

527 CMR Chapter 33 Hazardous Material Processes

Massachusetts Fire Prevention Regulations
(MFPR)

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Overview

- **Why are we here?**
 - **Previous explosions in Massachusetts**
- **Previous State Regulations**
 - **Limited in scope, only requires permits for flammable/combustible liquids, flammable solids, flammable gases**

Background

- **2005 PolyCarbon Industries explosion in Leominster, MA**
- **20-30 gal. processor containing xylene, triethylamine**
- **1 injured, roof and wall of facility blown off by deflagration; nearby residential damage**
- **Process changed & not evaluated, just prior to the explosion**
- **Findings: process safety controls deficient**

Background

- **2006 CAI, Inc. heptane vapor explosion in Danvers, MA**
- **10,000-pound mixture of flammable solvents overheated in unoccupied building**
- **10 injured, 24 houses and 6 businesses destroyed**
- **Findings: Process lacked safeguards such as alarms and automatic shutoffs**
- **CSB investigation**



Background

- 2011 Bostik Chemical Plant explosion in Middleton, MA
- Acetone vapors accidentally released from process via unintentionally open valve
- Unclassified electrical equipment present
- 4 injured, facility seriously damaged
- Findings: serious deficiencies in process safety management program; willful negligence





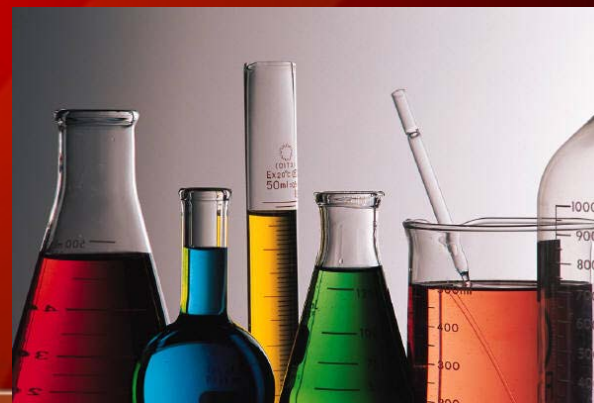
Purpose

“527 CMR 33.00 creates local fire department permit requirements for facilities engaging in the processing of certain hazardous materials. The standards are based on a classification system and requires disclosure and evaluation regarding a facility’s hazardous material operations.”

- Protect public and emergency response personnel**
- Enhance awareness of emergency response personnel to hazards present**
- Establish permitting requirements for hazmat processing**

Applicability

- **Applicable for New and Existing facilities that *process* hazardous materials – physical or health hazards [33.01(2)]**
 - **Physical Processes (Unit Operations)**
 - **Heating, cooling, mixing, distilling, compressing, pressurizing, etc.**
 - **Chemical Reaction Processes**
 - **Polymerization, oxidation, reduction, etc.**
 - **Preparation, separation, combination, purification, etc.**
 - **NOT storage or waste collection**



Applicability

- **Physical hazards**
 - **Combustible or flammable liquid**
 - **Compressed, cryogenic or flammable gas**
 - **Flammable solid**
 - **Oxidizer or organic peroxide**
 - **Pyrophoric**
 - **Unstable (reactive)**
 - **Water-reactive**
- **Health hazards**
 - **Toxic or highly toxic**
 - **Corrosive (damage to living tissue)**

Exclusions

- **Listed in MFPR 33.01(3)**
- **Retail of pre-mixed solutions**
- **Water treatment facilities (potable / waste)**
- **Atmospheric vessels storing materials that are below normal boiling point without heating or cooling**
- **Hazardous materials with a hazard rating of 2 or less per NFPA 704 (e.g. irritants)**



Process Classification

- **Category 1: Vessel capacity \leq 2.5 gal**
 - **Category 2: Vessel capacity \leq 60 gal**
 - **Category 3: Vessel capacity \leq 300 gal OR Group H occupancy**
 - **Category 4: Vessel capacity $>$ 300 gal and not Category 5**
 - **Category 5:**
 - **Vessel capacity exceeds chemical threshold quantity of**
 - **29 CFR 1910.119 (OSHA Process Safety Management for Highly Hazardous Materials) or**
 - **40 CFR part 68 (US EPA Chemical Accident Prevention Protocol)**
 - **Multiple Processes may be present in a single building; category requirements apply separately**
- } Most Facilities

Permit Requirements

- **Category 1 – no permit, but must comply with the requirements**
- **Categories 2-5**
- **New permit issued by FD, renewed annually (MFPR 33.04(1)); SEPARATE FROM STORAGE PERMIT!**
- **FD can deny permit in writing if protection measures deemed insufficient (MFPR 33.04(4b))**
- **FD can require a 3rd party *Competent Professional* evaluation following the denial for Category 3 and 4 facility (MFPR 33.04(4c))**
 - ***Competent Professional* has specialized knowledge beyond of that of an average person about risk assessment, process hazard analysis, and/or process safety management principles for the process being evaluated**

Permit Requirements

- **Permit deadlines**
 - **Category 5 by January 1, 2013**
 - **Category 4 by June 1, 2013**
 - **Category 2 & 3 by January 1, 2014**
- **New permit application required if Hazard Category increases**
- **Trade secrets may be excluded from public records in accordance with 33.08**

Documentation Requirements

- Required documentation increases with category level
- Must comply with requirements for each lower category level



Category 3 Hazard Evaluation

- Required for all Category 3 and 4 facilities / processes
- Written evaluation to identify hazards including adjacent vessels
- Determine required preventive, protective and safety control measures
- Conform to good engineering practice and safe work practice

Category 4 Limited Safety Program

- A written evaluation to ensure compliance with:
 - Process information
 - MSDS, P&ID, process control safety alarms, safety relief valves
 - Facility suitability
 - Building code compliance, electrical hazard classification, ventilation design, secondary containment / spill control, fire alarm / fire protection
 - Process hazard safety analysis (FMEA, what-if analysis, HAZOP)
 - Written procedures for startup, shutdown, routine operating / maintenance, emergency response measures
 - Training program for employees and contractors
 - Records management protocol including management of change
 - Internal review every 3 years

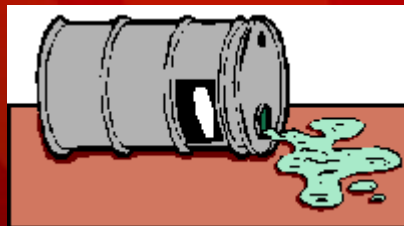
Emergency Response Planning

- Applicable to all categories
- Submitted to local FD; updates to FD within 2 weeks
- Identify emergency coordinator to be on-site within 1 hour of emergency
- Facility floor plan locating hazardous materials and emergency equipment
- Establish protocol with FD for equipment/process shutdown where loss of control poses a risk to the public



Post-Incident Analysis

- Applicable to Categories 3 through 5
- Report initiated within 48 hours of FD or EMS response, or release of hazardous materials
- Report completed within 45 days
- Report to include:
 - Summary of cause and contributing factors
 - Recommendations to prevent recurrence
 - Dates of implementation of recommendations / corrective actions
 - Reassessment of facility / process category
 - Apply for new permit if necessary



Category 1 Requirements

(Vessel Capacity \leq 2.5 gal)

- Compliance with:
 - OSHA 1910.1200 (Hazard communication to employees)
 - OSHA 1910.1450 (Occupational exposure to hazardous chemicals in labs, if applicable)
 - 527 CMR 14.00 (Flammable gases, liquids, solids)
 - 527 CMR 33.06 (*Emergency Response Plan*)



Category 2 Requirements

(Vessel Capacity \leq 60 gal)

- Compliance with:
 - All requirements of Category 1
 - *Permit per MFPR 33.04*



Category 3 Requirements

(Vessel Capacity \leq 300 gal OR Group H Occupancy)

- For each process, comply with:
 - All requirements of Category 2
 - *Category 3 Hazard Evaluation*
 - Implement process safety controls as identified in hazard evaluation
 - Ensure hazard evaluation modified prior to each process change
 - Potential third party review if permit is rejected in writing
 - *Post-Incident Analysis* per MFPR 33.07



Category 4 Requirements

(Vessel Capacity > 300 gal)

- Compliance with:
 - All requirements of Category 3
 - *Category 4 Limited Safety Program*
 - Implement process safety controls as identified in *Limited Safety Program (case study later in presentation)*
 - *Limited Safety Program* modified prior to each process change



Department Of Fire Services

Category 5 Requirements

(Vessel Contains Chemical Exceeding Threshold Stated in 29 CFR 1910.119 or 40 CFR part 68)

Example Chemicals & Threshold Quantities from 29 CFR 1910.119	
Chemical Name	Threshold Quantity (<i>lbs</i>)
Chlorine	1500
Formaldehyde (Formalin)	1000
Hydrochloric Acid, Anhydrous	5000
Hydrofluoric Acid, Anhydrous	1000
Hydrogen Peroxide (≥52% by weight)	7500
Nitric Acid (≥94.5% by weight)	500

- Compliance with:
 - *Emergency Response Plan* per MFPR 33.06
 - Self-certify compliance with 29 CFR 1910.119 (OSHA PSM HHM) or 40 CFR Part 68 (US EPA CAPP)

Case Study

Use Group H-2 Room containing a 50-gallon pressurized reaction vessel:

- Category 3
- Employee haz. comm.
- Employee exposure to haz. mats.

Emergency Response Plan

- FD Use Permit
 - 3rd Party Review if rejected
- Cat. 3 Hazard Evaluation
- Post-incident analysis



Case Study

1,000 gal Chemical Reaction Vessel and Associated Equipment within a processing/manufacturing/storage facility:

- Category 4
- Employee haz. comm.
- Employee exposure to haz. ma
- Emergency Response Plan
- FD Permit
 - 3rd Party Review if rejected
- Cat. 3 Hazard Evaluation
- Post-incident analysis
- Cat. 4 limited safety program
 - Modified prior to each process change



Category 4 – Facility Suitability

- Building Code Compliance
 - Height and area, construction type
 - Control Area layout and separation
 - Group H occupancy classification and location
 - Exhaust separation and routing
 - Fire suppression and alarm systems
 - Means of egress

Category 4 – Facility Suitability

High Hazard Features:

- **Explosion control – IBC and IFC**
- **Spill control, secondary containment, drainage for sprinkler discharge**
- **Monitor controls, standby/e-power, haz-mat alarm system**
- **Smoke and heat venting for >15,000 sq.ft. areas**
- **Fire detection**

Category 4 – Facility Suitability

Electrical Classification:

- **NFPA 70 (2011) – National Electrical Code**
- **Article 500 – hazardous locations**
 - **Class I – flammable gases and vapors**
 - **Class II – combustible dusts**
 - **Division 1 – hazard under normal operation**
 - **Division 2 – hazard due to spill, leak, etc**
 - **Class I Groups – A (acetylene), B (hydrogen), C (ethylene), D (propane)**
 - **Class II Groups – E (aluminum), F (carbon black), G (wood)**

Thank You For Your Time

Questions?