

527 CMR Chapter 33 Hazardous Material Processes

Massachusetts Fire Prevention Regulations
(527 CMR)

Spring 2012

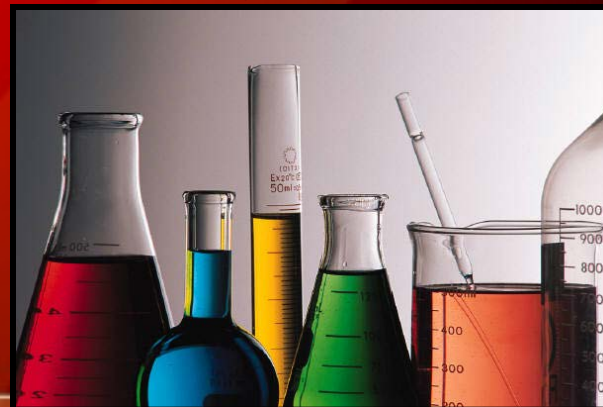
Division of Fire Safety

Chemical	CAS #	NFPA 704 Rating	Mass PSM Reg	Threshold Quantity (lbs.)	
				EPA RMP	OSHA PSM
				68.130	1910.119 App. A
Chlorine	7782-50-5	H-4	✓	2500	1500
Formaldehyde	50-00-0	H-3, F-4	✓	15000	1000
Hydrogen Cyanide	74-90-8	H-4, F-4	✓	2500	1000
Nitric Acid	7697-37-2	H-4	✓	1500 (≥ 80%)	500 (≥ 94.5%)
Oleum (fuming sulfuric acid)	8014-95-7	H-3	✓	10000	1000 (65-80%)
Sulfuric Acid	7664-93-9	H-3	✓	✗	✗
Ammonia (anhydrous)	7664-41-7	H-3	✓	10000	10000
Ammonia (solution)	7664-41-7	H-3	✓	20000 (≥ 20%)	15000 (>44%)
Hydrazine (anhydrous)	302-01-2	H-4, F-4	✓	15000	10000
Hydrazine Hydrate	7803-57-8	H-3	✓	✗	✗
Dimethylsulfate	77-78-1	H-4	✓	✗	✗

Applicability

Applicable for New and Existing facilities that *process* hazardous materials – physical or health hazards as defined by 780 CMR and 527 CMR definitions

- **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)

All hazards specifically defined in 527 CMR 33.02

Closes the OSHA loophole on certain classes

Exclusions

Listed in 527 CMR 33.01(3)

Many listed – must review to determine applicability. Some are:

- 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)**



Vessel Definition

Per 527 CMR 33.02:

A vessel is the container in which partial or the actual process takes place.

Examples:

- Beakers
- Pails
- Drums
- Reactor kettles
- Pipe reactors

The size of a vessel is its capacity.

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)**

Process Classification

**Most facilities will fall under either
Category 2 or Category 3:**

- **Category 2: Vessel capacity \leq 60 gal**
- **Category 3: Vessel capacity \leq 300 gal OR Group H
occupancy**



Process Classification

Multiple Processes may be present in a single building; category requirements apply separately

Initial implementation would have multiple permits. After full implementation need to combine into 1 permit.



527 CMR 33 Covers

527 CMR 33.00:

- Looks at it from the processes at the facility, not the facility with processes
- A facility (group of buildings) will generally have multiple processes
- Each process will comply with CMR 33.
- It does not default to the highest for the facility

527 CMR 33 Permits

During phase-in approach:

- Facility can have multiple permits
- Based on processes at the facility
- Based on the dates of compliance

After phase-in approach:

- Highly recommend – consolidation of permits into a single permit for all of the processes at the facility.

Permit Requirements

Category 1 – no permit, but must comply with the requirements

Categories 2-5

- **New permit issued by FD, renewed annually (527 CMR 33.04(1)); SEPARATE FROM STORAGE PERMIT!**
- **FD can deny permit in writing if protection measures deemed insufficient (527 CMR 33.04(4b))**
- **FD can require a 3rd party *Competent Professional* evaluation following the denial for Category 3 and Category 4 facility (527 CMR 33.04(4c))**

Competent Professional

Per 527 CMR 33.02:

A Competent Professional is a person who based upon education, training, skill, experience or professional licensure or a combination thereof, has a specialized knowledge beyond that of an average person about risk assessment, process hazard analysis, and/or PSM management principles for the process or processes 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 527 CMR 33.08.

Documentation

Facilities complying with typical “process safety management” will have many policies and procedures.

- Goal is to review any necessary items on site**
- Policies and procedures can overwhelm a department**
- Best rule: ask questions and see what employees know about a process**

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 527 CMR 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 527 CMR 33.07



Category 3 Hazard Evaluation

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

Required for all Category 3 (and 4) 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 3 Hazard Evaluation

Per 527 CMR 33.02:

Category 3 Hazard Evaluation: A written evaluation performed or procedure conducted to identify hazards, including adjacent vessels that contain hazardous materials, and determine the required preventive, protective, and safety control measures in conformance with recognized and generally accepted good engineering and safe work practices associated with a particular process or condition and the facility wherein such process or condition is taking place.

Category 4 Requirements

(Vessel Capacity > 300 gal and not Category 5)

A written evaluation (Category 4 Limited Process Safety Program) 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**

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**

Difficulties in facilities with mission creep

- **Changed process, vessels, quantities without benefit of a building permit**

Category 4 – Facility Suitability

High Hazard Features:

- Explosion control**
- 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**

Review to code at time of construction, not new code.

Category 4 – Facility Suitability

Electrical Classification:

- **Massachusetts Electrical Code - amended**
- **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)**

Good Engineering/Safe Work Practices

American Institute of Chemical Engineers (AIChE)

- Example:result in a safe, operable, and cost effective process.....
The development of such instincts requires experience, which is frequently based on failures.....means for development professionals to discuss experiences in the hope that, collectively, we can refine our predictive abilities and repeat good habits while rejecting bad ones.

Building Codes

- High Hazard Use Groups

National Consensus Standards

- NFPA standards

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 527 CMR 33.06***
- **Self-certify compliance with 29 CFR 1910.119 (OSHA PSM HHM) or 40 CFR Part 68 (US EPA CAPP)**

Emergency Response Planning

Applicable to all categories

- **Complexity increases by category**

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



Emergency Response Planning

Establish protocol with FD for equipment/process shutdown where loss of control poses a risk to the public

Pre-planning important:

- **Some cases may require special shutdowns procedures. Improper shutdown can expose first responders and adjacent areas to catastrophic incidents**



Post-Incident Analysis

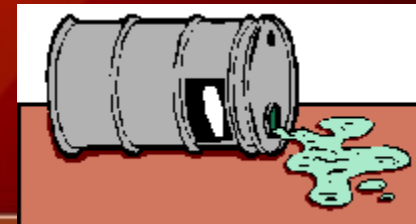
Applicable to Categories 3 through 5

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**



Public Records

527 CMR 33.08 – Trade Secrets

- Goal is not to require submission of “extra” paperwork. FD encouraged to review on site.

Must be aware of public records laws that may “trump” this regulation.

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**
- **Category 3 Hazard Evaluation**
- **Post-incident analysis**



Case Study

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

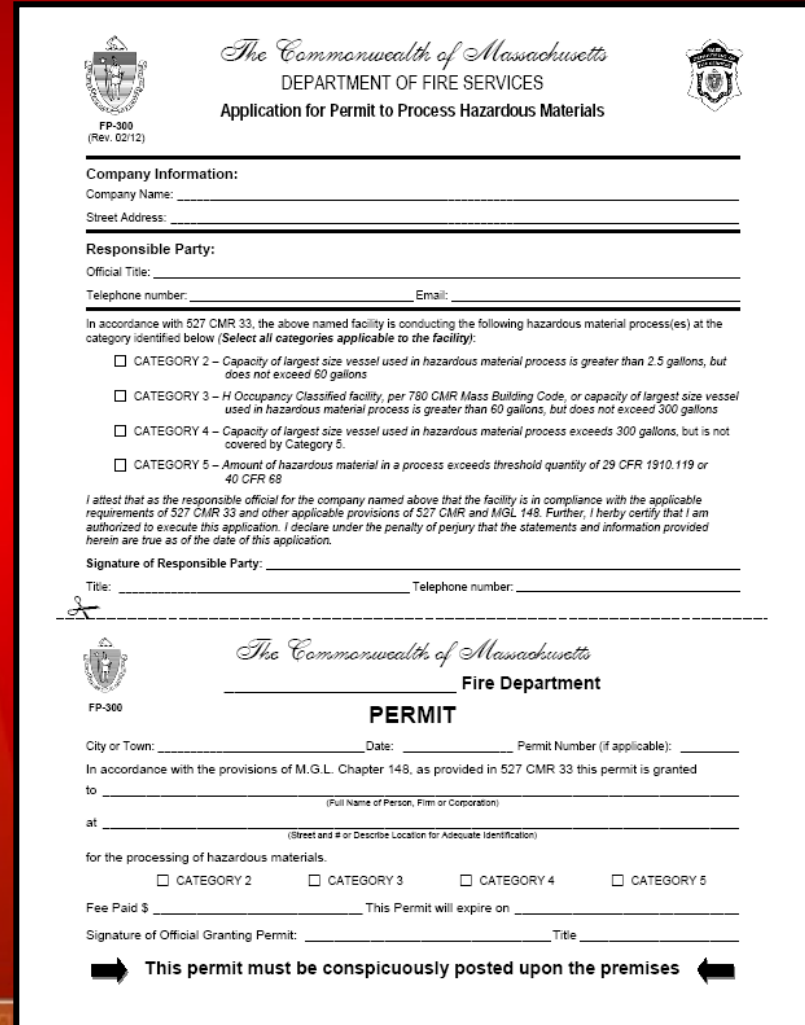
- **Category 4**
- **Employee haz. comm.**
- **Employee exposure to haz. mats.**
- **Emergency Response Plan**
- **FD Permit**
 - **3rd Party Review if rejected**
- **Category 3 Hazard Evaluation**
- **Post-incident analysis**
- **Category 4 limited safety program**
 - **Modified prior to each process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



Forms Released

Permit Application

- Online
- Known as FP-300



The Commonwealth of Massachusetts
DEPARTMENT OF FIRE SERVICES
Application for Permit to Process Hazardous Materials

FP-300
(Rev. 02/12)

Company Information:
Company Name: _____
Street Address: _____

Responsible Party:
Official Title: _____
Telephone number: _____ Email: _____

In accordance with 527 CMR 33, the above named facility is conducting the following hazardous material process(es) at the category identified below (Select all categories applicable to the facility):

- CATEGORY 2 - Capacity of largest size vessel used in hazardous material process is greater than 2.5 gallons, but does not exceed 60 gallons
- CATEGORY 3 - H Occupancy Classified facility, per 780 CMR Mass Building Code, or capacity of largest size vessel used in hazardous material process is greater than 60 gallons, but does not exceed 300 gallons
- CATEGORY 4 - Capacity of largest size vessel used in hazardous material process exceeds 300 gallons, but is not covered by Category 5.
- CATEGORY 5 - Amount of hazardous material in a process exceeds threshold quantity of 29 CFR 1910.119 or 40 CFR 68

I attest that as the responsible official for the company named above that the facility is in compliance with the applicable requirements of 527 CMR 33 and other applicable provisions of 527 CMR and MGL 148. Further, I hereby certify that I am authorized to execute this application. I declare under the penalty of perjury that the statements and information provided herein are true as of the date of this application.

Signature of Responsible Party: _____
Title: _____ Telephone number: _____

The Commonwealth of Massachusetts
Fire Department
FP-300
PERMIT

City or Town: _____ Date: _____ Permit Number (if applicable): _____

In accordance with the provisions of M.G.L. Chapter 148, as provided in 527 CMR 33 this permit is granted to _____
(Full Name of Person, Firm or Corporation)

at _____
(Street and # or Describe Location for Adequate Identification)

for the processing of hazardous materials.

- CATEGORY 2
- CATEGORY 3
- CATEGORY 4
- CATEGORY 5

Fee Paid \$ _____ This Permit will expire on _____

Signature of Official Granting Permit: _____ Title _____

➡ This permit must be conspicuously posted upon the premises ⬅

Commonwealth of Massachusetts



Department Of Fire Services

Forms Released

Fire Inspector's Checklist

- Basic form to assist inspector
- Known as FP-310
- Any “NO” checked should raise a flag

The Commonwealth of Massachusetts
DEPARTMENT OF FIRE SERVICES
870CMR 2.00M "Fireworking of Hazardous Materials"
Fire Department Inspector's Checklist I

FP-310 (Rev. 08/10)

Category 1 (Fire Extinguishers)

Category 2 (Fire Extinguishers 2.5 gallons to 60 gallons)

Category 3 (Fire Extinguishers 60 gallons to 200 gallons or 200 gallons to 500 gallons)

Category 4 (Fire Extinguishers 500 gallons to 1000 gallons or 1000 gallons to 2000 gallons)

Category 5 (Fire Extinguishers 2000 gallons to 10000 gallons)

Fireworks

Firearm

Watch DFS website for more info

www.mass.gov/dfs

Posting information regarding FAQ's and other helpful hints.