



RESOURCE COMPLIANCE

Introduction - RMP/PSM/CalARP Overview

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Introductions

What is Process Safety

- ***Process Safety*** generally refers to the prevention of unintentional releases of chemicals, energy, or other potentially dangerous materials during the course of chemical process operations that can have a serious effect life and the environment.
- ***Process Safety*** differs from ***Personal Safety***



Bhopal, India

- **Background:** Union Carbide built in 1969 to produce the pesticide Sevin using methyl isocyanate (MIC). MIC production plant was added in 1979.
- **Accident:** On December 2-3, 1984 water entered a tank containing 42 tons of MIC. The water caused an exothermic reaction. 30 metrics tons of MIC escaped and dispersed over Bhopal.

Bhopal, India

Consequences:

- 2,259 died immediately
- Some estimate 8,000 died within two weeks and another 8,000 or more have died.
- 2006 government report stated that it caused 558,125 injuries; 38,478 temporary partial disabling injuries; 3,900 severely and permanently disabling injuries

Overview of RMP, PSM, and CalARP

Federal EPA

Federal OSHA

Cal-OSHA

CUPA

June 20, 1996

Feb 24, 1992

1994

1999

RMP

Risk Management
Program

PSM

Process Safety
Management

PSM

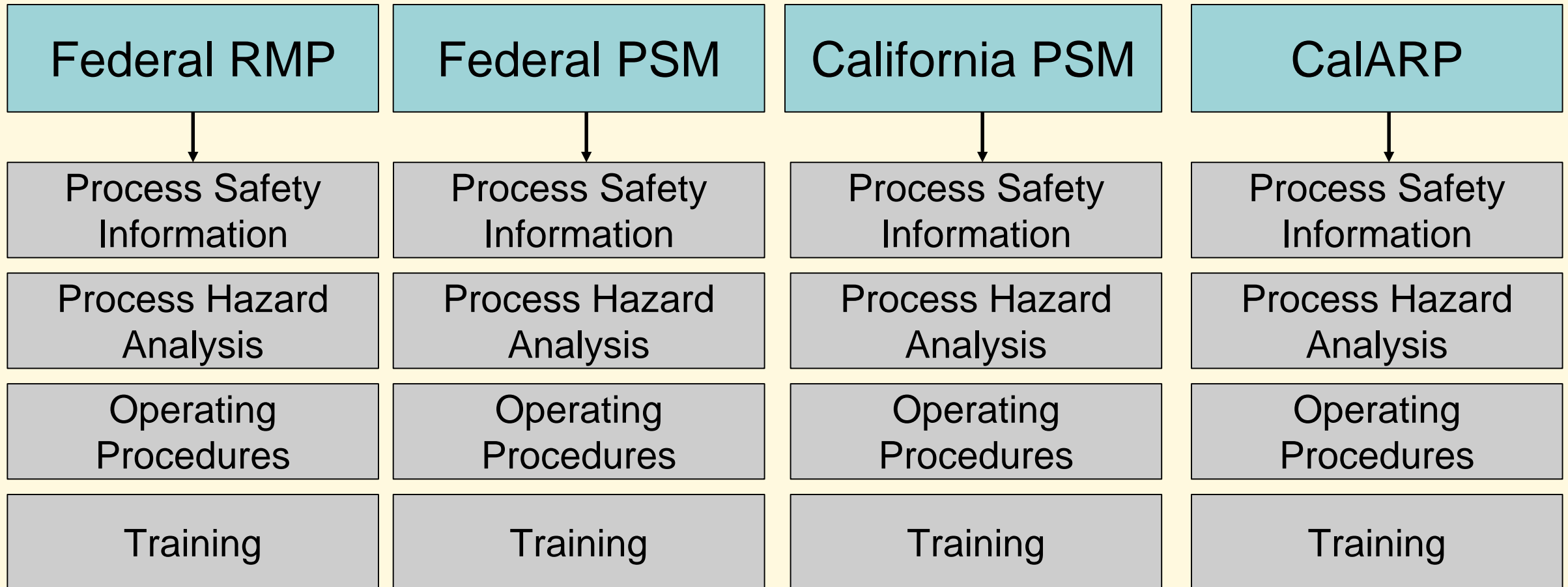
Process Safety
Management

CalARP

California
Accidental Release
Prevention
Program



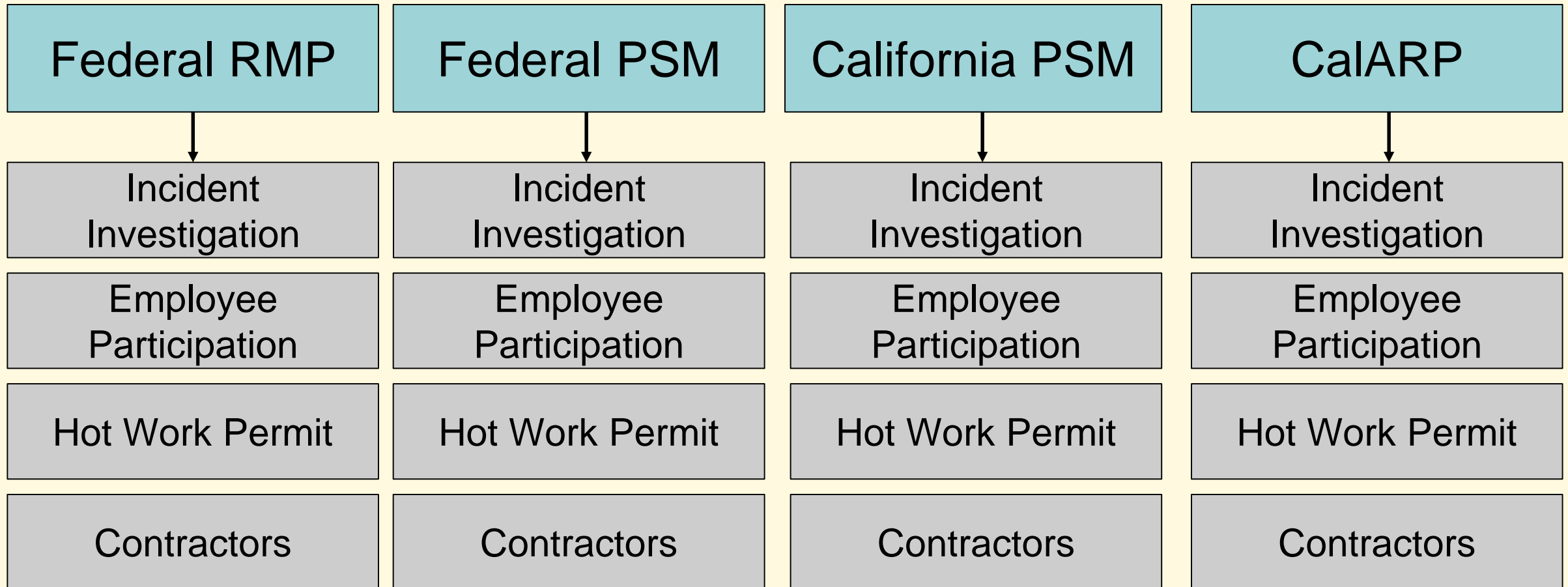
RMP/PSM/CalARP



RMP/PSM/CalARP

Federal RMP	Federal PSM	California PSM	CalARP
Mechanical Integrity	Mechanical Integrity	Mechanical Integrity	Mechanical Integrity
Management of Change	Management of Change	Management of Change	Management of Change
Pre-Startup Safety Review	Pre-Startup Safety Review	Pre-Startup Safety Review	Pre-Startup Safety Review
Compliance Audit	Compliance Audit	N/A	Compliance Audit

RMP/PSM/CalARP



RMP/PSM/CalARP

Federal RMP	Federal PSM	California PSM	CalARP
Hazard Assessment	N/A	N/A	Hazard Assessment
Emergency Response Plan	Emergency Response Plan	Emergency Response Plan	Emergency Response Plan
Regulatory Submission	N/A	N/A	Regulatory Submission
N/A	Trade Secrets	IIPP	N/A

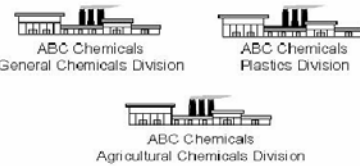
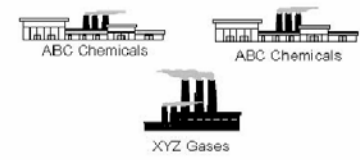
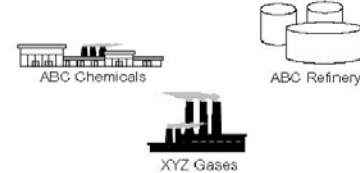

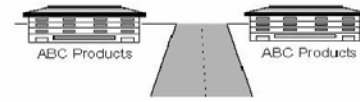
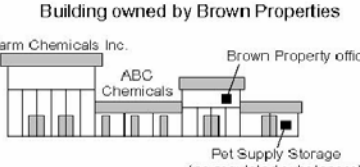
CaIARP/RMP Applicability

- An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under this RMP and/or CaIARP, must comply with the requirements of RMP and/or CaIARP



Stationary Source

A “facility” with more than a **threshold quantity** of a regulated substance as found in the RMP/CalARP regulations



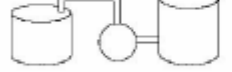





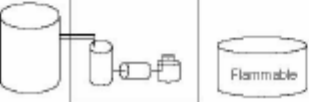
Schematic Representation	Description	Interpretation
 <p>ABC Chemicals General Chemicals Division</p> <p>ABC Chemicals Plastics Division</p> <p>ABC Chemicals Agricultural Chemicals Division</p>	<p><i>same</i> owner <i>same</i> industrial group</p>	<p>1 stationary source 1 RMP</p>
 <p>ABC Chemicals</p> <p>ABC Chemicals</p> <p>XYZ Gases</p>	<p>two owners</p>	<p>2 stationary sources 2 RMPs 1 ABC 1 XYZ</p>
 <p>ABC Chemicals</p> <p>ABC Refinery</p> <p>XYZ Gases</p>	<p>two owners three industrial groups</p>	<p>3 Stationary sources 3 RMPs 1 ABC Chemicals 1 ABC Refinery 1 XYZ Gases</p>
 <p>ABC Chemicals</p> <p>ABC-MINO Joint-Venture</p>	<p>two owners</p>	<p>2 stationary sources 2 RMPs</p>
 <p>ABC Products</p> <p>ABC Products</p>	<p><i>same</i> owner <i>same</i> industrial group contiguous property</p>	<p>1 stationary source 1 RMP</p>
 <p>Farm Chemicals Inc.</p> <p>ABC Chemicals</p> <p>Brown Property offices</p> <p>Pet Supply Storage (no regulated substances)</p>	<p>two owners</p>	<p>2 stationary sources 2 RMPs 1 ABC Chemicals 1 Farm Chemicals</p>

Threshold Quantities

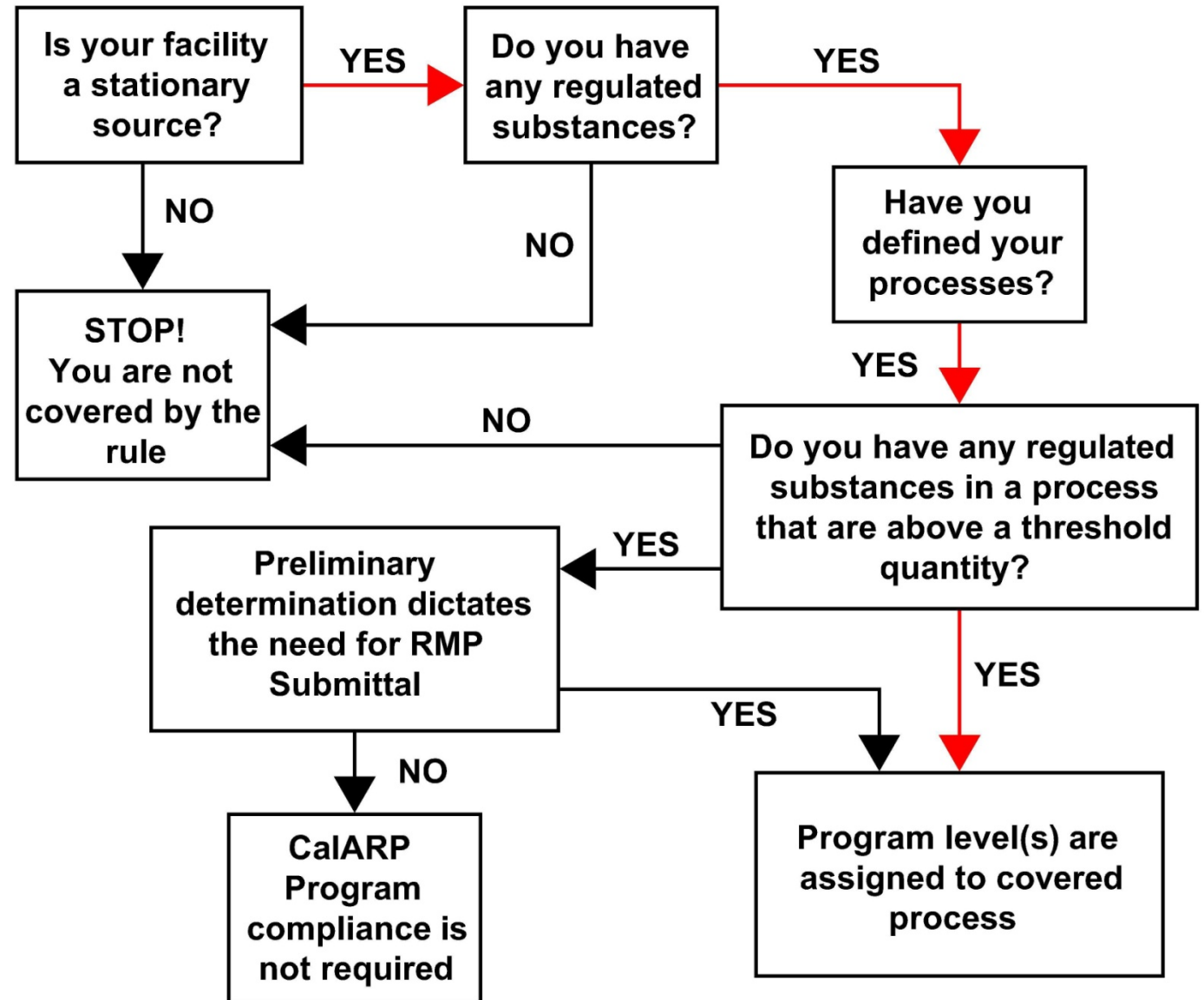
	Fed RMP	Fed OSHA	CaI-OSHA	CaIARP
Ammonia	10,000 lbs	10,000 lbs	10,000 lbs	500 lbs
Sulfur Dioxide	5,000 lbs	1,000 lbs	1,000 lbs	500 lbs
Chlorine	2,500 lbs	1,500 lbs	1,500 lbs	100 lbs

Process

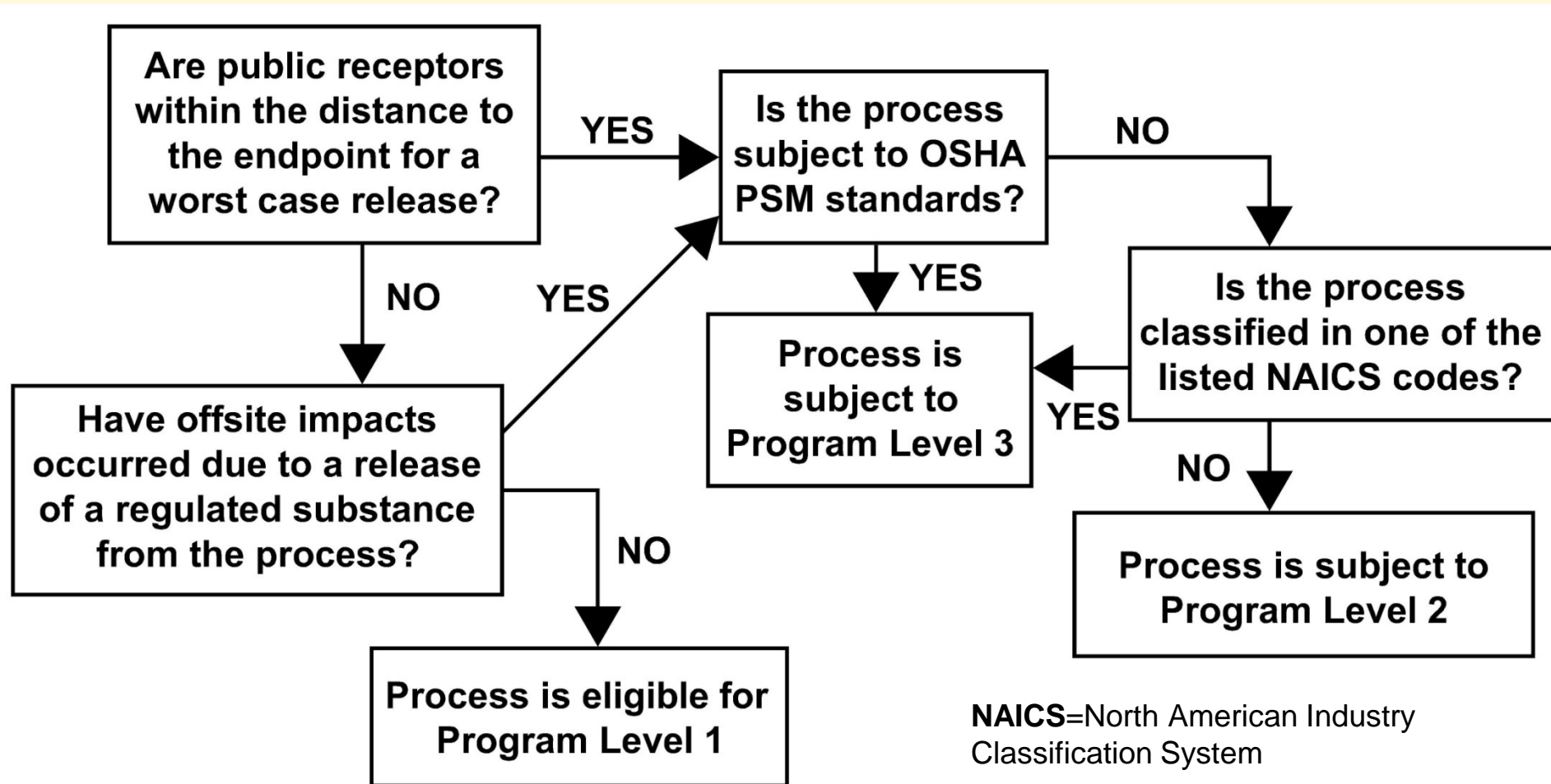
- “Process”** means any activity involving a regulated substance including any use, storage, manufacturing, handling, or on-site movement of such substances, or combination of these activities. For the purposes of this definition, any group of vessels that are interconnected, or separate vessels that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

Schematic Representation	Description	Interpretation
	1 vessel 1 regulated substance above TQ	1 process
	2 or more connected vessels <i>same</i> regulated substance above TQ	1 process
	2 or more connected vessels <i>different</i> regulated substances each above TQ	1 process
	pipeline feeding multiple vessels total above TQ	1 process
	2 or more vessels co-located <i>same</i> substance total above TQ	1 process
	2 or more vessels co-located <i>different</i> substances each above TQ	1 process
	2 vessels, located so they won't be involved in a single release <i>same</i> or <i>different</i> substances each above TQ	2 processes
	2 locations with regulated substances each above TQ	1 or 2 processes depending on distance
	1 series of interconnected vessels <i>same</i> or <i>different</i> substances above TQs plus a co-located storage vessel containing flammables	1 process

Stationary Source



Program Level Assignment



NAICS=North American Industry Classification System

NAICS Codes

- **NAICS:** North American Industry Classification System
- Used by Federal statistical agencies for classification
 - 115114: Postharvest Crop Activities (except Cotton Ginning)
 - 3116: Animal Slaughtering and Processing
 - 311411: Frozen Fruit, Juice, and Vegetable Manufacturing
 - 312111: Soft Drink Manufacturing
 - 49312: Refrigerated Warehousing and Storage

Classified NAICS Codes

- 32211: Pulp Mills
- 32411: Petroleum Refineries
- 32511: Petrochemical **Manufacturing**
- 325181: Alkalies and Chlorine **Manufacturing**
- 325188: All Other Basic Inorganic Chemical **Manufacturing**
- 325192: Cyclic Crude and Intermediate **Manufacturing**
- 325199: All Other Basic Organic Chemical **Manufacturing**
- 325211: Plastics Material and Resin **Manufacturing**
- 325311: Nitrogenous Fertilizer **Manufacturing**
- 32532: Pesticide and Other Agricultural Chemical **Manufacturing**

Practice – Applicability and Program Level

Two (2) one ton cylinders of sulfur dioxide

Regulations: CalARP, Fed OSHA – PSM, Cal OSHA – PSM

Program Level: 3

	Fed RMP	Fed OSHA	Cal-OSHA	CalARP
Sulfur Dioxide	5,000 lbs	1,000 lbs	1,000 lbs	500 lbs

Comparison of Program Requirements		
Program 1	Program 2	Program 3
Executive Summary	Executive Summary	Executive Summary
Worst-Case Release Analysis	Worst-Case Release Analysis	Worst-Case Release Analysis
	Alternate Release Analysis	Alternate Release Analysis
5-Year Accident History	5-Year Accident History	5-Year Accident History
	Document Management System	Document Management System
Prevention Program		
	Safety Information	Process Safety Information
	Hazard Review	Process Hazard Analysis
	Operating Procedures	Operating Procedures
	Training	Training
	Maintenance	Mechanical Integrity
	Incident Investigation	Incident Investigation
	Compliance Audit	Compliance Audit
		Management of Change
		Pre-Startup Safety Review
		Contractors
		Employee Participation
		Hot Work Permits
Emergency Response Program		
Coordinate with Local Responders	Develop a plan and program (if applicable) and coordinate with local emergency responders	Develop a plan and program (if applicable) and coordinate with local emergency responders



You are here: [RMP*Comp](#) » [Start](#) » Toxic Gas Processing

RMP*Comp

[← Back](#)

Errors Found

No errors found

Chemical Information

Chemical Name: Ammonia (anhydrous)

CAS Number: 7664-41-7

Chemical Type: Toxic Gas

Worst-case Analysis

Scenario type: Worst-case Alternative

Physical state: Unliquefied
 Liquefied by refrigeration
 Liquefied under pressure

Quantity released: pounds

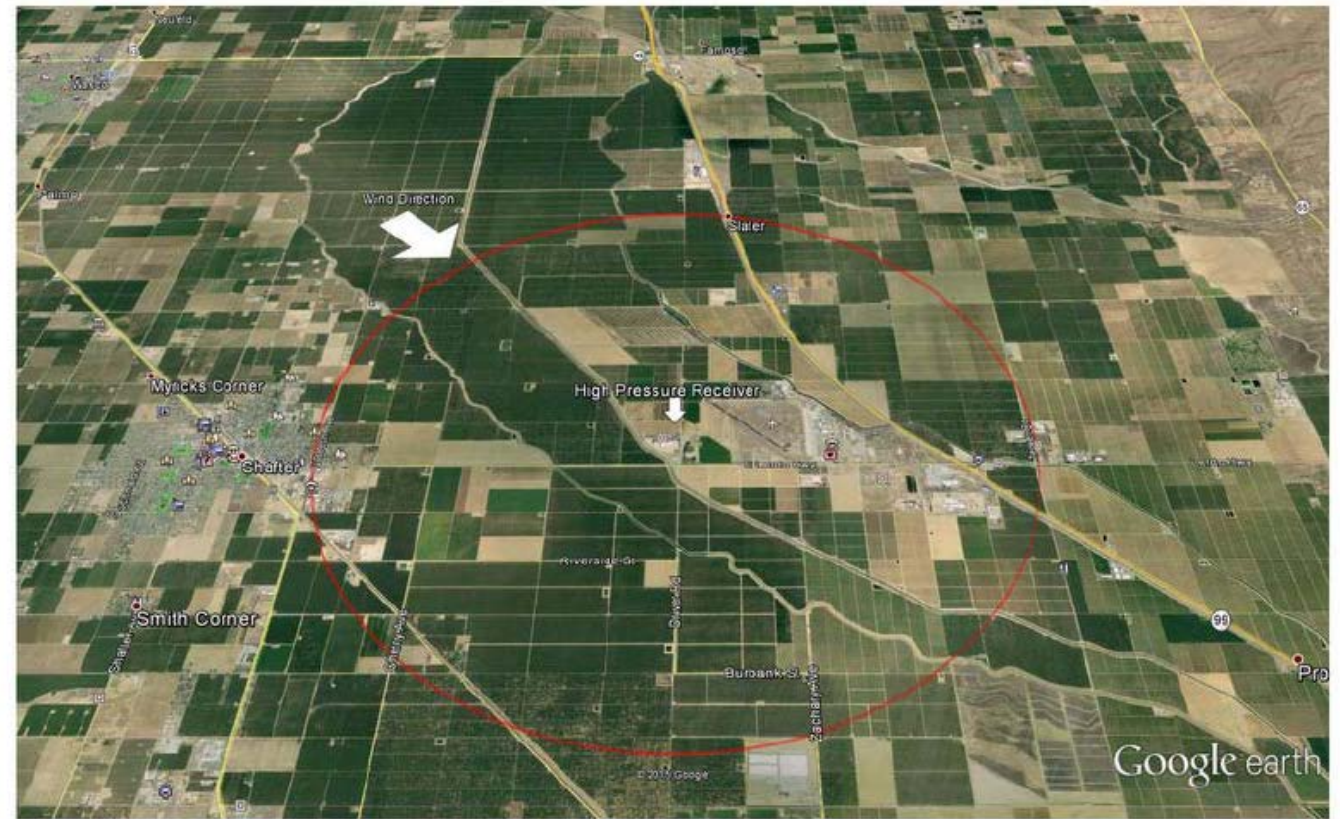
Surrounding terrain type: Urban (many obstacles in the immediate area)
 Rural (terrain generally flat and unobstructed)

Mitigation measures

Check the checkbox below if the following mitigation measure is in place in your process.

Release in enclosed space, in direct contact with outside air:

[Submit](#)

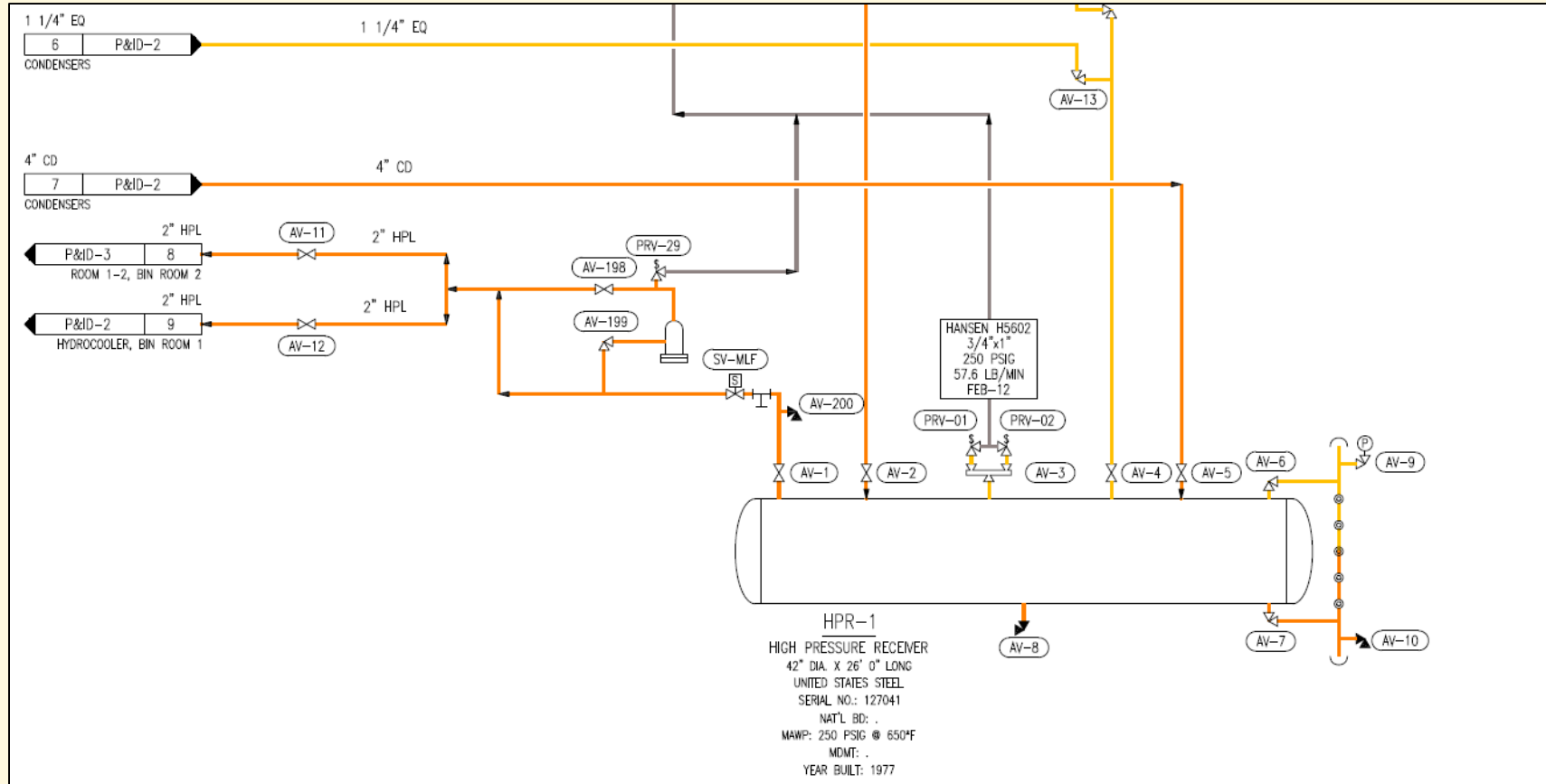


Google earth

miles
km

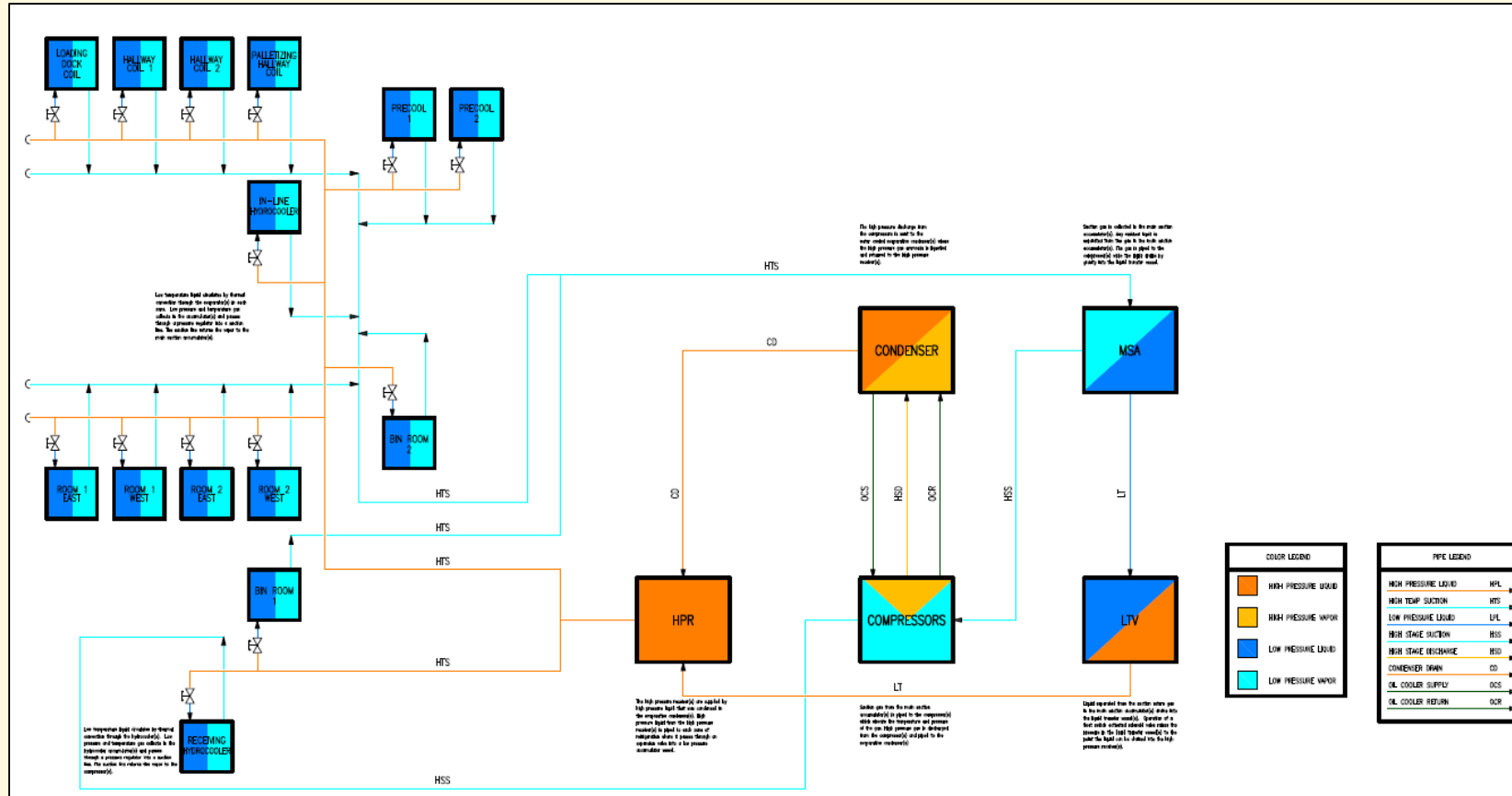


Hazard Assessment



Process Safety Information

Piping and Instrumentation Diagrams (P&IDs)

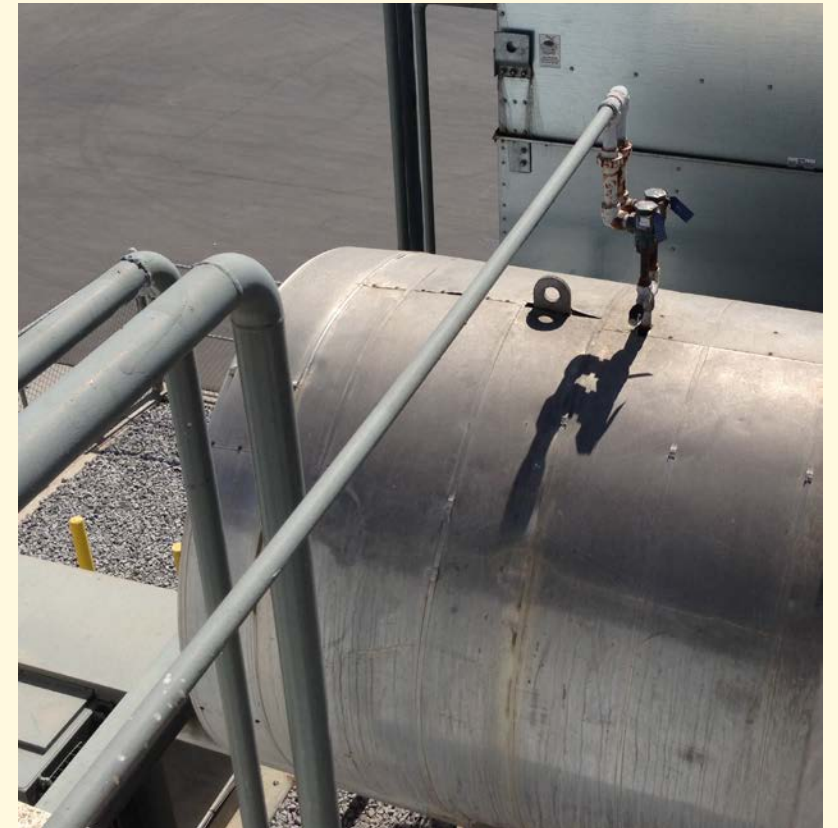


Process Safety Information

Block Flow Diagram



$$L = \frac{0.2146d^5(P_0^2 - P_2^2)}{fC_r^2} - \frac{d \times \ln(P_0/P_2)}{6f}$$



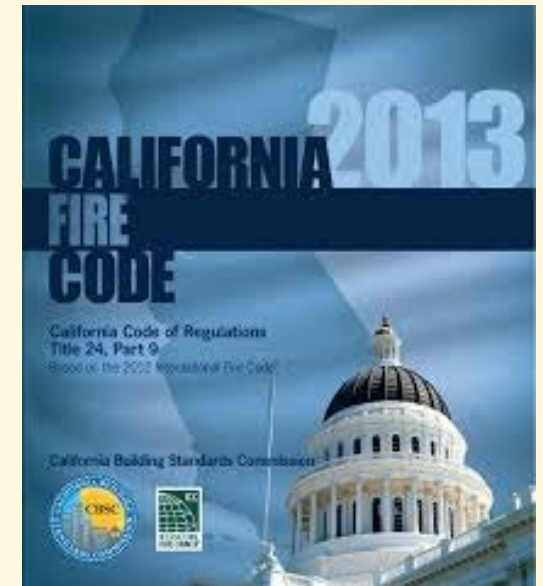
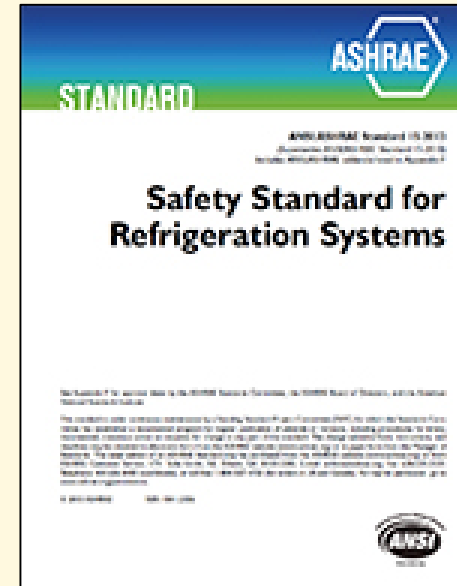
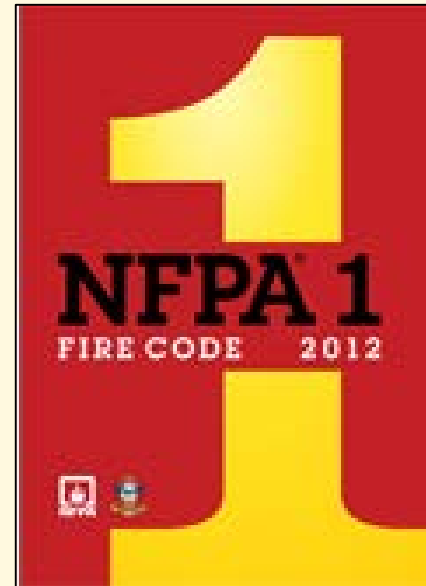
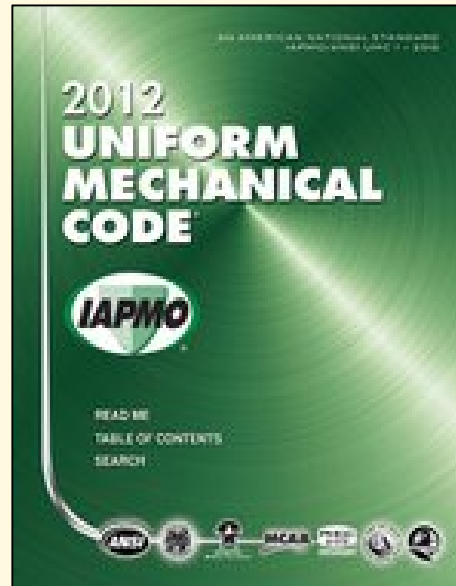
Process Safety Information

Relief System Design and Design Basis



Process Safety Information

Ventilation System Design



Process Safety Information

Design Codes and Standards Employed - RAGAGEP

Risk Matrix

Risk Ranking Profile: Resource Compliance

Likelihood	4	A	N	U	U
	3	A	C	N	U
	2	A	A	C	N
	1	A	A	A	C
		1	2	3	4
		Severity			

What If	Scenarios	Consequences	Severity Likelihood Risk Rankings	Safeguards
1: What if the equipment or associated components is damaged by nearby activity?	A forklift driver accidentally hits this piece of equipment.	1. Death 2. Injury 3. Low pressure liquid ammonia release 4. Reactive maintenance	4 1 C	1. The flooded accumulators are located behind bunker walls which provide some protection from forklift impact. 2. Facility forklift drivers have been trained to take extra care when driving around the refrigeration equipment. 3. The flooded accumulators are located on the roof which is inaccessible to vehicle traffic.
2: What if the back pressure	Actuator sticks in the	1. Product damage	2 3 C	1. Each room/zone is



Process Hazard Analysis

Operating Phases

Initial Startup

1. The specific initial startup procedures used when commissioning new air-cooling evaporators are not contained within this document. All air-cooling evaporator initial startups will be performed in accordance with the latest version of IIAR 5 *Start-up and Commissioning of Closed Circuit Ammonia Refrigerating Systems*. The facility *Pre-Startup Safety Review (PSSR)* checklist has been designed with the requirements of IIAR 5 in mind.
2. Upon successful completion of the PSSR, the air-cooling evaporator can be started by following the steps outlined in the *Startup Following a Turnaround, or After an Emergency Shutdown* operating phase.

Normal Operations

1. During normal operation, ammonia supplied to the air-cooling evaporator will be controlled automatically based on the room/zone temperature.
2. Air-cooling evaporator fan speed will be controlled automatically in units equipped with variable frequency drives.
3. Visually inspect each air-cooling evaporator at least twice per day for any problems such as ice-buildup, vibration, or ammonia leaks.

NOTE: Bunker-mounted air-cooling evaporators can be inspected by checking under the bunker wall.

4. If the air-cooling evaporator pressure appears to be outside of the acceptable range, the following actions are to be taken:
 - a. Check position of suction isolation valve on the air-cooling evaporator

Operating Procedures



Training

Certificate of Successful Completion

Ron Bryan

has successfully completed the 5-hour *Ammonia Awareness and Refrigeration* training workshop on December 10, 2015 at California Controlled Atmosphere in Dinuba, CA.

Workshop included the following sessions:

- Ammonia Awareness
- Condenser Maintenance
- Control Valves
- Daily Checklist
- Refrigeration Cycle
- Temperature Probe Calibration
- SOPs Fit For Your Facility
- Non-Destructive Testing
- PSM Compliance
- Oil Draining
- Relief Valves
- System Balance Demo



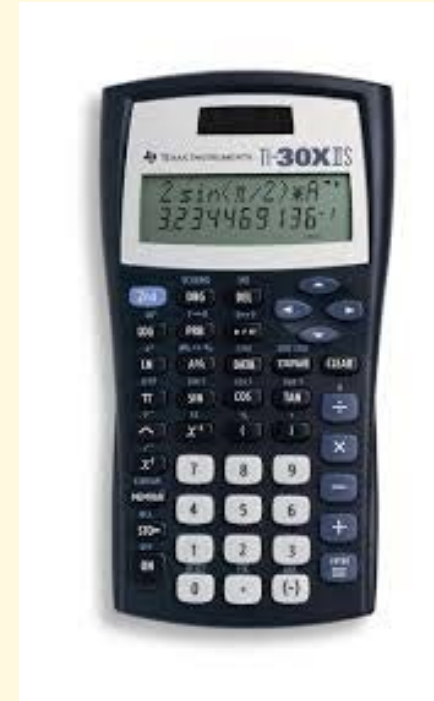
Peter Thomas - Engineer



Certificate No. 2753



Mechanical Integrity

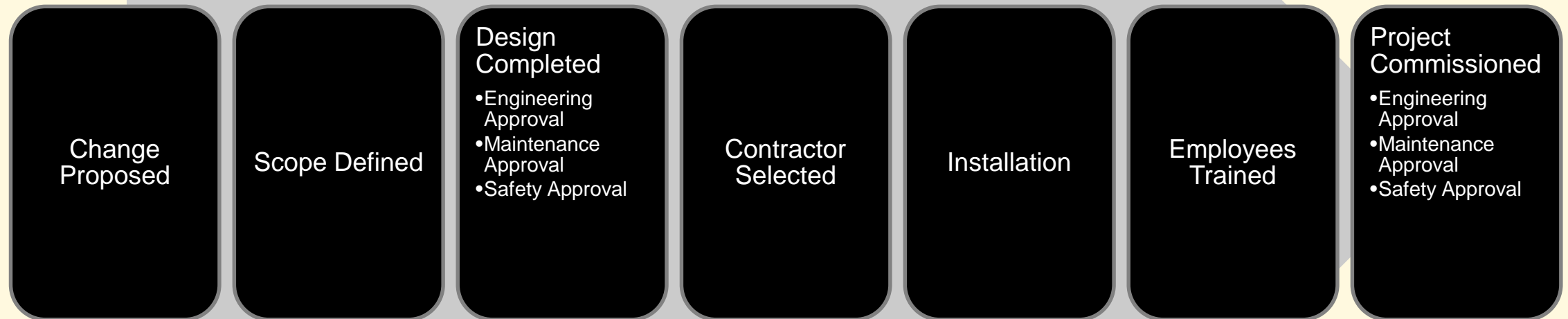


$$L = 2.234D^2 \rho_1 \sqrt{\frac{144P_g}{\rho_1} + \Delta h}$$

Incident Investigations



Compliance Audit



Management of Change and Pre-Startup Safety Review



Contractors



Employee Participation



HOT WORK PERMIT

The supervisor, in issuing this permit, certifies that all safety factors have been considered and cared for satisfactorily.
Return this permit upon completion of the job which it is to cover to the authorizing supervisor. The supervisor will write "complete", date and initial across the face of the permit.

AREA OF HOT WORK: _____

WORK TO BE DONE: _____

	YES	NO	N/A
1 Read the Hot Work Permit Procedure			
2 Work area and equipment has been made free of flammable, combustible, and hazardous materials.			
3 Gas Test taken.			
4 Is a fire extinguisher on the job?			
5 Smoke alarms covered?			
6 Lines disconnected and/or blanked?			
7 Is a fire watch provided?			
8 Adjoining equipment and operations considered ok from standpoint of possible effect on the job.			
9 Other necessary precautions SPECIFY			

APPROVAL
I have personally checked the conditions necessary and as specified I authorize this "Hot" work to begin.

APPROVED BY _____ DATE _____ TIME _____

HOT WORK PERMIT IS GOOD FOR _____ HOURS ONLY
THIS PERMIT CAN BE ISSUED FOR ONLY ONE SHIFT. IT BECOMES VOID AT THE END OF WORK SHIFT DAY.

Hot Work Permits

Comparison: Program 2 & Program 3

Program 2	Program 3
Prevention Program Element	
Safety Information	Process Safety Information
Hazard Review	Process Hazard Analysis
Operating Procedures	Operating Procedures
Training	Training
Maintenance	Mechanical Integrity
Incident Investigation	Incident Investigation
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	Management of Change
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Comparison: Program 2 & Program 3

- P3: Management of Change - §2760.6
 - P2: Safety information must be updated when a change occurs - §2755.1(c)
 - P2: Operating procedures must be updated when a change occurs - §2755.3(c)
 - P2: Training is required for all employees - §2755.4

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Comparison: Program 2 & Program 3

- P3: Pre-Startup Review - §2760.7
 - P2: Safety information must be updated when a change occurs - §2755.1(c)
 - P2: Training is required for all employees - §2755.4

Program 2	Program 3
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Comparison: Program 2 & Program 3

- P3: Contractors - §2760.12
 - P2: Owner must ensure that every contractor is trained to perform maintenance procedures - §2755.5(c)

Program 2	Program 3
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Comparison: Program 2 & Program 3

- P3: Employee Participation - §2760.10
 - P2: The hazard review shall be performed by a team familiar with process operations and shall include at least one employee who has experience and knowledge specific to the process being reviewed. - §2755.2(c)

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The End