

**Environmental Health and Safety** 

# Understanding Hazardous Materials and Hazard Classification

### **Hazmat definition**

Substance or material

Transported in commerce

Determined to pose unreasonable risk to health, safety and property

### **Hazmat definition**

Hazardous substances

Hazardous wastes

Marine pollutants



### **Hazmat definition**

Elevated temperature materials

Materials designated hazardous in 172.101

Materials meeting defining criteria in Part 173

### Hazardous substances

Includes mixtures and solutions

Listed in Appendix A of HMT

Equals or exceeds the RQ in Appendix A

### Hazardous substances

 Concentration by weight equals or exceeds concentration corresponding to its RQ

Radionuclides conform to Paragraph7 of Appendix A

### Hazardous waste

Subject to the hazardous waste manifest requirements of EPA

■ 40 CFR Part 262



### Marine pollutants

Listed in Appendix B of HMT

- Solution or mixture equals or exceeds 10 percent by weight
- Severe marine pollutant solution or mixture equals or exceeds 1 percent by weight

## Elevated temperature material

Liquid phase at or above 100 degrees C (212 degrees F)

Liquid phase with flash point at or above 37.8 degrees C (100 degrees F)

## Elevated temperature material

Solid phase at or above 240 degreesC (464 degrees F)

### Hazard classes

Class 1 – Explosives

Class 2 – Gases



Class 3 – Flammable or Combustible liquid

#### Hazard classes

Class 4 – Flammable solid

Class 5 – Oxidizer or Organic peroxide

Class 6 – Poison



#### Hazard classes

Class 7 – Radioactive

Class 8 – Corrosive

Class 9 – Miscellaneous



## Class 1 Explosives

1.1 Mass explosion hazard

1.2 Projection hazard

1.3 Fire hazard

### Class 1 Explosives

1.4 No significant blast hazard

1.5 Blasting agents

1.6 Detonating substances



### Class 2 Gases

2.1 Flammable gas

2.2 Non-flammable gas

2.3 Poison gas



### **Precedence list**

■ 1. Class 7

**2.** Division 2.3

■ 3. Division 2.1

**4.** Division 2.2

### **Precedence list**

■ 5. Division 6.1, PG I, PIH only

6. Division 4.2 (Pyrophoric)

7. Division 4.1 (Self-reactive)

#### Precedence list

8. Class 3, Class 8, Division 4.1,
 Division 4.2, Division 4.3, Division 5.1, Division 6.1

9. Combustible liquids

■ 10. Class 9



## Criteria Class 1 (Explosives)

Substance or article

Includes a device

Functions by explosion or chemical reaction

## Criteria Class 1 (Explosives)

#### Six divisions -

- 1.1 Mass explosion hazard affects entire load instantaneously
- 1.2 Projection hazard not mass explosion hazard
- 1.3 Fire hazard & minor blast/projection hazard

## Criteria Class 1 (Explosives)

- 1.4 -- Minor explosion hazard confined to package
- 1.5 Insensitive explosives mass explosion hazard
- 1.6 –Extremely insensitive explosives no mass explosion hazard

## Class 2 (Gases)

#### Three divisions

- 2.1 Flammable gas Gas at 20 degrees
   C (68 degrees F) or less
  - - 101.3 kPa (14.7 psi) of pressure
  - Is ignitable at 101.3 kPa (14.7 psi) when in a mixture of 13 percent or less by volume with air
  - - Has a flammable range at 101.3 kPa (14.7 psi) with air of at least 12 percent

## Class 2 (Gases)

- 2.2 Non-flammable gas In packaging exerts absolute pressure of 280 kPa (41 psia) or greater at 20 degrees C (68 degrees F)
  - Does not meet the definition of 2.1 and 2.3



## Class 2 (Gases)

- 2.3 Poison gas Gas at 20 degrees
   C (68 degrees) or less
  - - Pressure of 101.3kPa (14.7 psi)
  - Poses a health hazard to humans in transportation
  - Presumed to be toxic to humans

## Divisions defined by

Non-liquefied compressed gas – in a packaging is entirely gaseous at 20 degrees C (68 degrees F)

Liquefied compressed gas - partially liquid in a packaging at 20 degrees C (68 degrees F)

## Divisions defined by

Compressed gas - in solution is nonliquefied compressed gas dissolved in solvent

 Cryogenic liquid – refrigerated liquefied gas with boiling point below -90 degrees C (-130 degrees F)

## Refrigerant gas

All non-poisonous refrigerant or dispersant gases and mixtures listed in 172.101, 173.304, 173.314, and 173.315

## Flammable range

Difference between minimum and maximum volume percentages of the material in air that form a flammable mixture

### Class 3 (Flammable liquid)

Liquid having flash point not more than 60 degrees C (140 degrees F)

### Class 3 (Flammable liquid)

Any material in a liquid phase with flashpoint at or above 37.8 degrees C (100 degrees F) intentionally heated and transported at or above its flashpoint

## **Exceptions**

Any liquid meeting one of the definitions of a Class 2

Any mixture having a component with a flash point of 60 degrees C (140 degrees F) or higher, that makes up at least 99 percent of the total volume, and not transported above its flash point

## **Exceptions**

 Any liquid with a flash point greater than 35 degrees C (95 degrees F) that does not sustain combustion

Any liquid with a flash point greater than 35 degrees C (95 degrees F) and a fire point greater than 100 degrees C (212 degrees F)

## **Exceptions**

Any liquid with a flash point greater than 35 degrees C (95 degrees F) in a water-miscible solution with water content of more than 90 percent

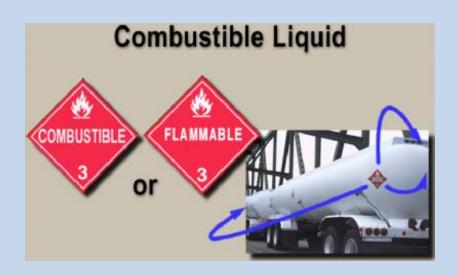
## Combustible liquid

Any liquid not meeting definition of any other hazard class

Flash point above 60 degrees C (140 degrees F) and below 93 degrees C (200 degrees F)

## Combustible liquid

 A flammable liquid with a flash point above 38 degrees C (100 degrees F) may be reclassed combustible



### Class 4 (Flammable solid)

#### Three divisions

### 4.1 (Flammable solid)

- Desensitized explosives
- Self-reactive materials
- Readily combustible solids



### Class 4 (Flammable solid)

#### 4.2 (Spontaneously combustible)

- Pyrophoric materials
- Self-heating materials



### Class 4 (Flammable solid)

#### 4.3 (Dangerous when wet)

- When in contact with water -
- Is liable to become spontaneously flammable
- Gives off flammable or toxic gas

# Class 5 (Oxidizers and Organic peroxide)

Two divisions

5.1 (Oxidizer)

Causes or enhances combustion by yielding oxygen



# Class 5 (Oxidizers and Organic peroxide)

5.2 (Organic peroxide)

- Contains oxygen
- May be considered a hydrogen peroxide derivative



## Class 6 (Poison)

#### Two divisions

- **6.1 (Poison)** 
  - Presumed toxic to humans
  - Health hazard during transport
  - Extreme irritation similar to tear gas



### Class 6 (Poison)

#### 6.2 (Infectious substance)

- Viable microorganism or its toxin
- May cause disease in humans or animals

## Class 7 (Radioactive)

Specific gravity greater than 0.002 microcuries per gram



## Class 8 (Corrosive)

Causes full thickness destruction of human skin

Severe corrosion rate on steel or aluminum

CORROSIVE

### Class 9 (Miscellaneous)

Hazmat that does not meet definition of any other hazard class



## ORM-D (Other regulated materials)

Consumer commodity

Limited hazard in transport

Must have exceptions in HMT

## Limited quantities exceptions

#### Exceptions

- Listed by class in Part 173 of HMR

## Limited quantity

Maximum amount of hazmat that has a specific labeling or packaging exception

**Limited Quantity** 

## Limited quantities (most hazmat)

- Excepted from labeling requirements
- Excepted from specification packaging requirements
- Excepted from placarding requirements

## Limited quantities (most hazmat)

Must meet Subpart B packaging requirements

May not exceed 30 kg (66 lbs) gross weight each package

# Limited quantities (Compressed gases)

Reference 173.306 in the HMT

Excepted from labeling unless specified

Excepted from specification packaging unless specified

## Limited quantities (Compressed gases)

Excepted from placarding requirements

- Excepted from Part 177 requirements, except shipping paper requirements (177.817)
- May not exceed 30 kg (66 lbs) gross weight each package

# Additional limited quantities

Addressed in 173.306

## Limited quantities (Radioactive)

Material package limits specified and conforming with 173.421 - .425



### **ORM-Ds**

Consumer commodity

Material packaged and distributed in a form suitable for retail sales

Includes drugs and/or medicines

### **ORM-Ds**

Limited quantity may be renamed consumer commodity

Same exceptions as limited quantities

Listed by class in Part 173 of HMR

## Other exceptions Class 3 (Flammable)

Alcoholic beverages - 173.150(d)

Aqueous solutions of alcohol -173.150(e)

Combustible liquids – 173.150(f)

### Other exceptions Class 8 (Corrosive)

Corrosive to aluminum and/or steel – 173.154(d)

