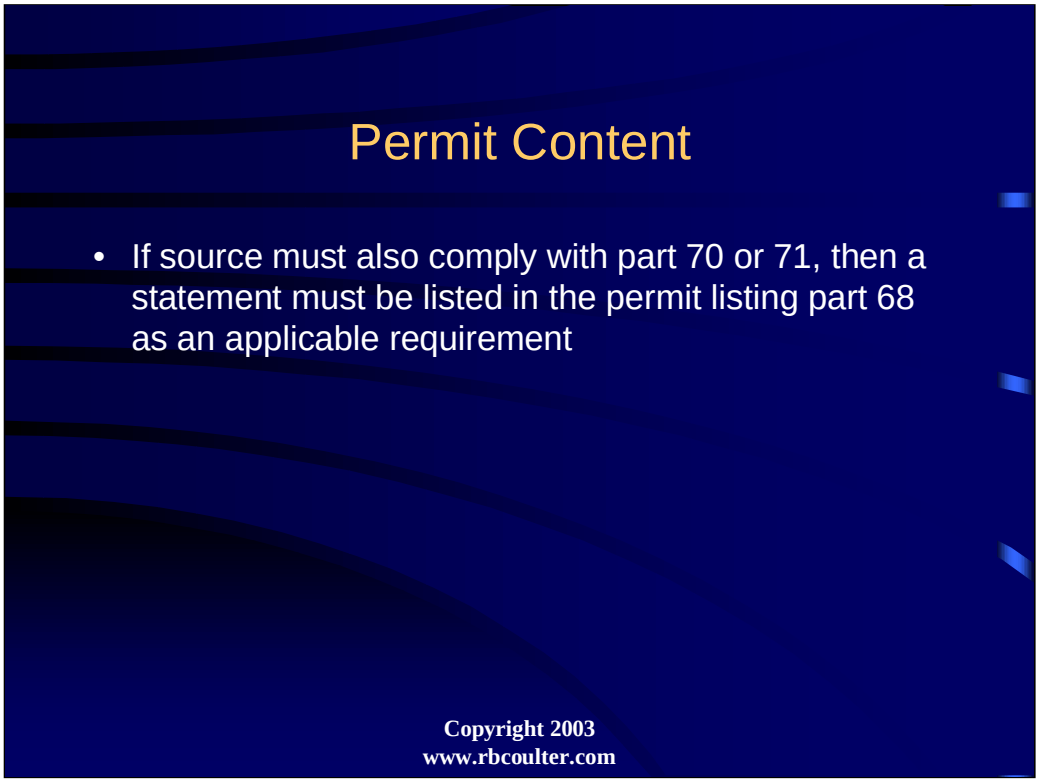


Maintain records supporting the implementation of this part for five years unless otherwise provided in subpart D (Program 3 - PHAs must be retained for the lifetime of the process.).

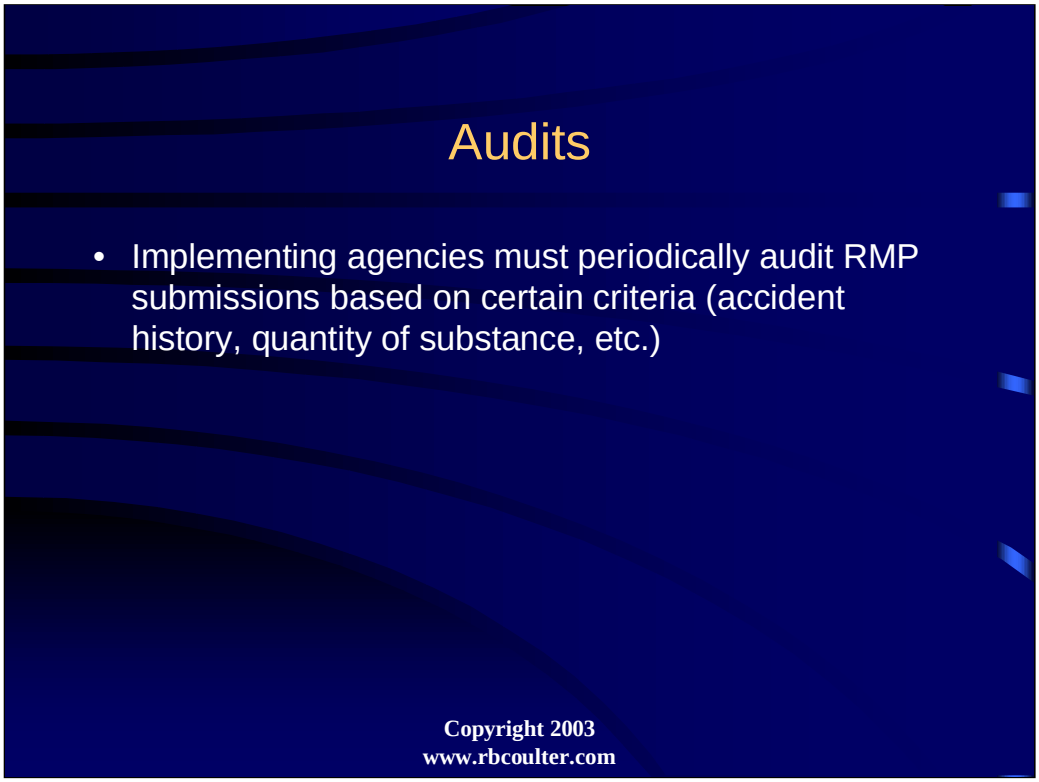


The RMP shall be available to the public as provided under 42 USC 7414 (c)

Releases from DOD or other federal agencies shall be controlled by the rules that apply to classified information.



If the source must also comply with part 70 or 71, then a statement must be listed in the permit listing part 68 as an applicable requirement.



Implementing agencies must periodically audit RMP submissions based on certain criteria (accident history, quantity of substance, etc.).