



Process Safety Management

- ***29 CFR 1910.119***

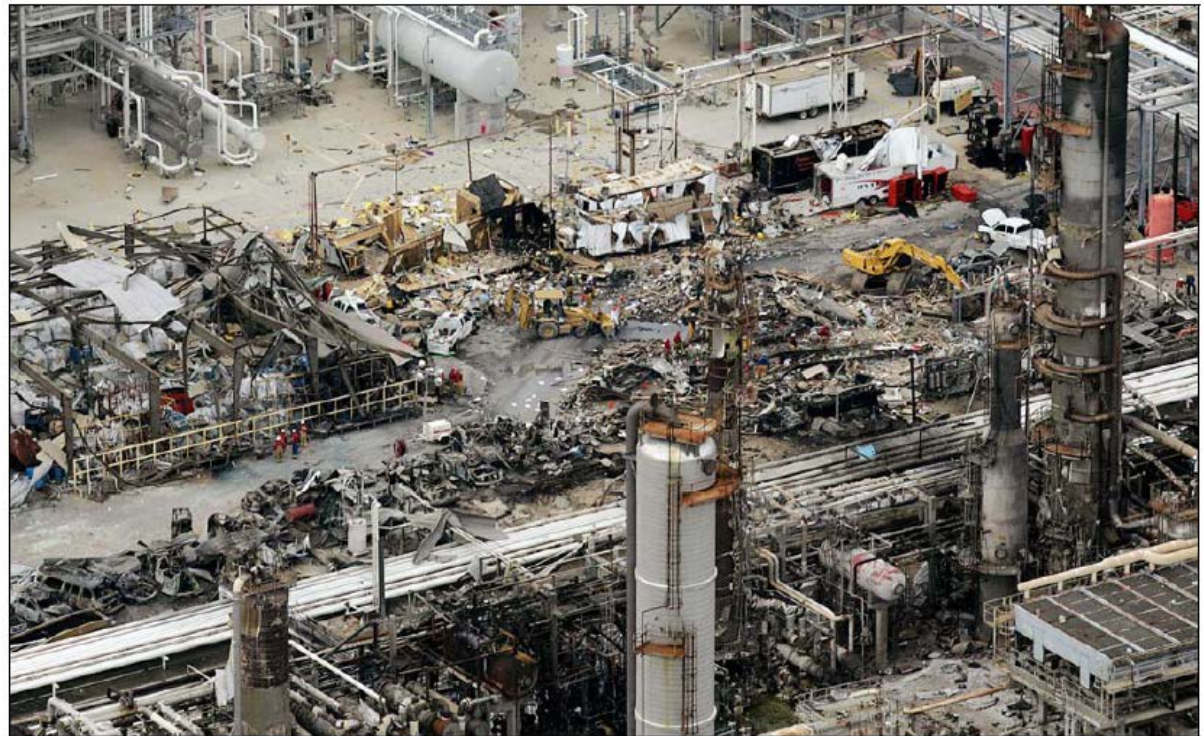
Objectives

- In this course, we will discuss the following:
 - Importance of Process Safety Management (PSM)
 - Elements of a PSM Program



Process Safety Management

- Prevent catastrophic releases of highly hazardous chemicals.

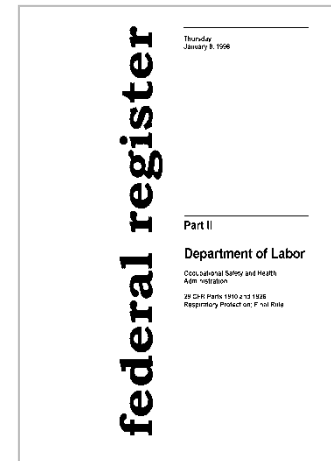


Events Leading to PSM Standard

- 1985: Institute, WV; 135 injured
 - 1988: Norco, LA; 7 dead/42 injured
 - 1988: Henderson, NV; 2 dead/350 injured
 - 1989: Richmond, CA; 9 injured
 - 1989: Pasadena, TX; 23 dead/232 injured
 - 1990: Channelview, TX; 7 dead
-

Clean Air Act Amendments of 1990 - Section 304

- OSHA develops chemical safety standard
 - Standard to contain a list of chemicals
 - Standard to contain certain elements



Implementation of the PSM Standard

- Top management support
- Personnel and capital investments
- “Giving another hat”
- Outside consultants
- Company take ownership
- “Canned programs”
- Time intensive



Application

1910.119(a)

- Toxic or reactive process chemical(s) \geq Threshold Quantity (TQ):
 - Chemicals covered in appendix A
 - Ammonia TQ = 10,000 Lbs.
 - Chlorine TQ = 1,500 Lbs.
 - Flammable liquids and gasses TQ = 10,000 Lbs.
 - » (except [A] and [B])





The Meer Decision

- Court decision implemented by directive
- Language in standard for flammable liquids “unconstitutionally vague”
 - **RESULT:** Flammable liquids in atmospheric storage tanks not counted in determining TQ



List of Hazardous Chemicals

Appendix A

CHEMICAL NAME	CAS*	TQ**
Acetaldehyde	75-07-0	2500
Acrolein (2-Propenal)	107-02-8	150
Acrylyl Chloride	814-68-6	250
Allyl Chloride	107-05-1	1000
Allylamine	107-11-9	1000
Alkylaluminums	Varies	5000
Ammonia, Anhydrous	7884-41-7	10000
Ammonia solutions (> 44% ammonia by weight)	7884-41-7	15000
Ammonium Perchlorate	7790-98-9	7500
Ammonium Permanganate	7787-38-2	7500
Arsine (also called Arsenic Hydride)	7784-42-1	100
Bis (Chloromethyl) Ether	542-88-1	100
Boron Trichloride	10294-34-5	2500
Boron Trifluoride	7637-07-2	250
Bromine	7726-95-8	1500
Bromine Chloride	13883-41-7	1500
Bromine Pentafluoride	7789-30-2	2500
Bromine Trifluoride	7787-71-5	15000
3-Bromopropyne (also called Propargyl Bromide)	106-96-7	100

Definitions

1910.119(b)

- Catastrophic release
- Facilities
- Hot work
- Normally unoccupied remote facility
- Process
- Replacement in kind
- Trade secret
- Covered process



Employee Participation

1910.119(c)

- Consult with employees throughout development
- Develop written employee participation plan
- Provide employee access to all elements of process safety program



Chemical Information

- Toxicity information
 - Corrosivity data
 - Permissible exposure limits (PEL)
 - Thermal and chemical stability data
 - Physical data
 - Hazardous effects of inadvertent mixing
 - Reactivity data
-

Technology information

1910.119(d)(2)

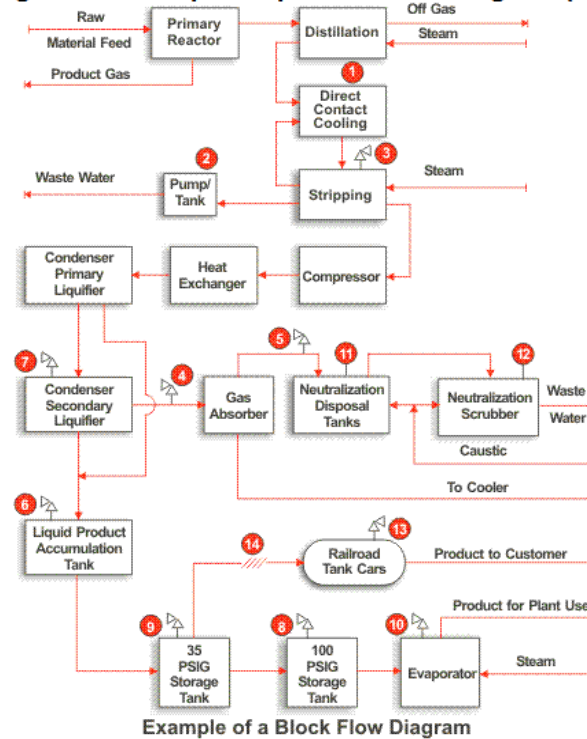
- Process chemistry
- Maximum inventory
- Safe upper and lower limits
- Consequences of deviation



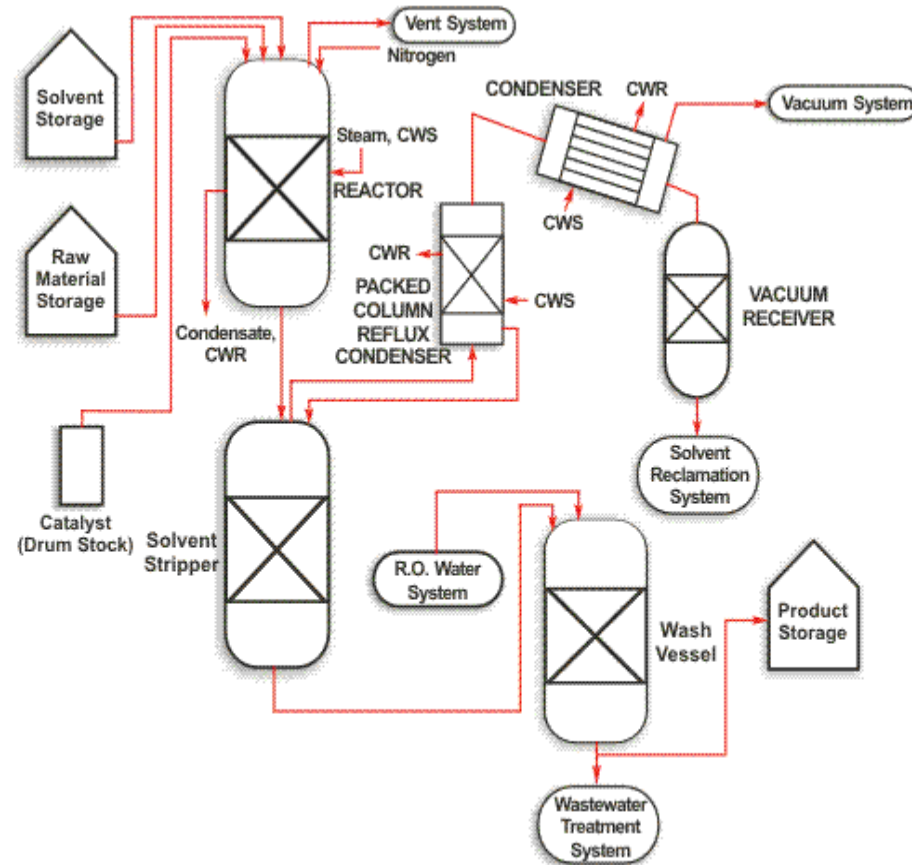
Flow Diagrams

- Block or simplified process flow diagram

§1910.119 Appendix B
Block flow diagram and simplified process flow diagram (non-mandatory)



Process Flow Diagram



Example of a Process Flow Diagram

Equipment Information

1910.119(d)(3)

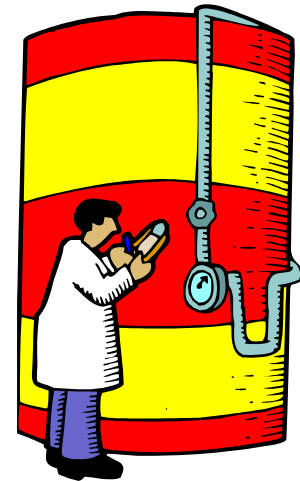
- Materials of construction
- Piping and instrument diagrams (P & ID's)
- Electrical classification
- Relief system design and design basis



Equipment Information

1910.119(d)(3)

- Ventilation systems design
- Design codes and standards employed
- Material and energy balances for processes
- Safety systems



Equipment Information

1910.119(d)(3)

- The equipment information must be compiled prior to process hazard analysis initiation.



Process Hazard Analysis

1910.119(e)(1)

- Process hazard analysis (PHA) - cornerstone of PSM
 - Formal, systematic means of identifying, evaluating, and controlling process hazards
 - Must perform an initial process hazard analysis (hazard evaluation) on processes



Process Hazard Analysis

1910.119(e)(2)

Methodologies must be appropriate to complexity of process

- What-if analysis
- Checklist analysis
- What-if/checklist
- Fault tree analysis
- Hazard and operability study (HAZOP)
- Failure modes and effects analysis
- Other



Process Hazard Analysis

1910.119(e)(3)

- Must address:
 - Process hazards
 - Identification of previous incidents
 - Engineering and administrative controls
 - Consequences of failures
 - Facility siting
 - Human factors
 - Qualitative evaluation of effects of failure of controls on employees



Process Hazard Analysis

1910.119(e)(4)

- Assemble team with:
 - Expertise in engineering and process operations
 - Experience and knowledge specific to the process being evaluated
 - Knowledgeable in the specific process hazard analysis methodology being used



Process Hazard Analysis

1910.119(e)(5)-(6)

- System to promptly address team's findings and recommendations
- PHA updated and revalidated every 5 years
- Retain records for life of process





Operating Procedures

1910.119(f)

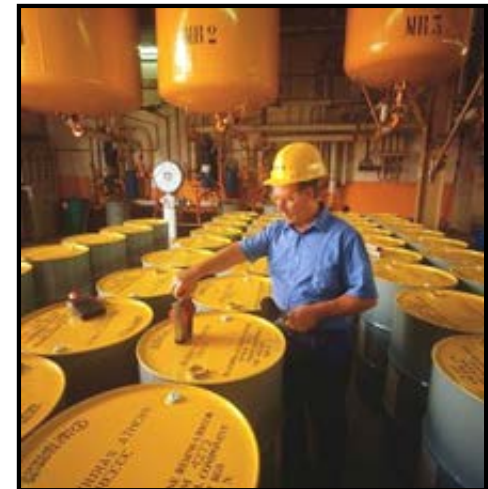
- Operating phases
- Operating limits
- Safety systems and their functions
- Safety and health considerations



Operating Procedures

1910.119(f)(1)-(4)

- Quality control for raw materials and hazardous chemical inventory levels
- Special or unique hazards
- Safety systems and functions
- Accessible operating procedures
 - Annual certification
- Safe work practices



Training

1910.119(g)

- Process overview
- Process hazards
- Operating procedures
- Emergency procedures
- Means to verify/document training
- Refresher training at least every three years



Employer Responsibilities

1910.119(h)(1)-(2)

- Evaluate contractor 's safety performance before hire
 - Inform of process hazards
 - Explain emergency action plan
 - Develop/implement safe work practices
 - Ensure contractors fulfilling obligations
 - Maintain contract employee injury and illness log
-

Contract Employer Responsibilities

1910.119(h)(3)

- Assure employees are trained
- Assure employees understand emergency action plan
- Document employee receipt and understanding
- Assure employees follow safe work practices
- Advise facility of unique hazards present or discovered



Pre-Startup Safety Review

1910.119(i)

- Construction and equipment meet design specifications
- Operating procedures in place and adequate
- New facilities; perform process hazard analysis
- Modified facilities; meets management of change
- Training before startup





Mechanical Integrity

1910.119(j)

- Establish list of equipment covered
- Establish and implement written procedures to maintain on-going integrity of equipment
- Training for maintenance activities



Inspection and Testing

1910.119(j)

- Inspect and test equipment
- Document inspection results
 - Frequency consistent with manufacturer's recommendations and good engineering practices
- Correct equipment deficiencies
- Establish quality assurance of equipment
 - Appropriate checks and inspections



Hot Work Permits

1910.119(k)

- Requires written permit
- Authorization for welding, cutting, brazing, flame or spark producing operations
 - On or near covered process
- Fire prevention and protection requirements
 - Requirements are in 29 CFR 1910.252(a)

Company Form
HOT WORK PERMIT

Date _____ Time _____

Name of Permittee/Performer/Work _____

Specific Location of Work _____

To Do

- _____ Cutting or welding permitted in an area that has been made fire safe.
- _____ Guards used to protect the work, such as that of the electrical control cabinet.
- _____ Fire extinguisher available for nearby use.
- _____ Fire watch is present when the work is done. Fire watch duties such as removal of combustibles nearby.
- _____ Flammable gases of combustibles tested for a minimum of 30 minutes.
- _____ Combustible items have been kept wet, covered with damp sand or protected by fire resistant shields.
- _____ Hot work being done only in areas authorized by management. No welding or cutting in unauthorized areas unless a permit is issued in presence of explicit instructions, or in case of emergency operations.
- _____ Oxy-acetylene cylinders that might carry sparks to distant combustibles protected or shielded.
- _____ Other sources of sparks or molten metal are protected and the safe use of the process.
- _____ Any hot surfaces adjacent to hot work are protected in accordance with conditions of which they are not to work.
- _____ Working in confined spaces.
- _____ Confined spaces cleaned and vented.
- _____ All hot work is performed in accordance with approved practices.
- _____ PPE used is correct, e.g., eye protection, flame protective clothing, respiratory, gloves.
- _____ Safety tags placed to mark other sources of energy.
- _____ Appropriate warning provided.
- _____ Other conditions or conditions which permit has been issued in per 1910.146.

For specific requirements refer to General Industry Standards 1910.146, 1910.252, 253, 254 and 272 and Construction Standards 1926.950, 1926, 1927 and 1928.

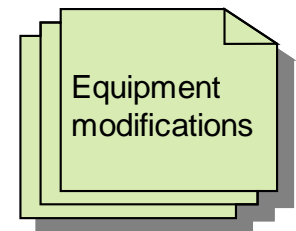
Authorized Signature: _____

OSHA 13049 Rev 1



Management of Change (MOC) 1910.119(l)

- Written procedures to manage changes to process chemicals, technology, equipment, procedures
 - Except “replacements in kind”
- Must address: technical basis, impact of change, modifications to operating procedures, and time period for change



Management of Change

1910.119(I)

- Authorization requirements for change
- Training for employees prior to start up
- Update process safety information after a change

Management of Change Form

Section 1: Request for Change Section 1 to be completed by person requesting change		
Organizer:	Process:	Organization Date:
Proposed Date of Change:	Change is: <input type="checkbox"/> Permanent OR <input type="checkbox"/> Temporary	
Description of proposed change and potential hazards. Summarize the technical basis for the proposed change and any potential hazards and safety impacts from the proposed change. If the change is temporary, indicate the proposed change start and end dates.		
Section 2: Authorization to Proceed with Change		
Review/Approved by: Maintenance Supervisor:	Signature:	Date:
Review/Approved by: Safety:	Signature:	Date:
Review/Approved by: Plant Engineer:	Signature:	Date:
Review/Approved by: Plant Manager:	Signature:	Date:
Section 3: Program with Change Section 3 to be completed following implementation of change but prior to the start-up of the change.		
Review Questions	Check Answer	Completion Date (if yes)
Have affected personnel (i.e. operations, maintenance or contract) been informed of and trained in this change?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Are SOP's or maintenance procedures required to be updated as a result of this change?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, have affected personnel been trained in the updated procedure?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Does the change affect overall process safety or the results of a previously conducted HRA or Process Hazard Analysis?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, has a HRA or Process Hazard Analysis been conducted and all recommendations addressed?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is Process Safety Information required to be updated as a result of this change?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
If yes, has the Process Safety Information been updated and distributed to appropriate personnel?	<input type="checkbox"/> Yes <input type="checkbox"/> No	
Section 4: Authorization for Startup		
Authorized by: Maintenance Supervisor:	Signature:	Authorized Startup Date:
Authorized by: Safety:	Signature:	Authorized Startup Date:
Authorized by: Plant Engineer:	Signature:	Authorized Startup Date:

* Attach documentation to this form, which substantiates completion of the applicable requirements (e.g. meeting minutes, sign-in, training records, etc.)

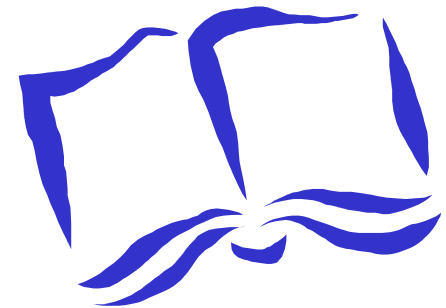
• Distribute completed forms to the following personnel:

- PSM Coordinator/Plant Engineer
- Safety Coordinator
- Maintenance Supervisor
- HR Department
- Plant Manager

Incident Investigation

1910.119(m)

- Incidents which did or could result in catastrophic release of hazardous chemicals
 - Investigation initiated within 48 hours
- Report and recommendations
- System to address recommendations
- Review with affected personnel
- Retained 5 years

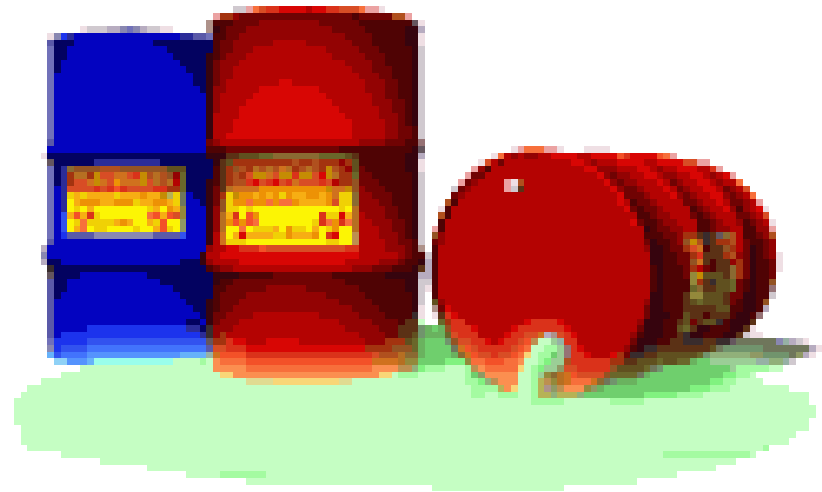




Emergency Planning and Response

1910.119(n)

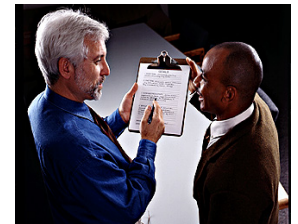
- Implementing emergency action plan
 - Handling of small releases



Compliance Audits

1910.119(o)

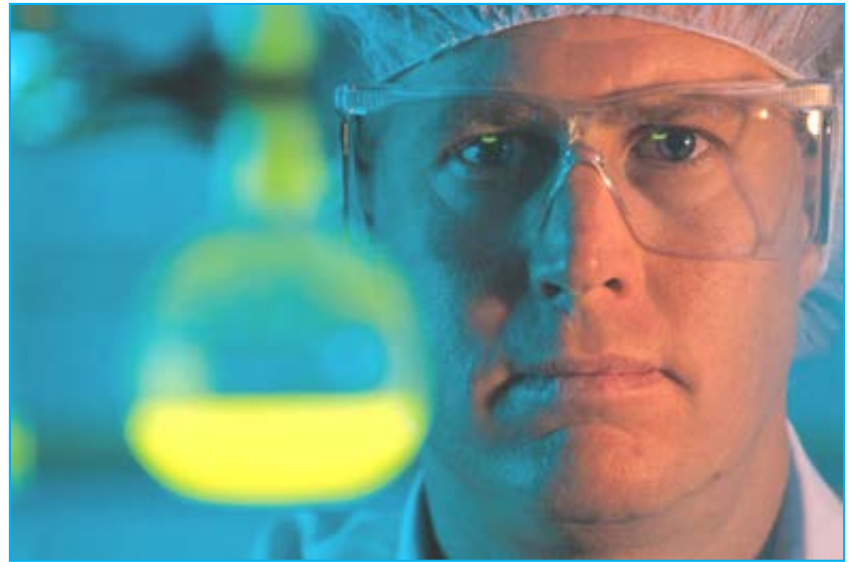
- Certify program in compliance
 - Every 3 years
- Ensure at least one person knowledgeable in process
- Develop report and recommendations
 - Document response and correction of deficiencies
- Retain 2 most current audits



Trade Secrets

1910.119(p)

- Protection of process trade secrets
- Confidentiality agreements (if needed)
- Information available to affected employees



Summary

1910.119

- In this course, we discussed:
 - Importance of Process Safety Management (PSM)
 - Elements of a PSM Program



Thank You For Attending!

Final Questions?
