



Pacific Northwest
NATIONAL LABORATORY

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Eliminating the Mystery of the Hazardous Material Codes

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Only the NFPA may issue a formal interpretation of its codes and standards

- Any comments and opinions I share are my own and should be viewed as my personal interpretation of NFPA codes and standards.
- They do not represent official NFPA policy.

Today's Objectives

Discuss key section of the NFPA codes for facilities using less than Maximum Allowable Quantities (MAQ) of hazardous materials. This includes excerpts from the following currently applicable codes:

1. NFPA 30, *Flammable and Combustible Liquids Codes* (2015)
2. NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals* (2015)
3. NFPA 400, *Hazardous Materials Code* (2013)



NFPA 30, Section 1.5.3 – Code installations considered compliant (typical applications)

1. NFPA 20, *Standard for the Installation of Stationary Fire Pumps*
2. NFPA 33, *Standard for Spray Application Using Flammable or Combustible Materials*
3. NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*
4. **NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals***
5. **NFPA 101, *Life Safety Code***

NFPA 30 – Special Occupancy MAQs

- ▶ For Assembly and Business the following applies*:
 - Storage in excess of 10 gal of Class I and Class II liquids combined or in excess of 60 gal of Class IIIA liquids shall be permitted where stored in flammable liquids storage cabinets and where the total aggregate quantity does not exceed 180 gal
 - MAQ's for Special Occupancies
 - Class I and II Liquids – 10 Gal
 - Class IIIA Liquids – 60 Gal
 - Class IIIB Liquids – 120 Gal

* These are the special occupancies that typically apply to DOE facilities

NFPA 30 – Outdoor Storage

- ▶ NFPA 30 restricts outdoor storage adjacent to buildings (see section 15.4)
 - There are allowances for storage against building (2 hour barriers and restrictions on location of openings).
 - Otherwise, there are limits to quantities and the associated separation distance.

NFPA 45 – Laboratory Classifications

- ▶ NFPA 45 classifies laboratories as Class A, B, C, or D depending use and storage of flammable and combustible liquids
 - Class A (high fire hazard)
 - Class B (moderate fire hazard)
 - Class C (low fire hazard)
 - Class D (minimal fire hazard)

- ▶ Many DOE Laboratories are Class C.
 - NFPA 45 designates Class A, B, and C laboratories as Industrial Occupancies (per NFPA 101)
 - Recognize that classifying a laboratory as a Class D laboratory significantly restricts MAQ limits (primarily compressed gases, combustible and flammable liquids)

NFPA 45 – Laboratories apply limited requirements from NFPA 55/400

- ▶ NFPA 55, section 1.1.2 (6) and NFPA 400, section 21.1.1.2.1 (6) – This code shall not apply to storage, use, and handling of liquefied and non-liquefied compressed gases in laboratory work areas in accordance with NFPA 45, *Standard on Fire Protection for Laboratories Using Chemicals*

NFPA 45 – Laboratories apply limited requirements from NFPA 55/400 (continued)

- ▶ NFPA 45 Compressed gas requirements (Chapter 10) – Notable sections related to MAQ's and application of specific NFPA 55 requirements:
 - **10.1.2*** Cylinders, except nominal 0.5 kg (1 lb) propane cylinders made for consumer use, that are not necessary for current laboratory requirements shall be stored outside the laboratory unit in accordance with NFPA 55
 - **10.1.6.5** The quantity of compressed and liquefied gases in Class A, Class B, and Class C laboratory units shall be in accordance with the amounts listed in Table 6.3.1 of NFPA 55

NFPA 45 – Laboratories apply limited requirements from NFPA 55/400 (continued)

- (Continued) Section 10.2 requires that compressed and liquefied gas storage and pipng systems meet applicable requirements of NFPA standards, including:
 - NFPA 51, *Standard for the Design and Installation of Oxygen–Fuel Gas Systems for Welding, Cutting, and Allied Processes*
 - NFPA 54, *National Fuel Gas Code*
 - **NFPA 55, *Compressed Gases and Cryogenic Fluids Code***
 - NFPA 58, *Liquefied Petroleum Gas Code*

- ▶ NFPA 45 modifies the requirements of NFPA 400
 - **8.2.1.1** Handling and storage of chemicals shall be in accordance with NFPA 400, except as specifically modified in Chapters 8 and 9

Notable difference between NFPA 45 and NFPA 30/400 for storage above 1st floor

- ▶ NFPA 45 MAQ adjustments as follows (Section 8.2.4 and Table 9.1.1)
 - Chemical inventories in each laboratory unit shall be maintained within the maximum allowable quantities specified in the applicable fire code or building code except as modified in Chapter 9 for buildings with more than three stories.
 - Reduce Maximum Allowable Quantities by 50 percent for B laboratory units located above the 3rd floor.
 - Reduce Maximum Allowable Quantities by 25 percent for C and D laboratory units located on the 4th–6th floors of a building, and reduce quantities by 50 percent for C and D laboratory units located above the 6th floor.

Note: Class A laboratories are not permitted above 3 stories, Class B laboratories are not permitted above 6 stories (Table 5.1.1). Laboratories are limited below grade and limited by area size.

NFPA 400 – Sections applying to all hazardous material storage.

- ▶ Section 1 through 4 (Administration, Referenced Publications, Definitions, and Classification of Materials, Wastes, and Hazard of Contents)
- ▶ Section 5 – Permissible Storage and Use Locations
- ▶ Section 6.1 – General Requirements
Includes requirements for Applicability, MSDS, Release of Hazardous Material, Personnel Training, Ignition Source Controls, Systems/Equipment/ Processes, Empty Containers/Tanks, Signs, Protection from Vehicles, Electrical Wiring/Equipment, Protection from Light, Separation from Incompatible Materials, General Storage, Seismic Protection, Maintenance Requirements, Testing, Hazardous Material Storage Cabinets, Installation of Tanks, and Fire Alarm Systems.

NFPA 400 – Key sections applied for hazardous materials above MAQ.

- Section 5.3 – Protection Levels (where storage and use exceed MAQ)
- Section 6.2 – General Requirements for Storage exceeding the MAQ
- Section 6.3 – General Requirements for Use, Dispensing, and Handling exceeding the MAQ
- Chapter 7 – Emergency Planning, Fire Risk Control, and Chemical Hazard Requirements for Industrial Processes (Only apply to the specifically listed materials where Protection Levels are required)
- Chapter 8 – Reserved
- Chapter 9 – Security (Only apply to the specifically listed materials where Protection Levels are required)
- Chapter 10 – Performance Based – Not typically used without an equivalency
- Chapter 11 – Ammonium Nitrate Solids and Liquids
- Chapter 12 – Corrosive Solids and Liquids

NFPA 400 – Key sections applied for hazardous materials above MAQ (continued)

- Chapter 13 – Flammable Solids
- Chapter 14 – Organic Peroxide Formulations
- Chapter 15 – Oxidizer Solids and Liquids
 - EXCEPTION:** Special Requirements at <MAQ levels for Class 1 Oxidizers in excess of 4000 lbs.
- Chapter 16 – Reserved
- Chapter 17 – Pyrophoric Solids and Liquids
- Chapter 18 – Toxic and Highly Toxic Solids and Liquids
- Chapter 19 – Unstable (Reactive) Solids and Liquids
- Chapter 20 – Water Reactive Solids and Liquids

NFPA 400 – Outdoor Control Area

- ▶ **5.4.1.1.2** Where storage or use is in an outdoor control area, compliance with the outdoor storage and use requirements in Chapters 11 through **21** shall not be required
- ▶ **5.4.2 Outdoor Storage and Use Areas.** Where the quantity of hazardous materials in outdoor storage or use exceeds the MAQ for outdoor control areas as set forth in Table 5.4.1.2, the outdoor area shall comply with the applicable outdoor requirements of Chapter 6 and Chapters 11 through 21

NFPA 400 – Incompatible Materials

- ▶ **6.1.12.1** Incompatible materials in storage and storage of materials incompatible with materials in use shall be separated when the stored materials are in containers having a capacity of more than 5 lb (2.268 kg) or 1/2 gal (1.89 L)
- ▶ **6.1.12.2** Separation shall be accomplished by one of the following methods:
 - Segregating incompatible materials storage by a distance of not less than 20 ft (6.1 m)
 - Isolating incompatible materials storage by a noncombustible partition extending not less than 18 in. (457 mm) above and to the sides of the stored material or by a noncombustible partition that interrupts the line of sight between the incompatible materials
 - Storing liquid and solid materials in hazardous materials storage cabinets complying with 6.1.18
 - Storing compressed gases in gas cabinets or exhausted enclosures complying with Chapter 21

NFPA 400 – Hazardous Material Equipment, Devices, and Systems Requiring Testing

▶ 6.1.17.2.1 Equipment, Devices, and Systems Requiring Testing.

The following equipment, devices, and systems shall be tested in accordance with 6.1.17 and 6.1.17.2.2:

- Limit control systems for liquid level, temperature, and pressure required by 6.2.1.7
- Monitoring and supervisory systems required by 6.2.1.1

NFPA 400 - Chapter 21 Compressed gases and Cryogenic Fluids

- ▶ Flammable and Oxidizing gases
 - **21.2.1.2.1** Flammable and oxidizing gases shall not be stored or used in other than industrial and storage occupancies. [55:6.3.1.6.1]
 - **21.2.1.2.2** Containers, cylinders, or tanks not exceeding 250 scf (7.1 Nm³) content at normal temperature and pressure (NTP) and used for maintenance purposes, patient care, or operation of equipment shall be permitted. [55:6.3.1.6.2]
- ▶ Toxic and Highly Toxic Compressed Gases
 - **21.2.1.3 Toxic and Highly Toxic Compressed Gases.** Except for containers or cylinders not exceeding 20 scf (0.6 Nm³) content at NTP stored or used within gas cabinets or exhausted enclosures of educational occupancies, toxic or highly toxic compressed gases shall not be stored or used in other than industrial and storage occupancies. [55:6.3.1.7]

NFPA 400 - Chapter 21 Compressed gases and Cryogenic Fluids (\leq MAQ)

- ▶ **21.2.2.3 Quantities Less than or Equal to the MAQ.** Building related controls in areas with compressed gases or cryogenic fluids stored or used within an indoor control area in quantities less than or equal to those shown in **Table 5.2.1.4 through Table 5.2.1.10.1** shall be in accordance with 21.2.1.2, 21.2.1.3, 21.2.7, 21.2.8, 21.2.12, 21.2.15, and 21.2.16

- ▶ Description of referenced sections:
 - 21.2.1.2 Flammable and oxidizing gases (see previous slide)
 - 21.2.1.3 Toxic and Highly Toxic Compressed Gases (see previous slide)
 - 21.2.7 Electrical Equipment (NFPA 70)
 - 21.2.8 Employee Alarms (where required by government regulations)
 - 21.2.12 Hazard ID Signs
 - 21.2.15 Vent Terminations
 - 21.2.16 Ventilation (required for indoor storage except for compressed air containers)

NFPA 400 - Chapter 21 Compressed gases and Cryogenic Fluids - Incompatibles

- ▶ **21.3.1.9.2 Incompatible Materials.** Gas cylinders, containers, and tanks shall be separated in accordance with Table 21.3.1.9.2. [55:7.1.11.2]
 - **21.3.1.9.2.1** Subparagraph 21.3.1.9.2 shall not apply to gases contained within closed piping systems. [55:7.1.11.2.1]
 - **21.3.1.9.2.2** The distances shown in Table 21.3.1.9.2 shall be permitted to be reduced without limit when compressed gas cylinders, tanks, and containers are separated by a barrier of noncombustible construction that has a fire resistance rating of at least 0.5 hour and interrupts the line of sight between the containers. [55:7.1.11.2.2]
 - **21.3.1.9.2.3** The 20 ft (6.1 m) distance shall be permitted to be reduced to 5 ft (1.5 m) where one of the gases is enclosed in a gas cabinet or without limit where both gases are enclosed in gas cabinets. [55:7.1.11.2.3]
 - **21.3.1.9.2.4** Cylinders without pressure relief devices shall not be stored without separation from flammable and pyrophoric gases with pressure relief devices. [55:7.1.11.2.4]

NFPA 400 - Chapter 21 Compressed gases and Cryogenic Fluids – Hazard Specific

- ▶ Sections 21.3.5 through 21.3.10.5 include the following wording:
“...gases exceeding the quantity threshold for gases requiring special provisions as specified in Table 5.2.1.2 through Table 5.2.1.10.1...”
- 21.3.5 – Corrosive Gases
- 21.3.6 – Flammable Gases
- 21.3.7 – Oxidizing Gases
- 21.3.8 – Pyrophoric Gases
- 21.3.9 – Toxic and Highly Toxic Gases
- 21.3.10 – Unstable Reactive Gases (Non-detonable)
- 21.3.10.5 – Unstable Reactive Gases (Detonable)

Conclusions

- ▶ NFPA 30, NFPA 45, and NFPA 400 are structured in a manner that provide practical integration of hazardous material requirements
- ▶ There are a few places in the code where errors might be present (actively working with the NFPA 400 committee members to clarify or correct)

▶ **QUESTIONS?**

Contact Information



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