



**Backgrounder
November 2017**

**Oregon Structural Specialty Code (OSSC)
Appendix N – New Construction Requirements**

The authority to administer and enforce construction standards in the State of Oregon is vested with the Building Codes Division (division) of the Department of Consumer and Business Services. The division currently uses the International Building Code (IBC) as published by the International Codes Council (ICC) as the base model code for the Oregon Structural Specialty Code (OSSC).

Through its code promulgation process, the ICC places construction requirements in the IBC as well as the International Fire Code (IFC). This has created much confusion in Oregon regarding the authority to enforce construction requirements which are not printed in or referenced through the state building code (ref. ORS 455.010).

The Department of Justice recently provided advice on the division’s authority and adoption practices of construction standards. The division was advised to print all construction requirements within the state building code as printed in the IFC. Accordingly, OSSC Appendix N now specifies standards for those construction requirements published in the IFC and clarifies related scoping requirements.

Effective January 1, 2018, building officials, plans examiners, and inspectors may only enforce construction requirements which are either printed in or adopted by reference through, the state building code. See the attached “Preamble” for further clarification.

Appendix N maintains the IFC section numbers in brackets for ease of use.

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APPENDIX N

REFERENCED CONSTRUCTION REQUIREMENTS

Preamble

- i. **Background.** Pursuant to ORS 455.010 and ORS 455.020, the Oregon Building Codes Division (the division) has been charged with the adoption of a state building code comprised of the specialty codes that govern the construction, reconstruction, alteration, and repair of buildings and other structures, and the installation of mechanical devices and equipment in those buildings and structures. One of the goals of the state building code is to establish predictability and uniformity in construction standards across the state.

The Department of Justice provided advice on the division's authority and adoption practices of construction standards. The division was advised to print all construction requirements within the state building code. Accordingly, Appendix N now specifies standards for those state building code requirements previously published elsewhere and clarifies related scoping requirements.

- ii. **Effective Date.** Effective January 1, 2018, building officials, plans examiners, and inspectors may not enforce construction requirements which are printed outside of the state building code including, but not limited to, construction requirements printed in the Oregon Fire Code.
 - a. **Effect on Cite-it Write-it Requirement.** Pursuant to OAR 918-098-1900 (Cite-it Write-it Requirement) and the enforcement of the *Oregon Structural Specialty Code*, citations are limited to the following:
 - i. Oregon Revised Statutes as noted in the *Oregon Structural Specialty Code*;
 - ii. Oregon Administrative Rules as noted in the *Oregon Structural Specialty Code*;
 - iii. The *Oregon Structural Specialty Code* and all adopted appendices, including Appendix N; and
 - iv. Specific standards adopted by reference in the *Oregon Structural Specialty Code*.
- iii. **References to Fire Code.** All references to a “*Fire Code*” in the *Oregon Structural Specialty Code* are revised as annotated in Table N101.

**TABLE N101
2014 OSSC REFERENCES**

Section / Table	Action	Revision
CHAPTER 1 - SCOPE AND ADMINISTRATION		
102.6	Replace with:	102.6 Existing structures. The legal occupancy of any structure existing on the date of adoption of this code shall be permitted to continue without change, except as is specifically covered in this code or the Fire Code , or as is deemed necessary by the building official for the general safety and welfare of the occupants and the public.
108.1	Replace with:	Note: Membrane structures erected for a period of less than 180 days are regulated under the Fire Code by the fire code official.
CHAPTER 2 - DEFINITIONS		
201.3	Replace with:	201.3 Terms defined in other codes. Where terms are not defined in this code and are defined in the <i>Energy Code</i> , <i>Fire Code</i> , <i>Mechanical</i> and <i>Fuel Gas Code</i> or <i>Plumbing Code</i> , such terms shall have the meanings ascribed to them as in those codes.
202	Replace with:	CONTROL AREA. Spaces within a building where quantities of <i>hazardous materials</i> not exceeding the maximum allowable quantities per control area are stored, dispensed, <i>used</i> or handled. See also the definition of “Outdoor control area” in the Fire Code.
202	Replace with:	DAY BOX. A portable magazine designed to hold explosive materials constructed in accordance with the requirements for a Type 3 magazine as defined and classified in Chapter 56 of the Fire Code Appendix N.
202	Delete:	FIRE CODE. For the purpose of the <i>Oregon Structural Specialty Code</i>, fire code shall mean those portions of the <i>Oregon Fire Code</i> which include construction, reconstruction, alteration, repair or installation of materials and equipment that is covered by the <i>State Building Code</i>.
202	Replace with:	HAZARDOUS MATERIALS. Those chemicals or substances that are <i>physical hazards</i> or <i>health hazards</i> as classified in Section 307 and the Fire Code Appendix N , whether the materials are in usable or waste condition.
202	Replace with:	PHYSIOLOGICAL WARNING THRESHOLD LEVEL. A concentration of air-borne contaminants, normally expressed in parts per million (ppm) or milligrams per cubic meter (mg/m ³), that represents the concentration at which persons can sense the presence of the contaminant due to odor, irritation or other quick-acting physiological response. When used in conjunction with the permissible exposure limit (PEL) the physiological warning threshold levels are those consistent with the classification system used to establish the PEL. See the definition of “Permissible exposure limit (PEL)” in the Fire Code Appendix N.
CHAPTER 3 – USE AND OCCUPANCY		
304.2	Replace with:	304.2 Lockup facilities. <ol style="list-style-type: none"> 3. The smoke control zone in which the lockup area is located shall be provided with an automatic smoke detection system installed in accordance with the Fire Code this code for Group I-3 occupancies.

Section / Table	Action	Revision
307.1	Replace with:	<p>307.1 High-hazard Group H. High-hazard Group H occupancy includes, among others, the use of a building or structure, or a portion thereof, that involves the manufacturing, processing, generation or storage of materials that constitute a physical or health hazard in quantities in excess of those allowed in <i>control areas</i> complying with Section 414, based on the maximum allowable quantity limits for <i>control areas</i> set forth in Tables 307.1(1) and 307.1(2). Hazardous occupancies are classified in Groups H-1, H-2, H-3, H-4 and H-5 and shall be in accordance with this section, the requirements of Section 415 and the Fire Code Appendix N. Hazardous materials stored, or used on top of roofs or canopies shall be classified as outdoor storage or use and shall comply with the Fire Code this code.</p> <p>Exceptions: The following shall not be classified as Group H, but shall be classified as the occupancy that they most nearly resemble.</p> <ol style="list-style-type: none"> 1. Buildings and structures occupied for the application of flammable finishes, provided that such buildings or areas conform to the requirements of Section 416 and the Fire Code Appendix N. 2. Wholesale and retail sales and storage of flammable and combustible liquids in mercantile occupancies conforming to the Fire Code this code. 11. Buildings and structures occupied for aerosol storage shall be classified as Group S-1, provided that such buildings conform to the requirements of the Fire Code this code. 13. The storage of black powder, smokeless propellant and small arms primers in Groups M and R-3 and special industrial explosive devices in Groups B, F, M and S, provided such storage conforms to the quantity limits and requirements prescribed in the Fire Code this code.
307.1.1	Replace with:	<p>307.1.1 Hazardous materials. Hazardous materials in any quantity shall conform to the requirements of this code, including Section 414, and the Fire Code Appendix N.</p>
Table 307.1(1)	Replace with:	<p>Footnotes:</p> <ol style="list-style-type: none"> i. The maximum allowable quantity shall not apply to fuel oil storage complying with Section 603.3.2 of the Fire Code this code. m. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 5003.1.2 of the Fire Code Appendix N.
Table 307.1	Replace with:	<p>Footnotes:</p> <ol style="list-style-type: none"> g. Allowed only when stored in approved exhausted gas cabinets or exhausted enclosures as specified in the Fire Code Appendix N. i. For gallons of liquids, divide the amount in pounds by 10 in accordance with Section 5003.1.2 of the Fire Code Appendix N.
CHAPTER 4 – SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY		
404.2	Replace with:	<p>404.2 Use. The floor of the <i>atrium</i> shall not be used for other than low fire hazard uses and only <i>approved materials and decorations</i> in accordance with the Fire Code shall be used in the <i>atrium</i> space.</p>
406.7	Replace with:	<p>406.7 Motor fuel-dispensing facilities. Motor fuel-dispensing facilities shall comply with the Fire Code Appendix N and Sections 406.7.1 and 406.7.2.</p>
406.8.	Replace with:	<p>406.8 Repair garages. Repair garages shall be constructed in accordance with the Fire Code Appendix N and Sections 406.8.1 through 406.8.6. This occupancy shall not include motor fuel dispensing facilities, as regulated in Section 406.7.</p>

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Section / Table	Action	Revision
410.3.6	Replace with:	410.3.6 Scenery. Combustible materials used in sets and scenery shall meet the fire propagation performance criteria of NFPA 701, in accordance with Section 806 and the Fire Code . Foam plastics and materials containing foam plastics shall comply with Section 2603 and the Fire Code .
411.1	Replace with:	411.1 General. / Exception: Amusement buildings or portions thereof that are without walls or a roof and constructed to prevent the accumulation of smoke need not comply with this section. For flammable decorative materials, see the Fire Code.
412.1	Replace with:	412.1 General. Aircraft-related occupancies shall comply with Sections 412.1 through 412.7 and the Fire Code Appendix N .
412.6.1	Replace with:	412.6.1 Occupancy group. Aircraft paint hangars shall be classified as Group H-2. Aircraft paint hangars shall comply with the applicable requirements of this code and the Fire Code for such occupancy.
413.1	Replace with:	413.1 General. High-piled stock or rack storage in any occupancy group shall comply with the Fire Code this code .
414.1.1	Replace with:	414.1.1 Other provisions. Buildings and structures with an occupancy in Group H shall comply with this section and the applicable provisions of Section 415 and the Fire Code Appendix N .
414.1.2	Replace with:	414.1.2 Materials. The safe design of hazardous material occupancies is material dependent. Individual material requirements are also found in Sections 307 and 415, and in the <i>Mechanical Code</i> and the Fire Code Appendix N .
414.1.2.1	Replace with:	414.1.2.1 Aerosols. Level 2 and 3 aerosol products shall be stored and displayed in accordance with the Fire Code this code . See Section 311.2 and the Fire Code for occupancy group requirements.
414.2	Replace with:	414.2 Control areas. <i>Control areas</i> shall comply with Sections 414.2.1 through 414.2.5 and the Fire Code Appendix N .
414.2.5	Replace with:	<p>414.2.5 Hazardous material in Group M display and storage areas and in Group S storage areas. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single <i>control area</i> of a Group M display and storage area, a Group S storage area or an outdoor <i>control area</i> is permitted to exceed the maximum allowable quantities per <i>control area</i> specified in Tables 307.1(1) and 307.1(2) without classifying the building or use as a Group H occupancy, provided that the materials are displayed and stored in accordance with the Fire Code Appendix N and quantities do not exceed the maximum allowable specified in Table 414.2.5(1).</p> <p>In Group M occupancy wholesale and retail sales uses, indoor storage of flammable and combustible liquids shall not exceed the maximum allowable quantities per <i>control area</i> as indicated in Table 414.2.5(2), provided that the materials are displayed and stored in accordance with the Fire Code Appendix N.</p> <p>The maximum quantity of aerosol products in Group M occupancy retail display areas, storage areas adjacent to retail display areas and retail storage areas shall be in accordance with the Fire Code Appendix N.</p>
Table 414.2.5(1)	Replace with:	<p>Footnotes:</p> <ul style="list-style-type: none"> a. Hazard categories are as specified in the Fire Code Appendix N. c. Maximum allowable quantities shall be increased 100 percent when stored in approved storage cabinets, in accordance with the Fire Code Appendix N. When note b also applies, the increase for both notes shall be applied accumulatively.

Section / Table	Action	Revision
Table 414.2.5(2)	Replace with:	Sprinklered in accordance with Tables 3404.3.6.3(4) through 3404.3.6.3(8) and Table 3404.3.7.5.1 of the International Fire Code <u>this code</u>
414.3	Replace with:	<p>414.3 Ventilation. Rooms, areas or spaces of Group H in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated as required by the Fire Code <u>this code</u> and the <i>Mechanical Code</i>.</p> <p>Ducts conveying explosives or flammable vapors, fumes or dusts shall extend directly to the exterior of the building without entering other spaces. Exhaust ducts shall not extend into or through ducts and plenums.</p> <p>Exception: Ducts conveying vapor or fumes having flammable constituents less than 25 percent of their lower flammable limit (LFL) are permitted to pass through other spaces. Emissions generated at workstations shall be confined to the area in which they are generated as specified in the Fire Code <u>Appendix N</u> and the <i>Mechanical Code</i>.</p> <p>The location of supply and exhaust openings shall be in accordance with the <i>Mechanical Code</i>. Exhaust air contaminated by <i>highly toxic</i> material shall be treated in accordance with the Fire Code <u>Appendix N</u>.</p>
414.5	Replace with:	414.5 Inside storage, dispensing and use. The inside storage, dispensing and use of hazardous materials shall be in accordance with Sections 414.5.1 through 414.5.4 of this code and the Fire Code <u>Appendix N</u> .
414.5.1	Replace with:	414.5.1 Explosion control. Explosion control shall be provided in accordance with the <i>Fire Code</i> as required by Table 414.5.1 where quantities of hazardous materials specified in that table exceed the maximum allowable quantities in Table 307.1(1) or where a structure, room or space is occupied for purposes involving explosion hazards as required by Section 415 or the Fire Code <u>Appendix N</u> .
Table 414.5.1	Replace with:	Footnote: b. See the Fire Code <u>Appendix N</u> .
414.5.2	Replace with:	414.5.2 Monitor control equipment. Monitor control equipment shall be provided where required by the Fire Code <u>Appendix N</u> .
414.5.3	Replace with:	<p>414.5.3 Emergency or standby power. Where mechanical <i>ventilation</i>, treatment systems, temperature control, alarm, detection or other electrically operated systems are required by the Fire Code or this code, such systems shall be provided with an emergency or standby power system in accordance with Chapter 27.</p> <p>Exceptions:</p> <ol style="list-style-type: none"> 1. Emergency or standby power are not required for the following storage areas: <ol style="list-style-type: none"> 1.5. For storage, use and handling areas for highly toxic or toxic materials, see Sections 6004.2.2.8 and 6004.3.4.2 of the Fire Code <u>Appendix N</u>.
414.5.4	Replace with:	414.5.4 Spill control, drainage and containment. Rooms, buildings or areas occupied for the storage of solid and liquid hazardous materials shall be provided with a means to control spillage and to contain or drain off spillage and fire protection water discharged in the storage area where required in the Fire Code <u>Appendix N</u> . The methods of spill control shall be in accordance with the Fire Code <u>Appendix N</u> .
414.6	Replace with:	414.6 Outdoor storage, dispensing and use. The outdoor storage, dispensing and use of hazardous materials shall be in accordance with the Fire Code <u>Appendix N</u> .

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Section / Table	Action	Revision
415.1	Replace with:	415.1 Scope. The provisions of Sections 415.1 through 415.10 shall apply to the storage and use of hazardous materials in excess of the maximum allowable quantities per <i>control area</i> listed in Section 307.1. Buildings and structures with an occupancy in Group H shall also comply with the applicable provisions of Section 414 and the Fire Code Appendix N .
415.5	Replace with:	415.5 Fire separation distance. / Exceptions: <ol style="list-style-type: none"> 1. <i>Liquid use, dispensing and mixing rooms</i> having a floor area of not more than 500 square feet (46.5 m²) need not be located on the outer perimeter of the building where they are in accordance with the Fire Code Appendix N and NFPA 30. 2. <i>Liquid storage rooms</i> having a floor area of not more than 1,000 square feet (93 m²) need not be located on the outer perimeter where they are in accordance with the Fire Code Appendix N and NFPA 30. 3. Spray paint booths that comply with the Fire Code Appendix N need not be located on the outer perimeter.
415.5.1	Replace with:	415.5.1 Group H occupancy minimum fire separation distance. Regardless of any other provisions, buildings containing Group H occupancies shall be set back to the minimum <i>fire separation distance</i> as set forth in Sections 415.5.1.1 through 415.5.1.4. Distances shall be measured from the walls enclosing the occupancy to <i>lot lines</i> , including those on a public way. Distances to assumed <i>lot lines</i> established for the purpose of determining exterior wall and opening protection are not to be used to establish the minimum <i>fire separation distance</i> for buildings on sites where explosives are manufactured or used when separation is provided in accordance with the quantity distance tables specified for explosive materials in the Fire Code Appendix N .
415.5.1.1	Replace with:	415.5.1.1 Group H-1. Group H-1 occupancies shall be set back not less than 75 feet (22 860 mm) and not less than required by the Fire Code Appendix N .
415.5.1.4	Replace with:	415.5.1.4 Explosive materials. Group H-2 and H-3 occupancies containing materials with explosive characteristics shall be separated as required by the Fire Code Appendix N . Where separations are not specified, the distances required shall be determined by a technical report issued in accordance with Section 414.1.3.
415.5.2	Replace with:	Footnote: <ol style="list-style-type: none"> a. For materials that are detonable, the distance to other buildings or lot lines shall be in accordance with Chapter 56 of the Fire Code Appendix N based on trinitrotoluene (TNT) equivalence of the material. For materials classified as explosives, see Chapter 56 of the Fire Code Appendix N.
415.7.3	Replace with:	415.7.3 Separation of incompatible materials. Hazardous materials other than those listed in Table 415.5.2 shall be allowed in manufacturing, processing, dispensing, use or storage areas when separated from incompatible materials in accordance with the provisions of the Fire Code Appendix N .
415.8	Replace with:	415.8 Group H-2. Occupancies in Group H-2 shall be constructed in accordance with Sections 415.8.1 through 415.8.4 and the Fire Code Appendix N .
415.8.1	Replace with:	415.8.1 Combustible dusts, grain processing and storage. The provisions of Sections 415.8.1.1 through 415.8.1.6 shall apply to buildings in which materials that produce combustible dusts are stored or handled. Buildings that store or handle combustible dusts shall comply with the applicable provisions of NFPA 61, NFPA 85, NFPA 120, NFPA 484, NFPA 654, NFPA 655 and NFPA 664, and the Fire Code Appendix N .

Section / Table	Action	Revision
415.8.1.4	Replace with:	415.8.1.4 Explosion control. Explosion control shall be provided as specified in the Fire Code Appendix N , or spaces shall be equipped with the equivalent mechanical <i>ventilation</i> complying with the <i>Mechanical Code</i> .
415.8.2	Replace with:	415.8.2 Flammable and combustible liquids. The storage, handling, processing and transporting of flammable and combustible liquids in Groups H-2 and H-3 occupancies shall be in accordance with Sections 415.8.2.1 through 415.8.2.9, the <i>Mechanical Code</i> and the Fire Code Appendix N .
415.8.2.3	Replace with:	415.8.2.3 Tanks. Storage tanks shall be <i>approved</i> tanks conforming to the requirements of the Fire Code Appendix N .
415.8.2.4	Replace with:	415.8.2.4 Leakage containment. A liquid-tight containment area compatible with the stored liquid shall be provided. The method of spill control, drainage control and secondary containment shall be in accordance with the Fire Code Appendix N .
415.8.2.6	Replace with:	415.8.2.6 Tank vent. Storage tank vents for Class I, II or IIIA liquids shall terminate to the outdoor air in accordance with the Fire Code Appendix N .
415.8.2.7	Replace with:	415.8.2.7 Room ventilation. Storage tank areas storing Class I, II or IIIA liquids shall be provided with mechanical <i>ventilation</i> . The mechanical <i>ventilation</i> system shall be in accordance with the <i>Mechanical Code</i> and the Fire Code Appendix N .
415.8.2.8	Replace with:	415.8.2.8 Explosion venting. Where Class I liquids are being stored, explosion venting shall be provided in accordance with the Fire Code Appendix N .
415.8.3	Replace with:	415.8.3 Liquefied petroleum gas facilities. The construction and installation of liquefied petroleum gas facilities shall be in accordance with the requirements of this code, the Fire Code Appendix N ; and the <i>Mechanical Code</i> , the Fuel Gas Code and NFPA 58.
415.8.4	Replace with:	415.8.4 Dry cleaning plants. The construction and installation of dry cleaning plants shall be in accordance with the requirements of this code, the <i>Mechanical Code</i> , the <i>Plumbing Code</i> and NFPA 32. Dry cleaning solvents and systems shall be classified in accordance with the Fire Code Appendix N .
415.9	Replace with:	415.9 Groups H-3 and H-4. Groups H-3 and H-4 shall be constructed in accordance with the applicable provisions of this code and the Fire Code Appendix N .
415.10	Replace with:	415.10 Group H-5. In addition to the requirements set forth elsewhere in this code, Group H-5 shall comply with the provisions of Sections 415.10.1 through 415.10.11 and the Fire Code Appendix N .
415.10.1.7	Replace with:	415.10.1.7 Transporting hazardous production materials to fabrication areas. HPM shall be transported to <i>fabrication areas</i> through enclosed piping or tubing systems that comply with Section 415.10.6, through <i>service corridors</i> complying with Section 415.10.3, or in <i>corridors</i> as permitted in the exception to Section 415.10.2. The handling or transporting of HPM within <i>service corridors</i> shall comply with the Fire Code Appendix N .
415.10.4	Replace with:	415.10.4 Storage of hazardous production materials. Storage of hazardous production materials (HPM) in <i>fabrication areas</i> shall be within <i>approved</i> or <i>listed</i> storage cabinets or gas cabinets or within a workstation. The storage of HPM in quantities greater than those listed in Section 5004.2 of the Fire Code Appendix N shall be in liquid storage rooms, HPM rooms or gas rooms as appropriate for the materials stored. The storage of other hazardous materials shall be in accordance with other applicable provisions of this code and the Fire Code Appendix N .

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Section / Table	Action	Revision
415.10.7.2	Replace with:	415.10.7.2 Gas detection system operation. The <i>continuous gas detection system</i> shall be capable of monitoring the room, area or equipment in which the gas is located at or below all the following gas concentrations: <ol style="list-style-type: none"> 4. Except as noted in this section, monitoring for highly toxic and toxic gases shall also comply with Chapter 60 of the Fire Code Appendix N.
415.10.9.3	Replace with:	415.10.9.3 Signals. The emergency control station shall receive signals from emergency equipment and alarm and detection systems. Such emergency equipment and alarm and detection systems shall include, but not be limited to, the following where such equipment or systems are required to be provided either in this chapter or elsewhere in this code: <ol style="list-style-type: none"> 7. Automatic detection and alarm systems for pyrophoric liquids and Class 3 water-reactive liquids required in Section 2705.2.3.4 of the Fire Code Appendix N. 8. Exhaust <i>ventilation</i> flow alarm devices for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust <i>ventilation</i> systems required in Section 2705.2.3.4 of the Fire Code Appendix N.
415.10.10.1	Replace with:	415.10.10.1 Required electrical systems. Emergency power shall be provided for electrically operated equipment and connected control circuits for the following systems: <ol style="list-style-type: none"> 9. Automatic alarm and detection systems for pyrophoric liquids and Class 3 water-reactive liquids required in Section 2705.2.3.4 of the Fire Code Appendix N. 10. Flow alarm switches for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust <i>ventilation</i> systems required in Section 2705.2.3.4 of the Fire Code Appendix N. 11. Electrically operated systems required elsewhere in this code or in the Fire Code Appendix N applicable to the use, storage or handling of HPM.
416.1	Replace with:	416.1 General. The provisions of this section shall apply to the construction, installation and use of buildings and structures, or parts thereof, for the application of flammable finishes. Such construction and equipment shall comply with the Fire Code this code .
416.4	Replace with:	416.4 Spray booths. Spray booths shall be designed, constructed and operated in accordance with the Fire Code this code .
421.1	Replace with:	421.1 General. Where required by the Fire Code Appendix N , hydrogen cutoff rooms shall be designed and constructed in accordance with Sections 421.1 through 421.8.
421.7	Replace with:	421.7 Explosion control. Explosion control shall be provided in accordance with Chapter 9 of the Fire Code this code .

CHAPTER 5 – GENERAL BUILDING HEIGHTS AND AREAS

501.2	Replace with:	501.2 Address identification. New and existing buildings shall be provided with <i>approved</i> address numbers or letters. Each character shall be not less than 4 inches (102 mm) in height and not less than 0.5 inch (12.7 mm) in width. They shall be installed on a contrasting background and be plainly visible from the street or road fronting the property. When required by the fire code official, address numbers shall be provided in additional approved locations to facilitate emergency response. Where access is by means of a private road and the building address cannot be viewed from the public way, a monument, pole or other approved sign or means shall be used to identify the structure.
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Section / Table	Action	Revision
507.3	Replace with:	507.3 Sprinklered, one story. / Exceptions: 1. Buildings and structures of Types I and II construction for rack storage facilities that do not have access by the public shall not be limited in height, provided that such buildings conform to the requirements of Sections 507.3 and 903.3.1.1 and Chapter 32 of the Fire Code Appendix N .
507.8.1.1.1	Replace with:	507.8.1.1.1 Liquid use, dispensing and mixing rooms. Liquid use, dispensing and mixing rooms having a floor area of not more than 500 square feet (46.5 m ²) need not be located on the outer perimeter of the building where they are in accordance with the Fire Code Appendix N and NFPA 30.
507.8.1.1.2	Replace with:	507.8.1.1.2 Liquid storage rooms. Liquid storage rooms having a floor area of not more than 1,000 square feet (93 m ²) need not be located on the outer perimeter where they are in accordance with the Fire Code Appendix N and NFPA 30.
507.8.1.1.3	Replace with:	507.8.1.1.3 Spray paint booths. Spray paint booths that comply with the Fire Code Appendix N need not be located on the outer perimeter.

CHAPTER 7 – FIRE AND SMOKE PROTECTION FEATURES

705.8.1	Replace with:	705.8.1 Allowable area of openings. Exceptions: 1.2. Where the wall faces an unoccupied space. The unoccupied space shall be on the same lot or dedicated for public use, shall not be less than 30 feet (9144 mm) in width and shall have access from a street by a posted fire lane in accordance with the Fire Code.
707.1	Replace with:	707.1 General. <i>Fire barriers</i> installed as required elsewhere in this code or the Fire Code shall comply with this section.

CHAPTER 9 – FIRE PROTECTION SYSTEMS

901.2	Replace with:	901.2 Fire protection systems. <i>Fire protection systems</i> shall be installed, repaired and operated in accordance with this code including those areas under the State Building Code which are printed for convenience in the Fire Code.
901.3	Replace with:	901.3 Modifications. No person shall remove or modify any <i>fire protection system</i> installed or maintained under the provisions of this code or the Fire Code without approval by the <i>building official</i> .
901.5	Replace with:	901.5 Acceptance tests. <i>Fire protection systems</i> shall be tested in accordance with the requirements of this code and the Fire Code . When required, the tests shall be conducted in the presence of the <i>building official</i> . Tests required by this code, the Fire Code and the standards listed in this code shall be conducted at the expense of the owner or the owner's representative. It shall be unlawful to occupy portions of a structure until the required <i>fire protection systems</i> within that portion of the structure have been tested and <i>approved</i> .
901.6.2	Replace with:	901.6.2 Fire alarm systems. Fire alarm systems required by the provisions of Section 907.2 of this code and Sections 907.2 and 907.9 of the Fire Code Appendix N shall be monitored by an <i>approved</i> supervising station in accordance with Section 907.6.5.
901.6.3	Replace with:	901.6.3 Group H. Supervision and monitoring of emergency alarm, detection and automatic fire-extinguishing systems in Group H occupancies shall be in accordance with the Fire Code Appendix N .

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Section / Table	Action	Revision
903.2.7.1	Replace with:	903.2.7.1 High-piled storage. An automatic sprinkler system shall be provided in accordance with the Fire Code this code in all buildings of Group M where storage of merchandise is in high-piled or rack storage arrays.
903.2.8	Replace with:	903.2.8 Group R. An automatic sprinkler system installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R fire area. For distance requirements to access roads and fire hydrants, see the Fire Code.
Table 903.2.11.6	Replace with:	Sprinkler system requirements as set forth in Section 903.2.11.6 of the Fire Code Appendix N
903.2.12	Delete:	903.2.12 During construction. Automatic sprinkler systems required during construction, alteration and demolition operations shall be provided in accordance with Chapter 33 of the Fire Code.
903.5	Replace with:	903.5 Testing and maintenance. Sprinkler systems shall be tested and maintained in accordance with the Fire Code Appendix N.
904.2.1	Replace with:	904.2.1 Commercial hood and duct systems. Each required commercial kitchen exhaust hood and duct system required by Section 609 of the Fire Code or Chapter 5 of the Mechanical Code to have a Type I hood shall be protected with an approved automatic fire-extinguishing system installed in accordance with this code.
905.1	Replace with:	905.1 General. Standpipe systems shall be provided in new buildings and structures in accordance with this section. Fire hose threads used in connection with standpipe systems shall be <i>approved</i> and shall be compatible with fire department hose threads. The location of fire department hose connections shall be <i>approved</i> . In buildings used for high-piled combustible storage, fire protection shall be in accordance with the Fire Code Appendix N.
905.3.6	Replace with:	905.3.6 Helistops and heliports. Buildings with a rooftop <i>helistop</i> or <i>heliport</i> shall be equipped with a Class I or III standpipe system extended to the roof level on which the <i>helistop</i> or <i>heliport</i> is located in accordance with Section 2007.5 of the Fire Code Appendix N.
905.3.7	Delete:	905.3.7 Marinas and boatyards. Standpipes in marinas and boatyards shall comply with Chapter 36 of the Fire Code.
905.4	Replace with:	905.4 Location of Class I standpipe hose connections. <ol style="list-style-type: none"> 1. In every required <i>stairway</i>, a hose connection shall be provided for each floor level above or below grade. Hose connections shall be located at an intermediate floor level landing between floors, unless otherwise approved by the fire code official.
906.1	Delete:	906.1 Where required. Portable fire extinguishers shall be provided in occupancies and locations as required by the Fire Code.
907.1.1	Replace with:	907.1.1 Construction documents. <i>Construction documents</i> for fire alarm systems shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code, the Fire Code, and relevant laws, ordinances, rules and regulations, as determined by the <i>building official</i> .
907.2	Delete:	907.2 Where required—new buildings and structures. / Exceptions: <ol style="list-style-type: none"> 2. The manual fire alarm box is not required for Group R-2 occupancies unless required by the fire code official to provide a means for fire watch personnel to initiate an alarm during a sprinkler system impairment event. Where provided, the manual fire alarm box shall not be located in an area that is accessible to the public.

Section / Table	Action	Revision
907.2.5	Replace with:	907.2.5 Group H. A manual fire alarm system that activates the occupant notification system in accordance with Section 907.5 shall be installed in Group H-5 occupancies and in occupancies used for the manufacture of organic coatings. An automatic smoke detection system shall be installed for highly toxic gases, organic peroxides and oxidizers in accordance with Chapters 60, 62 and 63, respectively, of the Fire Code Appendix N.
907.2.6	Replace with:	907.2.6 Group I. / Exceptions: 2. Occupant notification systems are not required to be activated where private mode signaling installed in accordance with NFPA 72 is <i>approved</i> by the fire code building official.
907.2.15	Replace with:	907.2.15 High-piled combustible storage areas. An automatic smoke detection system shall be installed throughout high-piled combustible storage areas where required by Section 3206.5 of the Fire Code Appendix N.
907.2.16	Replace with:	907.2.16 Aerosol storage uses. Aerosol storage rooms and general-purpose warehouses containing aerosols shall be provided with an <i>approved</i> manual fire alarm system where required by the Fire Code Appendix N.
907.4.2.5	Replace with:	907.4.2.5 Protective covers. The fire code building official is authorized to require the installation of <i>listed</i> manual fire alarm box protective covers to prevent malicious false alarms or to provide the manual fire alarm box with protection from physical damage. The protective cover shall be transparent or red in color with a transparent face to permit visibility of the manual fire alarm box. Each cover shall include proper operating instructions. A protective cover that emits a local alarm signal shall not be installed unless <i>approved</i> . Protective covers shall not project more than that permitted by Section 1003.3.3.
907.5.1	Replace with:	907.5.1 Presignal feature. A presignal feature shall not be installed unless <i>approved</i> by the fire code official and the fire department . Where a presignal feature is provided, a signal shall be annunciated at an <i>approved</i> constantly attended location approved by the fire department , in order that occupant notification can be activated in the event of fire or other emergency.
907.5.2.2	Replace with:	907.5.2.2 Emergency voice/alarm communication systems. Emergency voice/alarm communication systems required by this code shall be designed and installed in accordance with NFPA 72. The operation of any automatic fire detector, sprinkler waterflow device or manual fire alarm box shall automatically sound an alert tone followed by voice instructions giving <i>approved</i> information and directions for a general or staged evacuation in accordance with the building's fire safety and evacuation plans required by Section 404 of the Fire Code . In high-rise buildings, the system shall operate on a minimum of the alarming floor, the floor above and the floor below. Speakers shall be provided throughout the building by paging zones. At a minimum, paging zones shall be provided as follows:
907.6.5	Replace with:	907.6.5 Monitoring. Fire alarm systems required by this chapter or by the Fire Code Appendix N shall be monitored by an <i>approved</i> supervising station in accordance with NFPA 72.
907.6.5.2	Delete:	907.6.5.2 Termination of monitoring service. Termination of fire alarm monitoring services shall be in accordance with Section 901.9 of the Fire Code.
907.8	Delete:	907.8 Inspection, testing and maintenance. The maintenance and testing schedules and procedures for fire alarm and fire detection systems shall be in accordance with Section 907.8 of the Fire Code.

APPENDIX N

Section / Table	Action	Revision
909.19	Delete:	909.19 System acceptance. Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the <i>building official</i> determines that the provisions of this section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system and a written maintenance program complying with the requirements of Section 909.20.1 of the <i>Fire Code</i> has been submitted and approved by the fire code official.
909.20	Replace with:	909.20 Smokeproof enclosures. Where required by Section 1022.10, a smokeproof enclosure shall be constructed in accordance with this section. A smokeproof enclosure shall consist of an enclosed interior <i>exit stairway</i> that conforms to Section 1022.2 and an open exterior balcony or ventilated vestibule meeting the requirements of this section. Where access to the roof is required by the <i>Fire Code</i> , such access shall be from the smokeproof enclosure where a smokeproof enclosure is required.
910.2.2	Replace with:	910.2.2 High-piled combustible storage. Buildings and portions thereof containing high-piled combustible stock or rack storage in any occupancy group in accordance with Section 413 and the <i>Fire Code</i> Appendix N .
Table 910.3	Replace with:	Footnote: <ul style="list-style-type: none"> a. Additional requirements for rack storage heights in excess of those indicated shall be in accordance with Chapter 32 of the <i>Fire Code</i> Appendix N. For solid-piled storage heights in excess of those indicated, an approved engineered design shall be used.
912.3.3	Replace with:	912.3.3 Physical protection. Where fire department connections are subject to impact by a motor vehicle, vehicle impact protection shall be provided in accordance with Section N303 of Section 312 of the <i>Fire Code</i> Appendix N .

CHAPTER 10 – MEANS OF EGRESS

1001.3	Delete:	1001.3 Maintenance. <i>Means of egress</i> shall be maintained in accordance with the <i>Fire Code</i> .
1001.4	Delete:	1001.4 Fire safety and evacuation plans. Fire safety and evacuation plans shall be provided for all occupancies and buildings where required by the <i>Fire Code</i> . Such fire safety and evacuation plans shall comply with the applicable provisions of Sections 401.2 and 404 of the <i>Fire Code</i> as approved by the fire code official.
1008.1.9.6	Replace with:	1008.1.9.6 Special locking arrangements in doors in Groups I-1, I-2, R-3 and R-4 facilities providing care. <ul style="list-style-type: none"> 5. The procedures for the operation(s) of the unlocking system shall be described and <i>approved</i> as part of the construction documents emergency planning and preparedness required by Chapter 4 of the <i>Fire Code</i>.

CHAPTER 12 – INTERIOR ENVIRONMENT

1203.4.2	Replace with:	1203.4.2 Contaminants exhausted. Contaminant sources in naturally ventilated spaces shall be removed in accordance with the <i>Mechanical Code</i> and the <i>Fire Code</i> Appendix N .
1203.5	Replace with:	1203.5 Other ventilation and exhaust systems. <i>Ventilation</i> and exhaust systems for occupancies and operations involving flammable or combustible hazards or other contaminant sources as covered in the <i>Mechanical Code</i> or the <i>Fire Code</i> Appendix N shall be provided as required by both codes.

CHAPTER 15 – ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

Section / Table	Action	Revision
1507.16	Replace with:	1507.16 Roof gardens and landscaped roofs. Roof gardens and landscaped roofs shall comply with the requirements of this chapter and Sections 1607.12.3 and 1607.12.3.1 and the <i>Fire Code</i> <u>Appendix N</u> .

CHAPTER 16 – STRUCTURAL DESIGN

Table	Replace with:	RISK CATEGORY	NATURE OF OCCUPANCY
1604.5		III	<ul style="list-style-type: none"> Buildings and other structures not included in Risk Category IV containing quantities of toxic or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with the <i>Fire Code</i> <u>Appendix N</u>; and are sufficient to pose a threat to the public if released^b.
		IV	<ul style="list-style-type: none"> Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(2) or per outdoor control area in accordance with the <i>Fire Code</i> <u>Appendix N</u>; and are sufficient to pose a threat to the public if released^b.

CHAPTER 26 – PLASTIC

2603.4.1.12	Replace with:	2603.4.1.12 Interior signs. Foam plastic used for interior signs in <i>covered mall buildings</i> in accordance with Section 402.6.4 shall be permitted without a thermal barrier. Foam plastic signs that are not affixed to interior building surfaces shall comply with Chapter 8 of the <i>Fire Code</i>.
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CHAPTER 27 – ELECTRICAL

2702.1	Replace with:	2702.1 Installation. Emergency and standby power systems required by this code or the <i>Fire Code</i> <u>Appendix N</u> shall be installed in accordance with this code, NFPA 110 and 111.
2702.2.9	Replace with:	2702.2.9 Membrane structures. Standby power shall be provided for auxiliary inflation systems in accordance with Section 3102.8.2. Emergency power shall be provided for exit signs in temporary tents and membrane structures in accordance with the <i>Fire Code</i>.
2702.2.11	Replace with:	2702.2.11 Highly toxic and toxic materials. Emergency power shall be provided for occupancies with highly <i>toxic</i> or <i>toxic</i> materials in accordance with the <i>Fire Code</i> <u>Appendix N</u> .
2702.2.12	Replace with:	2702.2.12 Organic peroxides. Standby power shall be provided for occupancies with organic peroxides in accordance with the <i>Fire Code</i> <u>Appendix N</u> .
2702.3	Delete:	2702.3 Maintenance. Emergency and standby power systems shall be maintained and tested in accordance with the <i>Fire Code</i>.

CHAPTER 30 – ELEVATORS AND CONVEYING SYSTEMS

3003.3	Replace with:	3003.3 Standardized fire service elevator keys. All elevators shall be equipped to operate with a standardized fire service elevator key in accordance with the <i>Fire Elevator Code</i> .
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Section / Table	Action	Revision
3008.1.2	Delete:	3008.1.2 Fire safety and evacuation plan. The building shall have an <i>approved</i> fire safety and evacuation plan in accordance with the applicable requirements of Section 404 of the <i>Fire Code</i>. The fire safety and evacuation plan shall incorporate specific procedures for the occupants using evacuation elevators.

CHAPTER 31 – SPECIAL CONSTRUCTION

3102.1	Replace with:	3102.1 General. The provisions of Sections 3102.1 through 3102.8 shall apply to air-supported, air-inflated, membrane covered cable and membrane-covered frame structures, collectively known as membrane structures, erected for a period of 180 days or longer. Those erected for a shorter period of time shall comply with the <i>Fire Code</i>. Membrane structures covering water storage facilities, water clarifiers, water treatment plants, sewage treatment plants, greenhouses and similar facilities not used for human occupancy are required to meet only the requirements of Sections 3102.3.1 and 3102.7. Membrane structures erected on a building, balcony, deck or other structure for any period of time shall comply with this section.
3103.1	Replace with:	3103.1 General. The provisions of Sections 3103.1 through 3103.4 shall apply to structures erected for a period of less than 180 days. Tents and other membrane structures erected for a period of less than 180 days shall comply with the <i>Fire Code</i>. Those erected for a longer period of time shall comply with applicable sections of this code.

CHAPTER 33 – SAFEGUARDS DURING CONSTRUCTION

3302.3	Replace with:	3302.3 Fire safety during construction. Fire safety during construction shall comply with the applicable requirements of this code and the applicable provisions of Chapter 33 of the <i>Fire Code</i>.
3303.7	Delete:	3303.7 Fire safety during demolition. Fire safety during demolition shall comply with the applicable requirements of this code and the applicable provisions of Chapter 56 of the <i>Fire Code</i>.
3309.1	Delete:	3309.1 Where required. All structures under construction, <i>alteration</i> or demolition shall be provided with no fewer than one <i>approved</i> portable fire extinguisher in accordance with Section 906 and sized for not less than ordinary hazard as follows: 1. — At each <i>stairway</i> on all floor levels where combustible materials have accumulated. 2. — In every storage and construction shed. 3. — Additional portable fire extinguishers shall be provided where special hazards exist, such as the storage and use of flammable and combustible liquids.
3309.2	Delete:	3309.2 Fire hazards. The provisions of this code and the <i>Fire Code</i> shall be strictly observed to safeguard against all fire hazards attendant upon construction operations.

CHAPTER 34 – EXISTING BUILDINGS AND STRUCTURES

3401.3	Replace with:	3401.3 Compliance. <i>Alterations, repairs, additions</i> and changes of occupancy to existing structures shall comply with the provisions for <i>alterations, repairs, additions</i> and changes of occupancy in the <i>Energy Code, Fire Code, Fuel Gas Code, Mechanical Code, Plumbing Code, Residential Code</i> and NFPA 70.
3403.5	Delete:	3403.5 Smoke alarms in existing portions of a building. Where an <i>addition</i> is made to a building or structure of a Group R or I-1 occupancy, the existing building shall be provided with <i>smoke alarms</i> in accordance with Section 1103.8 of the <i>Fire Code</i>.

Section / Table	Action	Revision
3404.6	Delete:	3404.6 Smoke alarms. Individual <i>sleeping units</i> and individual <i>dwelling units</i> in Group R and I-1 occupancies shall be provided with <i>smoke alarms</i> in accordance with Section 1103.8 of the <i>Fire Code</i> .
3412.3.2	Delete:	3412.3.2 Compliance with other codes. Buildings that are evaluated in accordance with this section shall comply with the <i>Fire Code</i> .
3412.6.8.1	Replace with:	<p>3412.6.8.1 Categories. The categories for automatic fire detection are:</p> <ol style="list-style-type: none"> 1. Category a—None. 2. Category b—Existing <i>smoke detectors</i> in HVAC systems and maintained in accordance with the <i>Fire Code</i>. 3. Category c—<i>Smoke detectors</i> in HVAC systems. The detectors are installed in accordance with the requirements for new buildings in the <i>Mechanical Code</i>. 4. Category d—<i>Smoke detectors</i> throughout all floor areas other than individual <i>sleeping units</i>, tenant spaces and <i>dwelling units</i>. 5. Category e—<i>Smoke detectors</i> installed throughout the floor area.
3412.6.14	Replace with:	<p>3412.6.14 Elevator control. Evaluate the passenger elevator equipment and controls that are available to the fire department to reach all occupied floors.</p> <p>Emergency recall and in-car operation of elevator recall controls shall be provided in accordance with the <i>Fire Elevator Code</i>. Under the categories and occupancies in Table 3412.6.14, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.14, Elevator Control, for fire safety, means of egress and general safety. The values shall be zero for a single-story building.</p>
3412.6.14.1	Replace with:	<p>3412.6.14.1 Categories. The categories for elevator controls are:</p> <ol style="list-style-type: none"> 1. Category a — No elevator. 2. Category b—Any elevator without Phase I emergency recall operation and Phase II emergency in-car operation. 3. Category c — All elevators with Phase I emergency recall operation and Phase II emergency in-car operation as required by the <i>Fire Elevator Code</i>. 4. Category d—All meet Category c; or Category b where permitted to be without Phase I emergency recall operation and Phase II emergency in-car operation; and at least one elevator that complies with new construction requirements serves all occupied floors.
CHAPTER 35 – REFERENCED STANDARDS		
2012 IFC	Replace with:	<u>Appendix N</u>

CHAPTER N2 DEFINITIONS

SECTION N201 GENERAL

N201.1 Scope. Unless otherwise expressly stated, the following words and terms shall, for the purposes of these sections, have the meanings shown in Sections N201 and N202.

N201.2 Interchangeability. Words used in the present tense include the future; words stated in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural, the singular.

N201.3 Terms defined in other codes. Where terms are not defined in this section and are defined in Chapter 2 of this code or the *Mechanical Code* such terms shall have the meanings ascribed to them as in those codes.

N201.4 Terms not defined. Where terms are not defined through the methods authorized by this section, such terms shall have ordinarily accepted meanings such as the context implies. *Merriam Webster's Collegiate Dictionary, 11th Edition*, shall be considered as providing ordinarily accepted meanings.

SECTION N202 GENERAL DEFINITIONS

AEROSOL WAREHOUSE. A building used for warehousing aerosol products.

ALARM, NUISANCE. See "Nuisance alarm."

ALARM DEVICE, MULTIPLE STATION. See "Multiple Station Alarm Device."

ARRAY (These provisions). The configuration of storage. Characteristics considered in defining an array include the type of packaging, flue spaces, height of storage and compactness of storage.

ARRAY, CLOSED (These provisions). A storage configuration having a 6-inch (152 mm) or smaller width vertical flue space that restricts air movement through the stored commodity.

AUTOMATED RACK STORAGE. Automated rack storage is a stocking method whereby the movement of pallets, products, apparatus or systems are automatically controlled by mechanical or electronic devices.

BALED COTTON. See "Cotton."

BALED COTTON, DENSELY PACKED. See "Cotton."

BATTERY SYSTEM, STATIONARY LEAD ACID. A system which consists of three interconnected subsystems:

1. A lead-acid battery.
2. A battery charger.
3. A collection of rectifiers, inverters, converters and associated electrical equipment as required for a particular application.

BATTERY TYPES.

Lithium-ion battery. A storage battery that consists of lithium ions embedded in a carbon graphite or nickel metal-oxide substrate. The electrolyte is a carbonate mixture or a gelled polymer. The lithium ions are the charge carriers of the battery.

Lithium metal polymer battery. A storage battery that is comprised of nonaqueous liquid or polymerized electrolytes, which provide ionic conductivity between lithiated positive active material electrically separated from metallic lithium or lithiated negative active material.

Nickel cadmium (Ni-Cd) battery. An alkaline storage battery in which the positive active material is nickel oxide, the negative contains cadmium and the electrolyte is potassium hydroxide.

Nonrecombinant battery. A storage battery in which, under conditions of normal use, hydrogen and oxygen gases created by electrolysis are vented into the air outside of the battery.

Recombinant battery. A storage battery in which, under conditions of normal use, hydrogen and oxygen gases created by electrolysis are converted back into water inside the battery instead of venting into the air outside of the battery.

Stationary storage battery. A group of electrochemical cells interconnected to supply a nominal voltage of DC power to a suitably connected electrical load, designed for service in a permanent location. The number of cells connected in a series determines the nominal voltage rating of the battery. The size of the cells determines the discharge capacity of the entire battery. After discharge, it may be restored to a fully charged condition by an electric current flowing in a direction opposite to the flow of current when the battery is discharged.

Valve-regulated lead-acid (VRLA) battery. A lead-acid battery consisting of sealed cells furnished with a valve that opens to vent the battery whenever the internal pressure of the battery exceeds the ambient pressure by a set amount. In VRLA batteries, the liquid electrolyte in the cells is immobilized in an absorptive glass mat (AGM cells or batteries) or by the addition of a gelling agent (gel cells or gelled batteries).

Vented (flooded) lead-acid battery. A lead-acid battery consisting of cells that have electrodes immersed in liquid electrolyte. Flooded lead-acid batteries have a provision for the user to add water to the cell and are equipped with a flame-arresting vent which permits the escape of hydrogen and oxygen gas from the cell in a diffused manner such that a spark, or other ignition source, outside the cell will not ignite the gases inside the cell.

BIN BOX. A five-sided container with the open side facing an aisle. Bin boxes are self-supporting or supported by a structure designed so that little or no horizontal or vertical space exists around the boxes.

BULK OXYGEN SYSTEM. An assembly of equipment, such as oxygen storage containers, pressure regulators, safety devices, vaporizers, manifolds and interconnecting piping, that

has a storage capacity of more than 20,000 cubic feet (566 m³) of oxygen at *normal temperature and pressure (NTP)* including unconnected reserves on hand at the site. The bulk oxygen system terminates at the point where oxygen at service pressure first enters the supply line. The oxygen containers can be stationary or movable, and the oxygen can be stored as a gas or liquid.

BULK TRANSFER. The loading or unloading of flammable or *combustible liquids* from or between tank vehicles, tank cars or storage tanks.

CANOPY (This appendix). A structure or architectural projection of rigid construction over which a covering is attached that provides weather protection, identity or decoration, and may be structurally independent or supported by attachment to a building on one end and by not less than one stanchion on the outer end.

CARTON. A cardboard or fiberboard box enclosing a product.

CHEMICAL. An element, chemical compound or mixture of elements or compounds or both.

CHEMICAL NAME. The scientific designation of a chemical in accordance with the nomenclature system developed by the International Union of Pure and Applied Chemistry, the Chemical Abstracts Service rules of nomenclature, or a name which will clearly identify a chemical for the purpose of conducting an evaluation.

CLOSED CONTAINER. A container sealed by means of a lid or other device such that liquid, vapor or dusts will not escape from it under ordinary conditions of use or handling.

CLOSED SYSTEM. The use of a solid or liquid hazardous material involving a closed vessel or system that remains closed during normal operations where vapors emitted by the product are not liberated outside of the vessel or system and the product is not exposed to the atmosphere during normal operations; and all uses of *compressed gases*. Examples of closed systems for solids and liquids include product conveyed through a piping system into a closed vessel, system or piece of equipment.

COMBUSTIBLE DUST. Finely divided solid material which is 420 microns or less in diameter and which, when dispersed in air in the proper proportions, could be ignited by a flame, spark or other source of ignition. Combustible dust will pass through a U.S. No. 40 standard sieve.

COMMODITY. A combination of products, packing materials and containers.

COMPRESSED GAS CONTAINER. A pressure vessel designed to hold *compressed gases* at pressures greater than one atmosphere at 68°F (20°C) and includes cylinders, containers and tanks.

COMPRESSED GAS SYSTEM. An assembly of equipment designed to contain, distribute or transport *compressed gases*. It can consist of a *compressed gas* container or containers, reactors and appurtenances, including pumps, compressors and connecting piping and tubing.

COTTON.

Baled cotton. A natural seed fiber wrapped in and secured with industry-accepted materials, usually consisting of burlap, woven polypropylene, polyethylene or cotton or sheet polyethylene, and secured with steel, synthetic or wire bands, or wire; also includes linters (lint removed from the cottonseed) and motes (residual materials from the ginning process).

Baled cotton, densely packed. Cotton, made into banded bales, with a packing density of at least 22 pounds per cubic foot (360 kg/m³), and dimensions complying with the following: a length of 55 inches (1397 mm), a width of 21 inches (533.4 mm) and a height of 27.6 to 35.4 inches (701 to 899 mm).

CRYOGENIC FLUID. A fluid having a *boiling point* lower than -130°F (-89.9°C) at 14.7 pounds per square inch atmosphere (psia) (an absolute pressure of 101.3 kPa).

CYLINDER. A pressure vessel designed for pressures higher than 40 psia (275.6 kPa) and having a circular cross section. It does not include a portable tank, multi-unit tank car tank, cargo tank or tank car.

DESIGN PRESSURE. The maximum gauge pressure that a pressure vessel, device, component or system is designed to withstand safely under the temperature and conditions of use expected.

DETEARING. A process for rapidly removing excess wet coating material from a dipped or coated object or material by passing it through an electrostatic field.

DETONATION. An exothermic reaction characterized by the presence of a shock wave in the material which establishes and maintains the reaction. The reaction zone progresses through the material at a rate greater than the velocity of sound. The principal heating mechanism is one of shock compression. *Detonations* have an *explosive* effect.

DIP TANK. A tank, vat or container of flammable or combustible liquid in which articles or materials are immersed for the purpose of coating, finishing, treating and similar processes.

DRAFT CURTAIN. A structure arranged to limit the spread of smoke and heat along the underside of the ceiling or roof.

DRY CLEANING. The process of removing dirt, grease, paints and other stains from such items as wearing apparel, textiles, fabrics and rugs by use of nonaqueous liquids (solvents).

DRY CLEANING PLANT. A facility in which dry cleaning and associated operations are conducted, including the office, receiving area and storage rooms.

DRY CLEANING ROOM. An occupiable space within a building used for performing dry cleaning operations, the installation of solvent-handling equipment or the storage of dry cleaning solvents.

APPENDIX N

DRY CLEANING SYSTEM (These provisions). Machinery or equipment in which textiles are immersed or agitated in solvent or in which dry cleaning solvent is extracted from textiles.

EARLY SUPPRESSION FAST-RESPONSE (ESFR) SPRINKLER. A sprinkler *listed* for early suppression fast response performance.

ELECTROSTATIC FLUIDIZED BED. A container holding powder coating material that is aerated from below so as to form an air-supported expanded cloud of such material that is electrically charged with a charge opposite to that of the object to be coated. Such object is transported through the container immediately above the charged and aerated materials in order to be coated.

EMERGENCY SHUTOFF VALVE. A valve designed to shut off the flow of gases or liquids.

EMERGENCY SHUTOFF VALVE, AUTOMATIC. A fail-safe automatic-closing valve designed to shut off the flow of gases or liquids initiated by a control system that is activated by automatic means.

EMERGENCY SHUTOFF VALVE, MANUAL. A manually operated valve designed to shut off the flow of gases or liquids.

EXCESS FLOW CONTROL. A fail-safe system or other *approved* means designed to shut off flow caused by a rupture in pressurized piping systems.

EXHAUSTED ENCLOSURE. An appliance or piece of equipment which consists of a top, a back and two sides providing a means of local exhaust for capturing gases, fumes, vapors and mists. Such enclosures include laboratory hoods, exhaust fume hoods and similar appliances and equipment used to retain and exhaust locally the gases, fumes, vapors and mists that could be released. Rooms or areas provided with general ventilation, in themselves, are not exhausted enclosures.

EXPLOSIVE MATERIAL. The term “explosive” material means *explosives*, blasting agents and detonators.

EXTRA-HIGH-RACK COMBUSTIBLE STORAGE. Storage on racks of Class I, II, III or IV commodities which exceed 40 feet (12 192 mm) in height and storage on racks of high-hazard commodities which exceed 30 feet (9144 mm) in height.

FACILITY. A building or use in a fixed location including exterior storage areas for flammable and combustible substances and hazardous materials, piers, wharves, tank farms and similar uses. This term includes recreational vehicles, mobile home and manufactured housing parks, sales and storage lots.

FINES. Small pieces or splinters of wood byproducts that will pass through a 0.25-inch (6.4 mm) screen.

[B] FLAME SPREAD INDEX. A comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.

FLAMMABLE CRYOGENIC FLUID. A *cryogenic fluid* that is flammable in its vapor state.

FLAMMABLE FINISHES. Coatings to articles or materials in which the material being applied is a flammable liquid, combustible liquid, combustible powder, fiberglass resin or flammable or combustible gel coating.

FLAMMABLE VAPOR AREA. An area in which the concentration of flammable constituents (vapor, gas, fume, mist or dust) in air exceeds 25 percent of their lower flammable limit (LFL) because of the flammable finish processes operation. It shall include:

1. The interior of spray booths.
2. The interior of ducts exhausting from spraying processes.
3. Any area in the direct path of spray or any area containing dangerous quantities of air-suspended powder, combustible residue, dust, deposits, vapor or mists as a result of spraying operations.
4. The area in the vicinity of dip tanks, drain boards or associated drying, conveying or other equipment during operation or shutdown periods.

The *building official* is authorized to determine the extent of the flammable vapor area, taking into consideration the material characteristics of the flammable materials, the degree of sustained ventilation and the nature of the operations.

FLOAT. A floating structure normally used as a point of transfer for passengers and goods, or both, for mooring purposes.

FLUE SPACES.

Longitudinal flue space. The flue space between rows of storage perpendicular to the direction of loading.

Transverse flue space. The space between rows of storage parallel to the direction of loading.

FLUIDIZED BED. A container holding powder coating material that is aerated from below so as to form an air-supported expanded cloud of such material through which the preheated object to be coated is immersed and transported.

FURNACE CLASS A. An oven or furnace that has heat utilization equipment operating at approximately atmospheric pressure wherein there is a potential explosion or fire hazard that could be occasioned by the presence of flammable volatiles or combustible materials processed or heated in the furnace.

Note: Such flammable volatiles or combustible materials can, for instance, originate from the following:

1. Paints, powders, inks, and adhesives from finishing processes, such as dipped, coated, sprayed and impregnated materials.
2. The substrate material.
3. Wood, paper and plastic pallets, spacers or packaging materials.
4. Polymerization or other molecular rearrangements.

Potentially flammable materials, such as quench oil, water-borne finishes, cooling oil or cooking oils, that present a hazard are ventilated according to Class A standards.

FURNACE CLASS B. An oven or furnace that has heat utilization equipment operating at approximately atmospheric pressure wherein there are no flammable volatiles or combustible materials being heated.

FURNACE CLASS C. An oven or furnace that has a potential hazard due to a flammable or other special atmosphere being used for treatment of material in process. This type of furnace can use any type of heating system and includes a special atmosphere supply system. Also included in the Class C classification are integral quench furnaces and molten salt bath furnaces.

FURNACE CLASS D. An oven or furnace that operates at temperatures from above ambient to over 5,000°F (2760°C) and at pressures normally below atmospheric using any type of heating system. These furnaces can include the use of special processing atmospheres.

GAS DETECTION SYSTEM, CONTINUOUS. See “Continuous gas detection system.”

HIGH-PILED COMBUSTIBLE STORAGE. Storage of combustible materials in closely packed piles or combustible materials on pallets, in racks or on shelves where the top of storage is greater than 12 feet (3658 mm) in height. When required by the *building official*, *high-piled combustible storage* also includes certain high-hazard commodities, such as rubber tires, Group A plastics, flammable liquids, idle pallets and similar commodities, where the top of storage is greater than 6 feet (1829 mm) in height.

HIGH-PILED STORAGE AREA. An area within a building which is designated, intended, proposed or actually used for *high-piled combustible storage*.

HIGHLY VOLATILE LIQUID. A liquefied *compressed gas* with a *boiling point* of less than 68°F (20°C).

HOGGED MATERIALS. Wood waste materials produced from the lumber production process.

HPM FACILITY. See “Semiconductor fabrication facility.”

INHABITED BUILDING. A building regularly occupied in whole or in part as a habitation for people, or any place of religious worship, schoolhouse, railroad station, store or other structure where people are accustomed to assemble, except any building or structure occupied in connection with the manufacture, transportation, storage or use of *explosive materials*.

IRRITANT. A chemical which is not *corrosive*, but which causes a reversible inflammatory effect on living tissue by chemical action at the site of contact. A chemical is a skin irritant if, when tested on the intact skin of albino rabbits by the methods of CPSC 16 CFR Part 1500.41 for an exposure of four or more hours or by other appropriate techniques, it results in an empirical score of 5 or more. A chemical is classified as an eye irritant if so determined under the procedure listed in CPSC 16 CFR Part 1500.42 or other *approved* techniques.

LIMITED SPRAYING SPACE. An area in which operations for touch-up or spot painting of a surface area of 9 square feet (0.84 m²) or less are conducted.

LIQUEFIED PETROLEUM GAS (LP-gas). A material which is composed predominantly of the following hydrocarbons or mixtures of them: propane, propylene, butane (normal butane or isobutane) and butylenes.

LIQUID. A material having a melting point that is equal to or less than 68°F (20°C) and a *boiling point* which is greater than 68°F (20°C) at 14.7 pounds per square inch absolute (psia) (101 kPa). When not otherwise identified, the term “liquid” includes both flammable and *combustible liquids*.

LIQUID STORAGE ROOM. A room classified as a Group H-3 occupancy used for the storage of flammable or *combustible liquids* in a closed condition.

LIQUID STORAGE WAREHOUSE. A building classified as a Group H-2 or H-3 occupancy used for the storage of flammable or *combustible liquids* in a closed condition.

LONGITUDINAL FLUE SPACE. See “Flue Space—Longitudinal.”

LOW-PRESSURE TANK. A storage tank designed to withstand an internal pressure greater than 0.5 pounds per square inch gauge (psig) (3.4 kPa) but not greater than 15 psig (103.4 kPa).

LOWER EXPLOSIVE LIMIT (LEL). See “Lower flammable limit.”

MAGAZINE. A building, structure or container, other than an operating building, *approved* for storage of *explosive materials*.

Indoor. A portable structure, such as a box, bin or other container, constructed as required for Type 2, 4 or 5 magazines in accordance with NFPA 495, NFPA 1124 or DOTy 27 CFR Part 55 so as to be fire resistant and theft resistant.

Type 1. A permanent structure, such as a building or igloo, that is bullet resistant, fire resistant, theft resistant, weather resistant and ventilated in accordance with the requirements of NFPA 495, NFPA 1124 or DOTy 27 CFR Part 55.

Type 2. A portable or mobile structure, such as a box, skid-magazine, trailer or semitrailer, constructed in accordance with the requirements of NFPA 495, NFPA 1124 or DOTy 27 CFR Part 55 that is fire resistant, theft resistant, weather resistant and ventilated. If used outdoors, a Type 2 magazine is also bullet resistant.

Type 3. A fire resistant, theft resistant and weather resistant “day box” or portable structure constructed in accordance with NFPA 495, NFPA 1124 or DOTy 27 CFR Part 55 used for the temporary storage of *explosive materials*.

Type 4. A permanent, portable or mobile structure such as a building, igloo, box, semitrailer or other mobile container that is fire resistant, theft resistant and weather resistant and constructed in accordance with NFPA 495, NFPA 1124 or DOTy 27 CFR Part 55.

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Type 5. A permanent, portable or mobile structure such as a building, igloo, box, bin, tank, semitrailer, bulk trailer, tank trailer, bulk truck, tank truck or other mobile container that is theft resistant, which is constructed in accordance with NFPA 495, NFPA 1124 or DOTy 27 CFR Part 55.

MAGNESIUM. The pure metal and alloys, of which the major part is magnesium.

MANUAL STOCKING METHODS. Stocking methods utilizing ladders or other nonmechanical equipment to move stock

MATERIAL SAFETY DATA SHEET (MSDS). Information concerning a hazardous material which is prepared in accordance with the provisions of DOL 29 CFR Part 1910.1200 or in accordance with the provisions of a federally *approved* state OSHA plan.

MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA. The maximum amount of a hazardous material allowed to be stored or used within a *control area* inside a building or an outdoor *control area*. The maximum allowable quantity per control area is based on the material state (solid, liquid or gas) and the material storage or use conditions.

MECHANICAL STOCKING METHODS. Stocking methods utilizing motorized vehicles or hydraulic jacks to move stock.

MEMBRANE STRUCTURE. An air-inflated, air-supported, cable or frame-covered structure not otherwise defined as a tent.

METAL HYDRIDE. A generic name for compounds composed of metallic element(s) and hydrogen.

METAL HYDRIDE STORAGE SYSTEM. A *closed system* consisting of a group of components assembled as a package to contain metal-hydrogen compounds for which there exists an equilibrium condition where the hydrogen absorbing metal alloy(s), hydrogen gas and the metal-hydrogen compound(s) coexist and where only hydrogen gas is released from the system in normal use.

NONCOMBUSTIBLE. A material that, in the form in which it is used and under the conditions anticipated, does not ignite, burn, support combustion, or release flammable vapors, when subject to fire or heat. Materials that are reported as passing ASTM E136, Standard Test for Behavior of Materials in a vertical Tube Furnace at 750°C, are considered noncombustible materials. For the purposes of this code any material that does not meet this definition of noncombustible shall be deemed as combustible.

ORGANIC COATING. A liquid mixture of binders such as alkyd, nitrocellulose, acrylic or oil, and flammable and combustible solvents such as hydrocarbon, ester, ketone or alcohol, which, when spread in a thin film, convert to a durable protective and decorative finish.

Unclassified detonable. Organic peroxides that are capable of *detonation*. These peroxides pose an extremely high-explosion hazard through rapid explosive decomposition.

OUTDOOR CONTROL AREA. An outdoor area that contains hazardous materials in amounts not exceeding the maximum allowable quantities of Table 307.1(1) of this code.

[A]OWNER (This Section). A corporation, firm, partnership, association, organization and any other group acting as a unit, or a person who has legal title to any structure or premises with or without accompanying actual possession thereof, and shall include the duly authorized agent or attorney, a purchaser, devisee, fiduciary and any person having a vested or contingent interest in the premises in question.

OXIDIZING CRYOGENIC FLUID. An oxidizing gas in the cryogenic state.

OZONE-GAS GENERATOR. Equipment which causes the production of ozone.

PASS-THROUGH. An enclosure installed in a wall with a door on each side that allows chemicals, HPM, equipment, and parts to be transferred from one side of the wall to the other.

PERMISSIBLE EXPOSURE LIMIT (PEL). The maximum permitted 8-hour time-weighted-average concentration of an air-borne contaminant. The exposure limits to be utilized are those published in DOL 29 CFR Part 1910.1000.

The Recommended Exposure Limit (REL) concentrations published by the U.S. National Institute for Occupational Safety and Health (NIOSH), Threshold Limit Value-Time Weighted Average (TLV-TWA) concentrations published by the American Conference of Governmental Industrial Hygienists (ACGIH), Workplace Environmental Exposure Level (WEEL) Guides published by the American Industrial Hygiene Association (AIHA), and other *approved*, consistent measures are allowed as surrogates for hazardous substances not *listed* in DOL 29 CFR Part 1910.1000.

PLYWOOD AND VENEER MILLS. Facilities where raw wood products are processed into finished wood products, including waferboard, oriented strandboard, fiberboard, composite wood panels and plywood.

PRESSURE VESSEL. A closed vessel designed to operate at pressures above 15 psig (103 kPa).

PRIMARY CONTAINMENT. The first level of containment, consisting of the inside portion of that container which comes into immediate contact on its inner surface with the material being contained.

PROCESS TRANSFER. The transfer of flammable or *combustible liquids* between tank vehicles or tank cars and process operations. Process operations may include containers, tanks, piping and equipment.

PROPELLANT. The liquefied or *compressed gas* in an aerosol container that expels the contents from an aerosol container when the valve is actuated. A propellant is considered flammable if it forms a flammable mixture with air, or if a flame is self-propagating in a mixture with air.

PUBLIC TRAFFIC ROUTE (PTR). Any public street, road, highway, navigable stream or passenger railroad that is used for through traffic by the general public.

PYROPHORIC. A chemical with an autoignition temperature in air, at or below a temperature of 130°F (54°C).

PYROTECHNIC COMPOSITION. A chemical mixture that produces visible light displays or sounds through a selfpropagating, heat-releasing chemical reaction which is initiated by ignition.

QUANTITY-DISTANCE (Q-D). The quantity of *explosive material* and separation distance relationships providing protection. These relationships are based on levels of risk considered acceptable for the stipulated exposures and are tabulated in the appropriate Q-D tables. The separation distances specified afford less than absolute safety:

Inhabited building distance (IBD). The minimum separation distance between an operating building or magazine containing *explosive materials* and an inhabited building or site boundary.

Intermagazine distance (IMD). The minimum separation distance between magazines.

Intraline distance (ILD) or Intraplant distance (IPD). The distance to be maintained between any two operating buildings on an *explosives* manufacturing site when at least one contains or is designed to contain *explosives*, or the distance between a magazine and an operating building.

Minimum separation distance (D₀). The minimum separation distance between adjacent buildings occupied in conjunction with the manufacture, transportation, storage or use of *explosive materials* where one of the buildings contains *explosive materials* and the other building does not.

RAW PRODUCT. A mixture of natural materials such as tree, brush trimmings, or waste logs and stumps.

RECYCABLE PAPER AND PLASTIC MATERIALS. Any paper or plastic that would otherwise be a useless, unwanted or discarded material, except for the fact the material still has useful physical or chemical properties after serving a specific purpose, and the material has been kept separate from rubbish and waste materials.

REFRIGERANT (These provisions). The fluid used for heat transfer in a refrigeration system; the refrigerant absorbs heat and transfers it at a higher temperature and a higher pressure, usually with a change of state.

[M] REFRIGERATING (REFRIGERATION) SYSTEM. A combination of interconnected refrigerant-containing parts constituting one closed refrigerant circuit in which a refrigerant is circulated for the purpose of extracting heat.

REMOTELY LOCATED, MANUALLY ACTIVATED SHUTDOWN CONTROL. A control system that is designed to initiate shutdown of the flow of gases or liquids that is manually activated from a point located some distance from the delivery system.

REPAIR GARAGE. A building, structure or portion thereof used for servicing or repairing motor vehicles.

RESIN APPLICATION AREA. An area where reinforced plastics are used to manufacture products by hand lay-up or spray-fabrication methods.

RETAIL DISPLAY AREA. The area of a Group M occupancy open for the purpose of viewing or purchasing merchandise offered for sale. Individuals in such establishments are free to circulate among the items offered for sale which are typically displayed on shelves, racks or the floor.

ROLL COATING. The process of coating, spreading and impregnating fabrics, paper or other materials as they are passed directly through a tank or trough containing flammable or *combustible liquids*, or over the surface of a roller revolving partially submerged in a flammable or *combustible liquid*.

RUBBISH (TRASH). Combustible and noncombustible waste materials, including residue from the burning of coal, wood, coke or other combustible material, paper, rags, cartons, tin cans, metals, mineral matter, glass crockery, dust and discarded refrigerators, and heating, cooking or incinerator type appliances.

SECONDARY CONTAINMENT. That level of containment that is external to and separate from primary containment.

SEGREGATED. Storage in the same room or inside area, but physically separated by distance from *incompatible materials*.

SEMICONDUCTOR FABRICATION FACILITY. A building or a portion of a building in which electrical circuits or devices are created on solid crystalline substances having electrical conductivity greater than insulators but less than conductors. These circuits or devices are commonly known as semiconductors.

SERVICE CORRIDOR. A fully enclosed passage used for transporting HPM and purposes other than required *means of egress*.

SHELF STORAGE. Storage on shelves less than 30 inches (762 mm) deep with the distance between shelves not exceeding 3 feet (914 mm) vertically. For other shelving arrangements, see the requirements for rack storage.

SOLID SHELVING. Shelving that is solid, slatted or of other construction located in racks and which obstructs sprinkler discharge down into the racks.

SOLVENT DISTILLATION UNIT. An appliance that receives contaminated flammable or *combustible liquids* and which distills the contents to remove contaminants and recover the solvents.

SOLVENT OR LIQUID CLASSIFICATIONS. A method for classifying solvents or liquids according to the following classes:

Class I solvents. Liquids having a *flash point* below 100°F (38°C).

Class II solvents. Liquids having a *flash point* at or above 100°F (38°C) and below 140°F (60°C).

Class IIIA solvents. Liquids having a *flash point* at or above 140°F (60°C) and below 200°F (93°C).

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Class IIIB solvents. Liquids having a *flash point* at or above 200°F (93°C).

Class IV solvents. Liquids classified as nonflammable.

SPRAY BOOTH. A mechanically ventilated appliance of varying dimensions and construction provided to enclose or accommodate a spraying operation and to confine and limit the escape of spray vapor and residue and to exhaust it safely.

SPRAY ROOM. A room designed to accommodate spraying operations, constructed in accordance this code and separated from the remainder of the building by a minimum 1-hour *fire barrier*.

SPRAYING SPACE. An area in which dangerous quantities of flammable vapors or combustible residues, dusts or deposits are present due to the operation of spraying processes. The *building official* is authorized to define the limits of the spraying space in any specific case.

SUPERSTRUCTURE. That portion of the construction of a pier or wharf above the deck.

SYSTEM. An assembly of equipment consisting of a tank, container or containers, appurtenances, pumps, compressors and connecting piping.

TANK. A vessel containing more than 60 gallons (227 L).

TANK, ATMOSPHERIC. A storage tank designed to operate at pressures from atmospheric through 1.0 pound per square inch gauge (760 mm Hg through 812 mm Hg) measured at the top of the tank.

TANK, PORTABLE. A packaging of more than 60-gallon (227 L) capacity and designed primarily to be loaded into or on or temporarily attached to a transport vehicle or ship and equipped with skids, mountings or accessories to facilitate handling of the tank by mechanical means. It does not include any cylinder having less than a 1,000-pound (454 kg) water capacity, cargo tank, tank car tank or trailers carrying cylinders of more than 1,000-pound (454 kg) water capacity.

TANK, PRIMARY. A *listed* atmospheric tank used to store liquid. See “Primary containment.”

TANK, PROTECTED ABOVE GROUND. A tank *listed* in accordance with UL 2085 consisting of a primary tank provided with protection from physical damage and fire-resistive protection from a high-intensity liquid pool fire exposure. The tank may provide protection elements as a unit or may be an assembly of components, or a combination thereof.

TANK, STATIONARY. Packaging designed primarily for stationary installations not intended for loading, unloading or attachment to a transport vehicle as part of its normal operation in the process of use. It does not include cylinders having less than a 1,000-pound (454 kg) water capacity.

TANK VEHICLE. A vehicle other than a railroad tank car or boat, with a cargo tank mounted thereon or built as an integral part thereof, used for the transportation of flammable or *combustible liquids*, LP-gas or hazardous chemicals. Tank vehicles include self-propelled vehicles and full trailers and

semitrailers, with or without motive power, and carrying part or all of the load.

TIMBER AND LUMBER PRODUCTION FACILITIES. Facilities where raw wood products are processed into finished wood products.

TOOL. A device, storage container, workstation or process machine used in a fabrication area.

TRANSVERSE FLUE SPACE. See “Flue space—Transverse.”

TRASH. See “Rubbish.”

UNAUTHORIZED DISCHARGE. A release or emission of materials in a manner which does not conform to the provisions of this code or applicable public health and safety regulations.

[M] VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VESSEL. A motorized watercraft, other than a seaplane on the water, used or capable of being used as a means of transportation. Nontransportation vessels, such as houseboats and boathouses, are included in this definition.

CHAPTER N3 GENERAL REQUIREMENTS

SECTION N301 [304] COMBUSTIBLE WASTE MATERIAL

N301.1 [304.1.3] Space underneath seats. Spaces underneath grandstand and bleacher seats shall not be used for the storage of combustible and flammable materials. Except where enclosed in not less than 1-hour fire-resistance-rated construction in accordance with this code, spaces underneath grandstand and bleacher seats shall not be occupied or utilized for purposes other than *means of egress*.

SECTION N302 [306] MOTION PICTURE PROJECTION ROOMS AND MOTION PICTURE AND TELEVISION PRODUCTION STUDIO SOUNDSTAGES AND APPROVED PRODUCTION FACILITIES AND FILM

N302.1 [306.1] Motion picture projection rooms. Electric arc, xenon or other light source projection equipment which develops hazardous gases, dust or radiation and the projection of ribbon- type cellulose nitrate film, regardless of the light source used in projection, shall be operated within a motion picture projection room complying with Section 409 of this code.

N302.2 [306.3] Motion picture and television production studio soundstages and approved production facilities. Motion picture and television production soundstages and approved production facilities shall be designed and constructed in accordance this code and NFPA 140.

SECTION N303 [312] VEHICLE IMPACT PROTECTION

N303.1 [312.1] General. Vehicle impact protection required by this code shall be provided by posts that comply with Section N303.2 or by other *approved* physical barriers that comply with Section N303.3.

Exceptions:

1. Impact protection within a private garage.
2. Impact protection for installations in compliance with the *Plumbing Code* or *Mechanical Code* when protection is provided in accordance with the applicable code.

N303.2 [312.2] Posts. Guard posts shall comply with all of the following requirements:

1. Constructed of steel not less than 4 inches (102 mm) in diameter and concrete filled.
2. Spaced not more than 4 feet (1219 mm) between posts on center.
3. Set not less than 3 feet (914 mm) deep in a concrete footing of not less than a 15-inch (381 mm) diameter.
4. Set with the top of the posts not less than 3 feet (914 mm) above ground.
5. Located not less than 3 feet (914 mm) from the protected object.

N303.3 [312.3] Other barriers. Physical barriers shall be a minimum of 36 inches (914 mm) in height and shall resist a force of 12,000 pounds (53 375 N) applied 36 inches (914 mm) above the adjacent ground surface.

SECTION N304 [317] ROOFTOP GARDENS AND LANDSCAPED ROOFS

N304.1 [317.1] General. Rooftop gardens and landscaped roofs shall be installed in accordance with Sections 1505, 1507.16, N304.2 and N304.3.

N304.2 [317.2] Rooftop garden or landscaped roof size. Rooftop garden or landscaped roof areas shall not exceed 15,625 square feet (1,450 m²) in size for any single area with a maximum dimension of 125 feet (39 m) in length or width. A minimum 6-foot-wide (1.8 m) clearance consisting of a Class A-rated roof system complying with ASTM E108 or UL 790 shall be provided between adjacent rooftop gardens or landscaped roof areas.

N304.3 [317.3] Rooftop structure and equipment clearance. For all vegetated roofing systems abutting combustible vertical surfaces, a Class A-rated roof system complying with ASTM E108 or UL 790 shall be achieved for a minimum 6-foot-wide (1.8 m) continuous border placed around rooftop structures and all rooftop equipment including, but not limited to, mechanical and machine rooms, penthouses, skylights, roof vents, solar panels, antenna supports, and building service equipment.

SECTION N305 [319] COLLECTION AND STORAGE OF COMBUSTIBLE RECYCLABLE MATERIALS

N305.1 [319.1] Storage protection. Inside storage shall be in areas of not less than 1-hour construction with openings protected as required for occupancy separations or provided with an approved automatic sprinkler system.

CHAPTER N5 ACCESS TO OPENINGS

SECTION N501 [504] ACCESS TO BUILDING OPENINGS AND ROOFS

N501.1 [504.3] Stairway access to roof. New buildings four or more stories above grade plane, except those with a roof slope greater than four units vertical in 12 units horizontal (33.3-percent slope), shall be provided with a *stairway* to the roof. *Stairway* access to the roof shall be in accordance with Section 1009.16 of this code. Such *stairway* shall be marked at street and floor levels with a sign indicating that the *stairway* continues to the roof. Where roofs are used for roof gardens or for other purposes, *stairways* shall be provided as required for the occupant load.

CHAPTER N6 BUILDING SERVICES AND SYSTEMS

SECTION N601 GENERAL

N601.1 Scope. The provisions of this code shall apply to the installation, of fuel-fired appliances and heating systems, electrical equipment room signage, mechanical refrigeration systems, and stationary storage battery systems.

SECTION N602 DEFINITIONS

N602.1 Definitions. The following terms are defined in Section N202:

**BATTERY SYSTEM, STATIONARY LEAD-ACID.
BATTERY TYPES.
REFRIGERANT.
REFRIGERATION SYSTEM.**

SECTION N603 FUEL-FIRED APPLIANCES

N603.1 Installation. The installation of fuel-fired appliances, other than internal combustion engines, oil lamps and portable devices such as blow torches, melting pots and weed burners, shall comply with this section and the *Mechanical Code*.

N603.1.1 Manufacturer's instructions. The installation shall be made in accordance with the manufacturer's instructions and applicable federal, state and local rules and regulations. Where it becomes necessary to change, modify

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or alter a manufacturer's instructions in any way, written approval shall first be obtained from the manufacturer.

N603.1.2 Approval. The design, construction and installation of fuel-fired appliances shall be in accordance with the *Mechanical Code*.

N603.1.3 Electrical wiring and equipment. Electrical wiring and equipment used in connection with oil-burning equipment shall be installed in accordance with the *Electrical Code*.

N603.1.4 Reserved.

N603.1.5 Access. The installation shall be readily accessible for cleaning hot surfaces; removing burners; replacing motors, controls, air filters, chimney connectors, draft regulators and other working parts; and for adjusting, cleaning and lubricating parts.

N603.1.6 Testing, diagrams and instructions. After installation of the oil-burning equipment, operation and combustion performance tests shall be conducted to determine that the burner is in proper operating condition and that all accessory equipment, controls, and safety devices function properly.

N603.1.7 Clearances. Working clearances between oil-fired appliances and electrical panelboards and equipment shall be in accordance with the *Electrical Code*. Clearances between oil-fired equipment and oil supply tanks shall be in accordance with NFPA 31.

N603.2 Chimneys. Masonry chimneys shall be constructed in accordance with this code. Factory-built chimneys shall be installed in accordance with the *Mechanical Code*.

N603.3 Fuel oil storage systems. Fuel oil storage systems shall be installed in accordance with these sections. Fuel-oil piping systems shall be installed in accordance with the *Mechanical Code*.

N603.3.1 Fuel oil storage in outside, above-ground tanks. Where connected to a fuel-oil piping system, the maximum amount of fuel oil storage allowed outside above ground without additional protection shall be 660 gallons (2498 L). The storage of fuel oil above ground in quantities exceeding 660 gallons (2498 L) shall comply with NFPA 31.

N603.3.2 Fuel oil storage inside buildings. Fuel oil storage inside buildings shall comply with Sections N603.3.2.1 through N603.3.2.5 or Sections N5701 through N5706.

N603.3.2.1 Quantity limits. One or more fuel oil storage tanks containing Class II or III *combustible liquid* shall be permitted in a building. The aggregate capacity of all such tanks shall not exceed 660 gallons (2498 L).

Exception: The aggregate capacity limit shall be permitted to be increased to 3,000 gallons (11 356 L) of Class II or III liquid for storage in protected above-ground tanks complying with Section N5704.2.9.7, when all of the following conditions are met:

1. The entire 3,000-gallon (11 356 L) quantity shall be stored in protected above-ground tanks;

2. The 3,000-gallon (11 356 L) capacity shall be permitted to be stored in a single tank or multiple smaller tanks; and
3. The tanks shall be located in a room protected by an *automatic sprinkler system* complying with Section 903.3.1.1 of this code.

N603.3.2.2 Restricted use and connection. Tanks installed in accordance with Section N603.3.2 shall be used only to supply fuel oil to fuel-burning or generator equipment installed in accordance with Section N603.3.2.4. Connections between tanks and equipment supplied by such tanks shall be made using closed piping systems.

N603.3.2.3 Applicability of maximum allowable quantity and control area requirements. The quantity of *combustible liquid* stored in tanks complying with Section N603.3.2 shall not be counted towards the maximum allowable quantity set forth in Table 307.1(1) of this code, and such tanks shall not be required to be located in a *control area*.

N603.3.2.4 Installation. Tanks and piping systems shall be installed and separated from other uses in accordance with Section 915 and Chapter 13, both of the *Mechanical Code*, as applicable.

Exception: Protected above-ground tanks complying with Section N5704.2.9 shall not be required to be separated from surrounding areas.

N603.3.2.5 Tanks in basements. Tanks in *basements* shall be located not more than two stories below grade plane.

N603.4 Reserved.

N603.5 Heating appliances. Heating appliances shall be *listed* and shall comply with Sections N603.5.1 and N603.5.2.

N603.5.1 Guard against contact. The heating element or combustion chamber shall be permanently guarded so as to prevent accidental contact by persons or material.

N603.5.2 Heating appliance installation . Heating appliances shall be installed in accordance with the manufacturer's instructions, this code, the *Mechanical Code*, and the *Electrical Code*.

N603.6-N603.7 Reserved.

N603.8 Incinerators. Commercial, industrial and residential Type incinerators and chimneys shall be constructed in accordance with this code and the *Mechanical Code*.

N603.8.1 Residential incinerators. Residential incinerators shall be of an *approved* type

N603.8.2 Spark arrestor. Incinerators shall be equipped with an effective means for arresting sparks.

N603.9 Gas meters. Above-ground gas meters, regulators and piping subject to damage shall be protected by a barrier complying with Section N303 or otherwise protected in an *approved* manner.

SECTION N604 EMERGENCY AND STANDBY POWER SYSTEMS

N604.1 Installation. Emergency and standby power systems required by this code shall be installed in accordance with this code, NFPA 110 and NFPA 111.

Exception: Fuel supply requirements of NFPA 110, Section 5.1.2 may be reduced, when approved by the building official, based on the operational needs and of the facility served by the emergency or standby power system.

N604.1.1 [604.2.14.2.1] Other circuits. Circuits supplying lighting for the fire command center and mechanical equipment rooms shall be transferable to the standby source.

N604.1.2 [604.2.14.3] Emergency systems. *Exit* signs, *exit* illumination as required by Chapter 10 of this code, electrically powered fire pumps required to maintain pressure, and elevator car lighting are classified as emergency systems and shall operate within 10 seconds of failure of the normal power supply and shall be capable of being transferred to the standby source.

Exception: *Exit* sign, *exit* and *means of egress* illumination are permitted to be powered by a standby source in buildings of Group F and S occupancies.

SECTION N605 ELECTRICAL ROOM SIGNAGE

N605.1 [605.3.1] Labeling. Doors into electrical control panel rooms shall be marked with a plainly visible and legible sign stating ELECTRICAL ROOM or similar approved wording.

SECTION N606 MECHANICAL REFRIGERATION

[M]N606.1 Scope. Refrigeration systems shall be installed in accordance with the *Mechanical Code*.

[M]N606.2 Refrigerants. The use and purity of new, recovered and reclaimed refrigerants shall be in accordance with the *Mechanical Code*.

[M]N606.3 Refrigerant classification. Refrigerants shall be classified in accordance with the *Mechanical Code*.

[M]N606.4 Change in refrigerant type. A change in the type of refrigerant in a refrigeration system shall be in accordance with the *Mechanical Code*.

N606.5 – N606.6 Reserved.

N606.7 Emergency signs. Refrigeration units or systems having a refrigerant circuit containing more than 220 pounds (100 kg) of Group A1 or 30 pounds (14 kg) of any other group refrigerant shall be provided with *approved* emergency signs, charts and labels in accordance with NFPA 704. Hazard signs shall be in accordance with the *Mechanical Code* for the classification of refrigerants listed therein.

[M]N606.8 Refrigerant detector. Machinery rooms shall contain a refrigerant detector with an audible and visual alarm. The detector, or a sampling tube that draws air to the detector,

shall be located in an area where refrigerant from a leak will concentrate. The alarm shall be actuated at a value not greater than the corresponding TLV-TWA values shown in the *Mechanical Code* for the refrigerant classification. Detectors and alarms shall be placed in *approved* locations. The detector shall transmit a signal to an *approved* location.

[M]N606.9 Remote controls. Where flammable refrigerants are used and compliance with Section 1106 of the *Mechanical Code* is required, remote control of the mechanical equipment and appliances located in the machinery room as required by Sections N606.9.1 and N606.9.2 shall be provided at an *approved* location immediately outside the machinery room and adjacent to its principal entrance.

[M]N606.9.1 Refrigeration system emergency shutoff. A clearly identified switch of the break-glass type or with an *approved* tamper-resistant cover shall provide off-only control of refrigerant compressors, refrigerant pumps and normally closed automatic refrigerant valves located at an *approved* location immediately outside the machinery room and adjacent to its primary entrance. Additionally, this equipment shall be automatically shut off whenever the refrigerant vapor concentration in the machinery room exceeds the vapor detector's upper detection limit or 25 percent of the LEL, whichever is lower.

[M]N606.9.2 Ventilation system. A clearly identified switch of the break-glass type shall provide on-only control of the machinery room ventilation fans.

N606.10 Emergency pressure control system. Refrigeration systems containing more than 6.6 pounds (3 kg) of flammable, toxic or highly toxic refrigerant or ammonia shall be provided with an emergency pressure control system in accordance with Sections N606.10.1 and N606.10.2.

N606.10.1 Automatic crossover valves. Each high- and intermediate-pressure zone in a refrigeration system shall be provided with a single automatic valve providing a crossover connection to a lower pressure zone. Automatic crossover valves shall comply with Sections N606.10.1.1 through N606.10.1.3.

N606.10.1.1 Overpressure limit set point. Automatic crossover valves shall be arranged to automatically relieve excess system pressure to a lower pressure zone if the pressure in a high- or intermediate-pressure zone rises to within 90 percent of the set point for emergency pressure relief devices.

N606.10.1.2 Manual operation. When required by the *building official*, automatic crossover valves shall be capable of manual operation.

N606.10.1.3 System design pressure. Refrigeration system zones that are connected to a higher pressure zone by an automatic crossover valve shall be designed to safely contain the maximum pressure that can be achieved by interconnection of the two zones.

N606.10.2 Automatic emergency stop. An automatic emergency stop feature shall be provided in accordance with Sections N606.10.2.1 and N606.10.2.2.

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N606.10.2.1 Operation of an automatic crossover valve.

Operation of an automatic crossover valve shall cause all compressors on the affected system to immediately stop. Dedicated pressure-sensing devices located immediately adjacent to crossover valves shall be permitted as a means for determining operation of a valve. To ensure that the automatic crossover valve system provides a redundant means of stopping compressors in an overpressure condition, high-pressure cutout sensors associated with compressors shall not be used as a basis for determining operation of a crossover valve.

N606.10.2.2 Overpressure in low-pressure zone. The lowest pressure zone in a refrigeration system shall be provided with a dedicated means of determining a rise in system pressure to within 90 percent of the set point for emergency pressure relief devices. Activation of the overpressure sensing device shall cause all compressors on the affected system to immediately stop.

N606.11 Reserved.

N606.12 Termination of relief devices. Pressure relief devices, fusible plugs and purge systems for refrigeration systems containing more than 6.6 pounds (3 kg) of flammable, toxic or highly toxic refrigerants shall be provided with an *approved* discharge system as required by Sections N606.12.1, N606.12.2 and N606.12.3. Discharge piping and devices connected to the discharge side of a fusible plug or rupture member shall have provisions to prevent plugging the pipe in the event of the fusible plug or rupture member functions.

N606.12.1 Flammable refrigerants. Systems containing flammable refrigerants having a density equal to or greater than the density of air shall discharge vapor to the atmosphere only through an *approved* treatment system in accordance with Section N606.12.4 or a flaring system in accordance with Section N606.12.5. Systems containing flammable refrigerants having a density less than the density of air shall be permitted to discharge vapor to the atmosphere provided that the point of discharge is located outside of the structure at not less than 15 feet (4572 mm) above the adjoining grade level and not less than 20 feet (6096 mm) from any window, ventilation opening or *exit*.

N606.12.2 Toxic and highly toxic refrigerants. Systems containing toxic or highly toxic refrigerants shall discharge vapor to the atmosphere only through an *approved* treatment system in accordance with Section N606.12.4 or a flaring system in accordance with Section N606.12.5.

N606.12.3 Ammonia refrigerant. Systems containing ammonia refrigerant shall discharge vapor to the atmosphere through an *approved* treatment system in accordance with Section N606.12.4, a flaring system in accordance with Section N606.12.5, or through an *approved* ammonia diffusion system in accordance with Section N606.12.6, or by other *approved* means.

Exceptions:

1. Ammonia/water absorption systems containing less than 22 pounds (10 kg) of ammonia and for which the ammonia circuit is located entirely outdoors.

2. When the fire code building official determines, on review of an engineering analysis prepared in accordance with that a fire, health or environmental hazard would not result from discharging ammonia directly to the atmosphere.

N606.12.4 Treatment systems. Treatment systems shall be designed to reduce the allowable discharge concentration of the refrigerant gas to not more than 50 percent of the IDLH at the point of exhaust. Treatment systems shall be in accordance with Sections N6003 and N6004.

N606.12.5 Flaring systems. Flaring systems for incineration of flammable refrigerants shall be designed to incinerate the entire discharge. The products of refrigerant incineration shall not pose health or environmental hazards. Incineration shall be automatic upon initiation of discharge, shall be designed to prevent blowback and shall not expose structures or materials to threat of fire. Standby fuel, such as LP gas, and standby power shall have the capacity to operate for one and one-half the required time for complete incineration of refrigerant in the system.

N606.12.6 Ammonia diffusion systems. Ammonia diffusion systems shall include a tank containing 1 gallon of water for each pound of ammonia (4 L of water for each 1 kg of ammonia) that will be released in 1 hour from the largest relief device connected to the discharge pipe. The water shall be prevented from freezing. The discharge pipe from the pressure relief device shall distribute ammonia in the bottom of the tank, but no lower than 33 feet (10 058 mm) below the maximum liquid level. The tank shall contain the volume of water and ammonia without overflowing.

N606.13 Discharge location for refrigeration machinery room ventilation. Exhaust from mechanical ventilation systems serving refrigeration machinery rooms containing flammable, toxic or highly toxic refrigerants, other than ammonia, capable of exceeding 25 percent of the LFL or 50 percent of the IDLH shall be equipped with *approved* treatment systems to reduce the discharge concentrations to those values or lower.

SECTION N607 RESERVED

SECTION N608 STATIONARY STORAGE BATTERY SYSTEMS

N608.1 Scope. Flooded lead-acid, nickel cadmium and valve regulated lead-acid (VRLA) stationary storage battery systems of greater than seven batteries or over 600 amp-hour capacity, or more than 1,000 pounds (454 kg) for lithium-ion and lithium metal polymer, used for facility standby power, emergency power or uninterruptible power supplies shall comply with this section and Table N608.1. Stationary storage battery systems shall not be located in a space with an open combustion source.

N608.2 Safety caps. Safety caps for stationary storage battery systems shall comply with Sections N608.2.1 and N608.2.2.

N608.2.1 Nonrecombinant batteries. Vented lead-acid, nickel-cadmium or other types of nonrecombinant batteries shall be provided with safety venting caps.

N608.2.2 Recombinant batteries. VRLA batteries shall be equipped with self-resealing flame-arresting safety vents.

N608.3 Thermal runaway. VRLA and lithium metal polymer battery systems shall be provided with a *listed* device or other *approved* method to preclude, detect and control thermal runaway.

N608.4 Room design and construction. Enclosure of stationary battery systems shall comply with this code. Battery systems shall be allowed to be in the same room with the equipment they support.

N608.4.1 Separate rooms. When stationary batteries are installed in a separate equipment room accessible only to

authorized personnel, they shall be permitted to be installed on an open rack for ease of maintenance.

N608.4.2 Occupied work centers. When a system of VRLA, lithium-ion, or other type of sealed, nonventing batteries is situated in an occupied work center, it shall be allowed to be housed in a noncombustible cabinet or other enclosure to prevent access by unauthorized personnel.

N608.4.3 Cabinets. When stationary batteries are contained in cabinets in occupied work centers, the cabinet enclosures shall be located within 10 feet (3048 mm) of the equipment that they support.

TABLE N608.1
BATTERY REQUIREMENTS

REQUIREMENT	NONRECOMBINANT BATTERIES		RECOMBINANT BATTERIES		OTHER BATTERIES
	Vented (Flooded) Lead Acid Batteries	Vented (Flooded) Nickel-Cadmium (Ni-Cd) Batteries	Valve Regulated Lead-Acid (VRLA) Cells	Lithium-Ion Cells	Lithium Metal Cells
Safety caps	Venting caps (N608.2.1)	Venting caps (N608.2.1)	Self-resealing flame-arresting caps (N608.2.2)	No caps	No caps
Thermal runaway management	Not required	Not required	Required (N608.3)	Not required	Required (N608.3)
Spill control	Required (N608.5)	Required (N608.5)	Not required	Not required	Not required
Neutralization	Required	Required	Required	Not required	Not required
Ventilation	Required (N608.6.1; N608.6.2)	Required (N608.6.1; N608.6.2)	Required (N608.6.1; N608.6.2)	Not required	Not required
Signage	Required (N608.7)	Required (N608.7)	Required (N608.7)	Required (N608.7)	Required (N608.7)
Seismic protection	Required (N608.8)	Required (N608.8)	Required (N608.8)	Required (N608.8)	Required (N608.8)
Smoke detection	Required (N608.9)	Required (N608.9)	Required (N608.9)	Required (N608.9)	Required (N608.9)

N608.5 Spill control. An *approved* method and materials for the control of a spill of electrolyte shall be provided in areas containing lead-acid, nickel-cadmium or other types of batteries with free-flowing liquid electrolyte. For purposes of this paragraph, a “spill” is defined as any unintentional release of electrolyte.

Exception: VRLA, lithium-ion, lithium metal polymer or other types of sealed batteries with immobilized electrolyte shall not require spill control.

N608.6 Ventilation. Ventilation of stationary storage battery systems shall comply with Sections N608.6.1 and N608.6.2.

N608.6.1 Room ventilation. Ventilation shall be provided in accordance with the *Mechanical Code* and the following:

1. For flooded lead-acid, flooded Ni-Cd and VRLA batteries, the ventilation system shall be designed to limit the maximum concentration of hydrogen to 1.0 percent of the total volume of the room; or
2. Continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot (1 ft³/min/ft²) [0.0051 m³/s m²] of floor area of the room.

Exception: Lithium-ion and lithium metal polymer batteries shall not require additional ventilation beyond that which would normally be required for human occupancy of the space in accordance with the *Mechanical Code*.

[M]N608.6.2 Cabinet ventilation. When VRLA batteries are installed inside a cabinet, the cabinet shall be *approved* for use in occupied spaces and shall be mechanically or naturally vented by one of the following methods:

1. The cabinet ventilation shall limit the maximum concentration of hydrogen to 1 percent of the total volume of the cabinet during the worst-case event of simultaneous “boost” charging of all the batteries in the cabinet; or
2. When calculations are not available to substantiate the ventilation rate, continuous ventilation shall be provided at a rate of not less than 1 cubic foot per minute per square foot [1 ft³/min/ft² or 0.0051 m³/s • m²] of floor area covered by the cabinet. The room in which the cabinet is installed shall also be ventilated as required in Section N608.6.1.

[M]N608.6.3 Supervision. Mechanical ventilation systems where required by Sections N608.6.1 and N608.6.2 shall be supervised by an *approved* central, proprietary or remote station service or shall initiate an audible and visual signal at a constantly attended on-site location.

N608.7 Signage. Signs shall comply with Sections N608.7.1 and N608.7.2.

N608.7.1 Equipment room and building signage. Doors into electrical equipment rooms or buildings containing

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stationary battery systems shall be provided with *approved* signs. The signs shall state that:

1. The room contains energized battery systems.
2. The room contains energized electrical circuits.
3. The battery electrolyte solutions, where present, are *corrosive* liquids.

N608.7.2 Cabinet signage. Cabinets shall have exterior labels that identify the manufacturer and model number of the system and electrical rating (voltage and current) of the contained battery system. There shall be signs within the cabinet that indicate the relevant electrical, chemical and fire hazards.

N608.8 Seismic protection. The battery systems shall be seismically braced in accordance with this code.

N608.9 Smoke detection. An *approved* automatic smoke detection system shall be installed in accordance with Section 907.2 of this code in rooms containing stationary battery systems.

SECTION N609 RESERVED

SECTION N610 COMMERCIAL KITCHEN COOKING OIL STORAGE

N610.1 General. Storage of cooking oil (grease) in commercial cooking operations shall comply with Sections N5701 through N5706. Systems used to store cooking oils in larger than 60-gallon (227 L) above-ground tanks shall also comply with Sections N610.2 through N610.4. For purposes of this section, cooking oil shall be classified as a Class IIIB liquid unless otherwise determined by testing.

N610.2 Storage tanks. Cooking oil storage tanks shall be installed in accordance with Section N5704 and the tank manufacturer's instructions.

N610.3 [610.4] Tank venting. Normal and emergency venting for cooking oil storage tanks shall terminate outside the building as specified in Section Sections N5704.2.7.3 and 5704.2.7.4.

N610.4 [610.5] Electrical equipment. Electrical equipment used for the operation and heating of the cooking oil storage system shall be listed and comply with the *Electrical Code*.

CHAPTER N8 INTERIOR FINISHES AND DECORATIVE MATERIALS

SECTION N801 [807] DECORATIVE MATERIALS OTHER THAN DECORATIVE VEGETATION IN NEW CONSTRUCTION

N801.1 [807.4.2.2] Motion picture screens. The screens upon which motion pictures are projected in new buildings of Group A shall either meet the flame propagation performance criteria of NFPA 701 or shall comply with the requirements for a Class B interior finish in accordance with Section 803 of this code.

SECTION N802 [808] FURNISHINGS OTHER THAN UPHOLSTERED FURNITURE AND MATTRESSES OR DECORATIVE MATERIALS IN NEW CONSTRUCTION

N801.1 [808.4] Combustible lockers. Where lockers constructed of combustible materials are used, the lockers shall be considered interior finish and shall comply with Section 803 of this code.

Exception: Lockers constructed entirely of wood and noncombustible materials shall be permitted to be used wherever interior finish materials are required to meet a Class C classification in accordance with Section 803.1.1 of this code.

CHAPTER N9 EXPLOSION CONTROL

SECTION N901 [911] EXPLOSION CONTROL

N901.1 [911.1] General. Explosion control shall be provided in the following locations:

1. Where a structure, room or space is occupied for purposes involving explosion hazards as identified in Table 414.5.1 of this code.
2. Where quantities of hazardous materials specified in Table 414.5.1 of this code exceed the maximum allowable quantities in Table 307.1(1) of this code.

Such areas shall be provided with explosion (*deflagration*) venting, explosion (*deflagration*) prevention systems, or *barricades* in accordance with this section and NFPA 69, or NFPA 495 as applicable. *Deflagration* venting shall not be utilized as a means to protect buildings from *detonation* hazards.

N901.2 [911.2] Required deflagration venting. Areas that are required to be provided with *deflagration* venting shall comply with the following:

1. Walls, ceilings and roofs exposing surrounding areas shall be designed to resist a minimum internal pressure of 100 pounds per square foot (psf) (4788 Pa). The minimum internal design pressure shall not be less than five times the maximum internal relief pressure specified in Section N901.2, Item 5.
2. *Deflagration* venting shall be provided only in exterior walls and roofs.

Exception: Where sufficient exterior wall and roof venting cannot be provided because of inadequate exterior wall or roof area, *deflagration* venting shall be allowed by specially designed shafts vented to the exterior of the building.

3. *Deflagration* venting shall be designed to prevent unacceptable structural damage. Where relieving a *deflagration*, vent closures shall not produce projectiles of sufficient velocity and mass to cause life threatening injuries to the occupants or other persons on the property or adjacent *public ways*.

4. The aggregate clear area of vents and venting devices shall be governed by the pressure resistance of the construction assemblies specified in Item 1 of this section and the maximum internal pressure allowed by Item 5 of this section.
5. Vents shall be designed to withstand loads in accordance with this code. Vents shall consist of any one or any combination of the following to relieve at a maximum internal pressure of 20 pounds per square foot (958 Pa), but not less than the loads required elsewhere in this code:
 - 5.1. *Exterior walls* designed to release outward.
 - 5.2. Hatch covers.
 - 5.3. Outward swinging doors.
 - 5.4. Roofs designed to uplift.
 - 5.5. Venting devices *listed* for the purpose.
6. Vents designed to release from the *exterior walls* or roofs of the building when venting a *deflagration* shall discharge directly to the exterior of the building where an unoccupied space not less than 50 feet (15 240 mm) in width is provided between the exterior walls of the building and the lot line.

Exception: Vents complying with Item 7 of this section.
7. Vents designed to remain attached to the building when venting a *deflagration* shall be so located that the discharge opening shall not be less than 10 feet (3048 mm) vertically from window openings and *exits* in the building and 20 feet (6096 mm) horizontally from *exits* in the building, from window openings and *exits* in adjacent buildings on the same lot, and from the lot line.
8. Discharge from vents shall not be into the interior of the building.

N901.3 [911.3] Explosion prevention systems. Explosion prevention systems shall be of an *approved* type and installed in accordance with the provisions of this code and NFPA 69.

N901.4 [911.4] Barricades. *Barricades* shall be designed and installed in accordance with NFPA 495.

CHAPTER N20 AVIATION FACILITIES

SECTION N2001 [2007] HELISTOPS AND HELIPORTS

N2001.1 [2007.5] Standpipe systems. A building with a rooftop helistop or heliport shall be provided with a Class I or III standpipe system extended to the roof level on which the helistop or heliport is located. All portions of the helistop and heliport area shall be within 150 feet (45 720 mm) of a 2½-inch (63.5 mm) outlet on the standpipe system.

NOTE: Provisions which determine when standpipes are required are reprinted from the Oregon Fire Code. Installation and construction standards for standpipe systems are adopted by the Oregon Building Codes Division.

N2001.2 [2007.6] Foam protection. Foam fire-protection capabilities shall be provided for rooftop heliports. Such systems shall be designed, installed in accordance with the applicable provisions of Sections 903, 904 and 905 of this code.

CHAPTER N21 DRY CLEANING

SECTION N2101 GENERAL

N2101.1 Scope. Dry cleaning plants shall comply with the requirements of Sections N2101 through N2108.

SECTION N2102 DEFINITIONS

N2102.1 Definitions. The following terms are defined in Section N202:

DRY CLEANING.

DRY CLEANING PLANT.

DRY CLEANING ROOM.

DRY CLEANING SYSTEM.

SOLVENT OR LIQUID CLASSIFICATIONS.

Class I solvents.

Class II solvents.

Class IIIA solvents.

Class IIIB solvents.

Class IV solvents.

SECTION N2103 CLASSIFICATIONS

N2103.1 Solvent classification. Dry cleaning solvents shall be classified according to their *flash points* as follows:

1. Class I solvents are liquids having a *flash point* below 100°F (38°C).
2. Class II solvents are liquids having a *flash point* at or above 100°F (38°C) and below 140°F (60°C).
3. Class IIIA solvents are liquids having a *flash point* at or above 140°F (60°C) and below 200°F (93°C).
4. Class IIIB solvents are liquids having a *flash point* at or above 200°F (93°C).
5. Class IV solvents are liquids classified as nonflammable.

N2103.2 Classification of dry cleaning plants and systems.

Dry cleaning plants and systems shall be classified based on the solvents used as follows:

1. Type I—systems using Class I solvents.
2. Type II—systems using Class II solvents.
3. Type III-A—systems using Class IIIA solvents.
4. Type III-B—systems using Class IIIB solvents.
5. Type IV—systems using Class IV solvents in which dry cleaning is not conducted by the public.
6. Type V—systems using Class IV solvents in which dry cleaning is conducted by the public.

Spotting and pretreating operations shall not change the type of the dry cleaning plant.

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N2103.2.1 Multiple solvents. Dry cleaning plants using more than one class of solvent for dry cleaning shall be classified based on the numerically lowest solvent class.

N2103.3 Design. The occupancy classification, design and construction of dry cleaning plants shall comply with the applicable requirements of this code.

SECTION N2104 GENERAL REQUIREMENTS

N2104.1 Prohibited use. Type I dry cleaning plants shall be prohibited. Limited quantities of Class I solvents stored and used in accordance with this section shall not be prohibited in dry cleaning plants.

N2104.1.1 [2104.2.1] Ventilation. Ventilation shall be provided in accordance with Section 502 of the *Mechanical Code* and DOL 29 CFR Part 1910.1000, where applicable.

N2104.1.2 [2104.2.2] Heating. In Type II dry cleaning plants, heating shall be by indirect means using steam, hot water or hot oil only.

SECTION N2105 RESERVED

SECTION N2106 RESERVED

SECTION N2107 DRY CLEANING SYSTEMS

N2107.1 General equipment requirements. Dry cleaning systems, including dry cleaning units, washing machines, stills, drying cabinets, tumblers and their appurtenances, including pumps, piping, valves, filters and solvent coolers, shall be installed in accordance with NFPA 32. The construction of buildings in which such systems are located shall comply with the requirements of this section and the applicable provisions elsewhere in this code.

N2107.2 Type II systems. Type II dry cleaning and solvent tank storage rooms shall not be located below grade or above the lowest floor level of the building and shall comply with Sections N2107.2.2 and N2107.2.3.

N2107.2.1 Reserved.

N2107.2.2 Number of means of egress. Type II dry cleaning rooms shall have not less than two *means of egress* doors located at opposite ends of the room, at least one of which shall lead directly to the outside.

N2107.2.3 Spill control and secondary containment. Curbs, drains or other provisions for spill control and secondary containment shall be provided in accordance with Section N5004.2 to collect solvent leakage and fire protection water and direct it to a safe location.

SECTION N2108 FIRE PROTECTION

N2108.1 General. Where required by this section, *fire protection systems*, devices and equipment shall be installed, inspected and tested in accordance with Chapter 9 of this code.

N2108.2 Automatic sprinkler system. An *automatic sprinkler system* shall be installed in accordance with Section 903.3.1.1 of this code throughout dry cleaning plants containing Type II, Type III-A or Type III-B dry cleaning systems.

Exceptions:

1. An *automatic sprinkler system* shall not be required in Type III-A dry cleaning plants where the aggregate quantity of Class III-A solvent in dry cleaning machines and storage does not exceed 330 gallons (1250 L) and dry cleaning machines are equipped with a feature that will accomplish any one of the following:
 - 1.1. Prevent oxygen concentrations from reaching 8 percent or more by volume.
 - 1.2. Keep the temperature of the solvent at least 30°F (16.7°C) below the flash point.
 - 1.3. Maintain the solvent vapor concentration at a level lower than 25 percent of the lower explosive limit (LEL).
 - 1.4. Utilize equipment *approved* for use in Class I, Division 2 hazardous locations in accordance with *the Electrical Code*.
 - 1.5. Utilize an integrated dry-chemical, clean agent or water-mist automatic fire-extinguishing system designed in accordance with Chapter 9 of this code.
2. An *automatic sprinkler system* shall not be required in Type III-B dry cleaning plants where the aggregate quantity of Class III-B solvent in dry cleaning machines and storage does not exceed 3,300 gallons (12 490 L).

N2108.3 Automatic fire-extinguishing systems. Type II dry cleaning units, washer-extractors, and drying tumblers in Type II dry cleaning plants shall be provided with an *approved* automatic fire-extinguishing system installed in accordance with Chapter 9 of this code.

Exception: Where *approved*, a manual steam jet not less than ¾ inch (19 mm) with a continuously available steam supply at a pressure not less than 15 pounds per square inch gauge (psig) (103 kPa) is allowed to be substituted for the automatic fire-extinguishing system.

CHAPTER N22 COMBUSTIBLE DUST-PRODUCING OPERATIONS

SECTION N2201 GENERAL

N2201.1 Scope. The equipment, processes and operations involving dust explosion hazards shall comply with the provisions of Sections N2201 through N2205.

SECTION N2202 DEFINITION

N2202.1 Definition. The following term is defined in Section 202:

COMBUSTIBLE DUST.

SECTION N2203 RESERVED

SECTION N2204 EXPLOSION PROTECTION

N2204.1 Standards. The *building official* is authorized to enforce applicable construction provisions of the codes and standards listed in Table N2204.1 to prevent and control dust explosions.

**TABLE N2204.1
EXPLOSION PROTECTION STANDARDS**

STANDARD	SUBJECT
NFPA 61	Agricultural and Food Products
NFPA 69	Explosion Prevention
NFPA 70	National Electrical Code
NFPA 85	Boiler and Combustion System Hazards
NFPA 120	Coal Preparation Plants
NFPA 484	Combustible Metals
NFPA 654	Manufacturing, Processing and Handling of Combustible Particulate Solids
NFPA 655	Prevention of Sulfur Fires and Explosions
NFPA 664	Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

SECTION N2205 DUST COLLECTION

N2205.1 Dust collection. Dust collection systems shall be designed and installed in accordance with Sections 510 and 511 of the *Mechanical Code*. Electrical ventilation fan motors shall be interlocked in accordance with Section 503.1 of the *Mechanical Code*.

NOTE: The *Oregon Mechanical Specialty Code*, Section 511.1.1, Exception 2, limits the number of independent collectors (portable collectors) to not more than three collectors, servicing not more than five dust-producing appliances.

CHAPTER N24 FLAMMABLE FINISHES

SECTION N2401 GENERAL

N2401.1 Scope. Sections N2401 through N2409 shall apply to locations or areas where any of the following activities are conducted:

1. The application of flammable finishes to articles or materials by means of spray apparatus.
2. The application of flammable finishes by dipping or immersing articles or materials into the contents of tanks, vats or containers of flammable or *combustible liquids* for coating, finishing, treatment or similar processes.
3. The application of flammable finishes by applying combustible powders to articles or materials utilizing powder spray guns, electrostatic powder spray guns, fluidized beds or electrostatic fluidized beds.
4. The application of flammable finishes consisting of dual-component coatings or Class I or II liquids when applied by brush or roller in quantities exceeding 1 gallon (4 L).

N2401.2 Nonapplicability. This code shall not apply to spray finishing utilizing flammable or *combustible liquids* which do not sustain combustion, including:

1. Liquids that have no fire point when tested in accordance with ASTM D92.
2. Liquids with a flashpoint greater than 95°F (35°C) in a water-miscible solution or dispersion with a water and inert (noncombustible) solids content of more than 80 percent by weight.

SECTION N2402 DEFINITIONS

2402.1 Definitions. The following terms are defined in Section N202:

DETEARING.

DIP TANK.

ELECTROSTATIC FLUIDIZED BED.

FLAMMABLE FINISHES.

FLAMMABLE VAPOR AREA.

FLUIDIZED BED.

LIMITED SPRAYING SPACE.

RESIN APPLICATION AREA.

ROLL COATING.

SPRAY BOOTH.

SPRAY ROOM.

SPRAYING SPACE.

SECTION N2403 PROTECTION OF OPERATIONS

N2403.1 General. Operations covered by Sections N2401 through N2409 shall be protected as required by N2403.2 through N2403.2.2.

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N2403.2 Sources of ignition. Protection against sources of ignition shall be provided in accordance with Sections N2403.2.1 and N2403.2.2.

N2403.2.1 [2403.2.1.1] Flammable vapor areas. Such areas shall be considered to be Class I, Division 1 or Class II, Division 1 hazardous locations in accordance with *the Electrical Code*.

N2403.2.2 Open flames and sparks. Open flames and spark-producing devices shall not be located in flammable vapor areas and shall not be located within 20 feet (6096 mm) of such areas unless separated by a permanent partition.

Exception: Drying and baking apparatus complying with Section N2404.6.1.2.

SECTION N2404 SPRAY FINISHING

N2404.1 General. The application of flammable or *combustible liquids* by means of spray apparatus in continuous or intermittent processes shall be in accordance with the requirements of Sections N2403 and N2404.2 through N2404.9.4.

N2404.2 Location of spray-finishing operations. Spray finishing operations conducted in buildings used for Group A, E, I or R occupancies shall be located in a spray room protected with an *approved automatic sprinkler system* installed in accordance with Section 903.3.1.1 of this code and separated vertically and horizontally from other areas in accordance with this code. In other occupancies, spray-finishing operations shall be conducted in a spray room, spray booth or spraying space *approved* for such use.

Exceptions:

1. Automobile undercoating spray operations and spray-on automotive lining operations conducted in areas with *approved* natural or mechanical ventilation shall be exempt from the provisions of Section N2404 when *approved* and where utilizing Class IIIA or IIIB *combustible liquids*.
2. In buildings other than Group A, E, I or R occupancies, *approved* limited spraying space in accordance with Section N2404.9.
3. Resin application areas used for manufacturing of reinforced plastics complying with Section N2409 shall not be required to be located in a spray room, spray booth or spraying space.

N2404.3 Design and construction. Design and construction of spray rooms, spray booths and spray spaces shall be in accordance with Sections N2404.3 through N2404.3.3.1.

N2404.3.1 Spray rooms. Spray rooms shall be constructed and designed in accordance with this section and other applicable requirements of this code, and shall comply with Sections N2404.4 through N2404.8.

N2404.3.1.1 Floor. Combustible floor construction in spray rooms shall be covered by *approved*, noncombustible, nonsparking material, except where combustible coverings, including but not limited to thin

paper or plastic and strippable coatings, are utilized over noncombustible materials to facilitate cleaning operations in spray rooms.

N2404.3.2 Spray booths. The design and construction of spray booths shall be in accordance with Sections N2404.3.2.1 through N2404.3.2.6, Sections N2404.4 through N2404.8 and NFPA 33.

N2404.3.2.1 Construction. Spray booths shall be constructed of *approved* noncombustible materials. Aluminum shall not be used. Where walls or ceiling assemblies are constructed of sheet metal, single-skin assemblies shall be no thinner than 0.0478 inch (18 gage) (1.2 mm) and each sheet of double-skin assemblies shall be no thinner than 0.0359 inch (20 gage) (0.9 mm). Structural sections of spray booths are allowed to be sealed with latex-based or similar caulks and sealants.

N2404.3.2.2 Surfaces. The interior surfaces of spray booths shall be smooth; shall be constructed so as to permit the free passage of exhaust air from all parts of the interior and to facilitate washing and cleaning; and shall be designed to confine residues within the booth. Aluminum shall not be used.

N2404.3.2.3 Floor. Combustible floor construction in spray booths shall be covered by *approved*, noncombustible, nonsparking material, except where combustible coverings, including but not limited to thin paper or plastic and strippable coatings, are utilized over noncombustible materials to facilitate cleaning operations in spray booths.

N2404.3.2.4 Means of egress. *Means of egress* shall be provided in accordance with Chapter 10 of this code.

Exception: *Means of egress* doors from premanufactured spray booths shall not be less than 30 inches (762 mm) in width by 80 inches (2032 mm) in height.

N2404.3.2.5 Clear space. Spray booths shall be installed so that all parts of the booth are readily accessible for cleaning. A clear space of not less than 3 feet (914 mm) shall be provided on all sides of the spray booth.

Exceptions:

1. This requirement shall not prohibit locating a spray booth closer than 3 feet (914 mm) to or directly against an interior partition, wall or floor/ceiling assembly that has a *fire-resistance rating* of not less than 1 hour, provided the spray booth can be adequately maintained and cleaned.
2. This requirement shall not prohibit locating a spray booth closer than 3 feet (914 mm) to an exterior wall or a roof assembly, provided the wall or roof is constructed of noncombustible material and the spray booth can be adequately maintained and cleaned.

N2404.3.2.6 Size. The aggregate area of spray booths in a building shall not exceed the lesser of 10 percent of the area of any floor of a building or the basic area allowed for a Group H-2 occupancy without area increases, as set forth

in this code. The area of an individual spray booth in a building shall not exceed the lesser of the aggregate size limit or 1,500 square feet (139 m²).

Exception: One individual booth not exceeding 500 square feet (46 m²).

N2404.3.3 Spraying spaces. Spraying spaces shall be designed and constructed in accordance with this code, Section N2404.3.3.1 and Sections N2404.4 through N2404.8.

N2404.3.3.1 Floor. Combustible floor construction in spraying spaces shall be covered by *approved*, noncombustible, nonsparking material, except where combustible coverings, such as thin paper or plastic and strippable coatings, are utilized over noncombustible materials to facilitate cleaning operations in spraying spaces.

N2404.4 Fire protection. Spray booths and spray rooms shall be protected by an *approved* automatic fire-extinguishing system complying with Chapter 9 of this code. Protection shall also extend to exhaust plenums, exhaust ducts and both sides of dry filters when such filters are used.

N2404.5 Reserved.

N2404.6 Sources of ignition. Control of sources of ignition shall be in accordance with Section N2403.2 and Sections N2404.6.1 and N2404.6.1.2.

N2404.6.1 Drying operations. Spray booths and spray rooms shall not be alternately used for the purpose of drying by arrangements or methods that could cause an increase in the surface temperature of the spray booth or spray room except in accordance with Section N2404.6.1.2. Except as specifically provided in this section, drying or baking units utilizing a heating system having open flames or that are capable of producing sparks shall not be installed in a flammable vapor areas.

N2404.6.1.1 Reserved.

N2404.6.1.2 Drying apparatus. Fixed drying apparatus shall comply with this code and the applicable provisions Sections N3001 through N3006. When recirculation ventilation is provided in accordance with Section 502.7 of the *Mechanical Code*, the heating system shall not be within the recirculation air path.

N2404.6.1.2.1 Interlocks. The spraying apparatus, drying apparatus and ventilating system for the spray booth or spray room shall be equipped with interlocks arranged to:

1. Prevent operation of the spraying apparatus while drying operations are in progress.
2. Purge spray vapors from the spray booth or spray room for a period of not less than 3 minutes before the drying apparatus is rendered operable.
3. Have the ventilating system maintain a safe atmosphere within the spray booth or spray room during the drying process and automatically shut off drying apparatus in the event of a failure of the ventilating system.

4. Shut off the drying apparatus automatically if the air temperature within the booth exceeds 200°F (93°C).

[M] N2404.7 Ventilation. Mechanical ventilation of flammable vapor areas shall be provided in accordance with Section 502.7 of the *Mechanical Code*.

N2404.7.1-N2404.7.5 Reserved.

[M] N2404.7.6 Termination point. The termination point for exhaust ducts discharging to the atmosphere shall not be less than the following distances:

1. Ducts conveying explosive or flammable vapors, fumes or dusts: 30 feet (9144 mm) from the lot line; 10 feet (3048 mm) from openings into the building; 6 feet (1829 mm) from exterior walls and roofs; 30 feet (9144 mm) from combustible walls or openings into the building that are in the direction of the exhaust discharge; 10 feet (3048 mm) above adjoining grade.
2. Other product-conveying outlets: 10 feet (3048 mm) from the lot line; 3 feet (914 mm) from exterior walls and roofs; 10 feet (3048 mm) from openings into the building; 10 feet (3048 mm) above adjoining grade.

N2404.7.7 Reserved.

N2404.7.8 Filters. Air intake filters that are part of a wall or ceiling assembly shall be *listed* as Class I or II in accordance with UL 900. Exhaust filters shall be required.

N2404.7.8.1 Supports. Supports and holders for filters shall be constructed of noncombustible materials.

N2404.7.8.2 Attachment. Overspray collection filters shall be readily removable and accessible for cleaning or replacement.

N2404.7.8.3 Maintaining air velocity. Visible gauges, audible alarms or pressure-activated devices shall be installed to indicate or ensure that the required air velocity is maintained.

N2404.7.8.4 Filter rolls. Spray booths equipped with a filter roll that is automatically advanced when the air velocity is reduced to less than 100 feet per minute (0.51 m/s) shall be arranged to shut down the spraying operation if the filter roll fails to advance automatically.

N2404.7.8.5 [2404.7.8.7] Waterwash spray booths. Waterwash spray booths shall be of an *approved* design so as to prevent excessive accumulation of deposits in ducts and residue at duct outlets. Such booths shall be arranged so that air and overspray are drawn through a continuously flowing water curtain before entering an exhaust duct to the building exterior.

N2404.8 Interlocks. Interlocks for spray application finishes shall be in accordance with Sections N2404.8.1 through N2404.8.2.

N2404.8.1 Automated spray application operations. Where protecting automated spray application operations, automatic fire-extinguishing systems shall be equipped with an *approved* interlock feature that will, upon discharge of the system, automatically stop the spraying operations and

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workpiece conveyors into and out of the flammable vapor areas. Where the building is equipped with a fire alarm system, discharge of the automatic fire extinguishing system shall also activate the building alarm notification appliances.

N2404.8.1.1 Alarm station. A manual fire alarm and emergency system shutdown station shall be installed to serve each flammable vapor area. When activated, the station shall accomplish the functions indicated in Section N2404.8.1.

N2404.8.1.2 Alarm station location. At least one manual fire alarm and emergency system shutdown station shall be readily accessible to operating personnel. Where access to this station is likely to involve exposure to danger, an additional station shall be located adjacent to an *exit* from the area.

N2404.8.2 Ventilation interlock prohibited. Air makeup and flammable vapor area exhaust systems shall not be interlocked with the fire alarm system and shall remain in operation during a fire alarm condition.

Exception: Where the type of fire-extinguishing system used requires such ventilation to be discontinued, air makeup and exhaust systems shall shut down and dampers shall close.

N2404.9 Limited spraying spaces. Limited spraying spaces shall comply with Sections N2404.9.1 through N2404.9.4.

N2404.9.1 Job size. The aggregate surface area to be sprayed shall not exceed 9 square feet (0.84 m²).

N2404.9.2 Frequency. Spraying operations shall not be of a continuous nature.

N2404.9.3 Ventilation. Positive mechanical ventilation providing a minimum of six complete air changes per hour shall be installed. Such system shall meet the requirements of this code for handling flammable vapor areas. Explosion venting is not required.

N2404.9.4 Electrical wiring. Electrical wiring within 10 feet (3048 mm) of the floor and 20 feet (6096 mm) horizontally of the limited spraying space shall be designed for Class I, Division 2 locations in accordance with the *Electrical Code*.

SECTION N2405 DIPPING OPERATIONS

N2405.1 General. Dip-tank operations shall comply with the requirements of Section N2403 and Sections N2405.2 through N2405.11.

N2405.2 Location of dip-tank operations. Dip-tank operations conducted in buildings used for Group A, I or R occupancies shall be located in a room designed for that purpose, equipped with an *approved automatic sprinkler system* and separated vertically and horizontally from other areas in accordance with this code.

N2405.3 Construction of dip tanks. Dip tanks shall be constructed in accordance with Sections N2405.3.1 through N2405.3.4.2 and NFPA 34. Dip tanks, including drain boards, shall be constructed of noncombustible material and their

supports shall be of heavy metal, reinforced concrete or masonry.

N2405.3.1 Overflow. Dip tanks greater than 150 gallons (568 L) in capacity or 10 square feet (0.93 m²) in liquid surface area shall be equipped with a trapped overflow pipe leading to an *approved* location outside the building. The bottom of the overflow connection shall not be less than 6 inches (152 mm) below the top of the tank.

N2405.3.2 Bottom drains. Dip tanks greater than 500 gallons (1893 L) in liquid capacity shall be equipped with bottom drains that are arranged to automatically and manually drain the tank quickly in the event of a fire unless the viscosity of the liquid at normal atmospheric temperature makes this impractical. Manual operation shall be from a safe, accessible location. Where gravity flow is not practicable, automatic pumps shall be provided. Such drains shall be trapped and discharged to a closed, vented salvage tank or to an *approved* outside location.

Exception: Dip tanks containing Class IIIB *combustible liquids* where the liquids are not heated above room temperature and the process area is protected by automatic sprinklers.

N2405.3.3 Dipping liquid temperature control. Protection against the accumulation of vapors, self-ignition and excessively high temperatures shall be provided for dipping liquids that are heated directly or heated by the surfaces of the object being dipped.

N2405.3.4 Dip-tank covers. Dip-tank covers allowed by Section N2405.4.1 shall be capable of manual operation and shall be automatic closing by *approved* automatic-closing devices designed to operate in the event of a fire.

N2405.3.4.1 Construction. Covers shall be constructed of noncombustible material or be of a tin-clad type with enclosing metal applied with locked joints.

N2405.3.4.2 Supports. Chain or wire rope shall be utilized for cover supports or operating mechanisms.

N2405.4 Fire protection. Dip-tank operations shall be protected in accordance with Sections N2405.4.1 and N2405.4.1.1.

N2405.4.1 Fixed fire-extinguishing equipment. An *approved* automatic fire-extinguishing system or dip-tank cover in accordance with Section N2405.3.4 shall be provided for the following dip tanks:

1. Dip tanks less than 150 gallons (568 L) in capacity or 10 square feet (0.93 m²) in liquid surface area.
2. Dip tanks containing a liquid with a *flash point* below 110°F (43°C) used in such manner that the liquid temperature could equal or be greater than its *flash point* from artificial or natural causes, and having both a capacity of more than 10 gallons (37.9 L) and a liquid surface area of more than 4 square feet (0.37 m²).

N2405.4.1.1 Fire-extinguishing system. An *approved* automatic fire-extinguishing system shall be provided for dip tanks with a 150-gallon (568 L) or more capacity or 10

square feet (0.93 m²) or larger in a liquid surface area. Fire-extinguishing system design shall be in accordance with NFPA 34.

N2405.5 Reserved.

N2405.6 Sources of ignition. Control of sources of ignition shall be in accordance with Section N2403.2.

[M] N2405.7 Ventilation of flammable vapor areas. Flammable vapor areas shall be provided with mechanical ventilation adequate to prevent the dangerous accumulation of vapors. Required ventilation systems shall be arranged such that the failure of any ventilating fan shall automatically stop the dipping conveyor system.

N2405.8 Conveyor interlock. Dip tanks utilizing a conveyor system shall be arranged such that in the event of a fire, the conveyor system shall automatically cease motion and the required tank bottom drains shall open.

N2405.9 Hardening and tempering tanks. Hardening and tempering tanks shall comply with Sections N2405.3 through N2405.3.3 and N2405.8, but shall be exempt from other provisions of Section N2405.

N2405.9.1 Location. Tanks shall be located as far as practical from furnaces and shall not be located on or near combustible floors.

N2405.9.2 Hoods. Tanks shall be provided with a noncombustible hood and vent or other *approved* venting means, terminating outside of the structure to serve as a vent in case of a fire. Such vent ducts shall be treated as flues and proper clearances shall be maintained from combustible materials.

N2405.9.3 Alarms. Tanks shall be equipped with a high-temperature limit switch arranged to sound an alarm when the temperature of the quenching medium reaches 50°F (10°C) below the *flash point*.

N2405.9.4 Fire protection. Hardening and tempering tanks greater than 500 gallons (1893 L) in capacity or 25 square feet (2.3 m²) in liquid surface area shall be protected by an *approved* automatic fire-extinguishing system complying with Chapter 9 of this code.

N2405.9.5 Use of air pressure. Air under pressure shall not be used to fill or agitate oil in tanks.

N2405.10 Flow-coating operations. Flow-coating operations shall comply with the requirements for dip tanks. The area of the sump and any areas on which paint flows shall be considered to be the area of a dip tank.

N2405.10.1 Paint supply. Paint shall be supplied by a gravity tank not exceeding 10 gallons (38 L) in capacity or by direct low-pressure pumps arranged to shut down automatically in case of a fire by means of *approved* heat-actuated devices.

N2405.11 Roll-coating operations. Roll-coating operations shall comply with Section N2405.10.

SECTION N2406 POWDER COATING

N2406.1 General. Operations using finely ground particles of protective finishing material applied in dry powder form by a fluidized bed, an electrostatic fluidized bed, powder spray guns or electrostatic powder spray guns shall comply with Sections N2406.2 through N2406.7. In addition, Section N2407 shall apply to fixed electrostatic equipment used in powder coating operations.

N2406.2 Location. Powder coating operations shall be conducted in enclosed powder coating rooms, enclosed powder coating facilities which are ventilated or ventilated spray booths.

N2406.3 Construction of powder coating rooms and booths. Powder coating rooms shall be constructed of noncombustible materials. Spray booths shall be constructed in accordance with Section N2404.3.2.

Exception: *Listed* spray-booth assemblies that are constructed of other materials shall be allowed.

N2406.4 Fire protection. Areas used for powder coating shall be protected by an *approved* automatic fire-extinguishing system complying with Chapter 9 of this code.

N2406.4.1 Additional protection for fixed systems. Automated powder application equipment shall be protected by the installation of an *approved*, supervised flame detection apparatus that shall react to the presence of flame within 0.5 second and shall accomplish all of the following:

1. Shutting down of energy supplies (electrical and compressed air) to conveyor, ventilation, application, transfer and powder collection equipment.
2. Closing of segregation dampers in associated ductwork to interrupt airflow from application equipment to powder collectors.
3. Activation of an alarm that is audible throughout the powder coating room or booth.

N2406.5 Reserved.

N2406.6 Sources of ignition. Control of sources of ignition shall be in accordance with Sections N2403.2 and N2406.6.1

N2406.6.1 Drying, curing and fusion equipment. Drying, curing and fusion equipment shall comply with Sections N3001 through N3006.

[M] N2406.7 Ventilation. Exhaust ventilation shall be sufficient to maintain the atmosphere below one-half the minimum *explosive* concentration for the material being applied. Nondeposited, air-suspended powders shall be removed through exhaust ducts to the powder recovery system.

SECTION N2407 ELECTROSTATIC APPARATUS

N2407.1 General. Electrostatic apparatus and devices used in connection with paint-spraying and paint-detearing operations shall be of an *approved* type

N2407.2 Location and clear space. A sign stating the sparking distance shall be conspicuously posted near the assembly.

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Exception: Portable electrostatic paint-spraying apparatus listed for use in Class I, Division 1, locations.

N2407.3 Construction of equipment. Electrodes and electrostatic atomizing heads shall be of *approved* construction, rigidly supported in permanent locations and effectively insulated from ground. Insulators shall be nonporous and noncombustible.

Exception: Portable electrostatic paint-spraying apparatus listed for use in Class I, Division 1, locations.

N2407.3.1 Barriers. Booths, fencing, railings or guards shall be placed about the equipment such that either by their location or character, or both, isolation of the process is maintained from plant storage and personnel. Railings, fencing and guards shall be of conductive material at least 5 feet (1524 mm) from processing equipment.

Exception: Portable electrostatic paint-spraying apparatus listed for use in Class I, Division 1, locations.

N2407.4 Fire protection. Areas used for electrostatic spray finishing with fixed equipment shall be protected with an *approved* automatic fire-extinguishing system complying with Chapter 9 of this code and Section N2407.4.1.

N2407.4.1 Protection for automated liquid electrostatic spray application equipment. Automated liquid electrostatic spray application equipment shall be protected by the installation of an *approved*, supervised flame detection apparatus that shall, in the event of ignition, react to the presence of flame within 0.5 second and shall accomplish all of the following:

1. Activation of a local alarm in the vicinity of the spraying operation and activation of the building alarm system, if such a system is provided.
2. Shutting down of the coating material delivery system.
3. Termination of all spray application operations.
4. Stopping of conveyors into and out of the flammable vapor areas.
5. Disconnection of power to the high-voltage elements in the flammable vapor areas and disconnection of power to the system.

N2407.5 Reserved.

N2407.6 Sources of ignition. Transformers, power packs, control apparatus and all other electrical portions of the equipment, except high-voltage grids and electrostatic atomizing heads and connections, shall be located outside of the flammable vapor areas or shall comply with Section N2403.2.

N2407.7 Ventilation. The flammable vapor area shall be ventilated in accordance with Section N2404.7.

N2407.8 Emergency shutdown. Electrostatic apparatus shall be equipped with automatic controls operating without time delay to disconnect the power supply to the high-voltage transformer and signal the operator under any of the following conditions:

1. Stoppage of ventilating fans or failure of ventilating equipment from any cause.
2. Stoppage of the conveyor carrying articles past the high-voltage grid.

3. Occurrence of a ground or an imminent ground at any point of the high-voltage system.
4. The space between goods being painted or deteared and electrodes, electrostatic atomizing heads or conductors is less than twice the sparking distance posted in accordance with Section N2407.2.

N2407.9 Ventilation interlock. Hand electrostatic equipment shall be interlocked with the ventilation system for the spraying area so that the equipment cannot be operated unless the ventilating system is in operation.

SECTION N2408 ORGANIC PEROXIDES AND DUAL-COMPONENT COATINGS

N2408.1 General. Spraying operations involving the use of organic peroxides and other dual-component coatings shall be in accordance with the requirements of Section N2403, Sections N2408.2 and N2408.3.

N2408.2 Use of organic peroxide coatings. Spraying operations involving the use of organic peroxides and other dual component coatings shall be conducted in *approved* sprinklered spray booths complying with Section N2404.3.2.

N2408.3 Equipment. Spray guns and related handling equipment used with organic peroxides shall be of a type manufactured for such use.

N2408.3.1 Pressure tanks. Separate pressure vessels and inserts specifically for the application shall be used for the resin and for the organic peroxide, and shall not be interchanged. Organic peroxide pressure tank inserts shall be constructed of stainless steel or polyethylene.

SECTION N2409 INDOOR MANUFACTURING OF REINFORCED PLASTICS

N2409.1 General. Indoor manufacturing processes involving spray or hand application of reinforced plastics and using more than 5 gallons (19 L) of resin in a 24-hour period shall be in accordance with Sections N2409.2 through N2409.6.1.

N2409.2 Resin application equipment. Equipment used for spray application of resin shall be installed and used in accordance with Section N2408 and Sections N2409.3 through N2409.6.1.

N2409.3 Fire protection. Resin application areas shall be protected by an *automatic sprinkler system*. The sprinkler system design shall not be less than that required for Ordinary Hazard, Group 2, with a minimum design area of 3,000 square feet (279 m²). Where the materials or storage arrangements are required by other regulations to be provided with a higher level of sprinkler system protection, the higher level of sprinkler system protection shall be provided.

N2409.4 Reserved.

N2409.5 Sources of ignition in resin application areas. Sources of ignition in resin application areas shall comply with Section N2403.2.

N2409.6 Ventilation. Mechanical ventilation shall be provided throughout resin application areas in accordance with Section N2404.7. The ventilation rate shall be adequate to maintain the concentration of flammable vapors in the resin application area at or below 25 percent of the LFL.

Exception: Mechanical ventilation is not required for buildings that have 75 percent of the perimeter unenclosed.

N2409.6.1 Local ventilation. Local ventilation shall be provided inside of workpieces where personnel will be under or inside of the workpiece.

CHAPTER N25 FRUIT AND CROP RIPENING

SECTION N2501 GENERAL

N2501.1 Scope. Ripening processes where ethylene gas is introduced into a room to promote the ripening of fruits, vegetables and other crops shall comply with Sections N2501 through N2507.

Exception: Mixtures of ethylene and one or more inert gases in concentrations which prevent the gas from reaching greater than 25 percent of the lower explosive limit (LEL) when released to the atmosphere.

N2501.2 [2501.3] Ethylene generators. *Approved* ethylene generators shall be operated in accordance with Section N2506.

SECTION N2502 RESERVED

SECTION N2503 ETHYLENE GAS

N2503.1 Location. Ethylene gas shall be discharged only into *approved* rooms or enclosures designed and constructed for this purpose.

N2503.2 Dispensing. Valves controlling discharge of ethylene shall provide positive and fail-closed control of flow and shall be set to limit the concentration of gas in air below 1,000 parts per million (ppm).

SECTION N2504 SOURCES OF IGNITION

N2504.1 [2504.2] Electrical wiring and equipment. Electrical wiring and equipment, including luminaires, shall be *approved* for use in Class I, Division 2, Group C hazardous (classified) locations.

SECTION N2505 RESERVED

SECTION N2506 ETHYLENE GENERATORS

N2506.1 Ethylene generators. Ethylene generators shall be *listed* and *labeled* by an *approved* testing laboratory, *approved* by the *building official* and used only in *approved* rooms in accordance with the ethylene generator manufacturer's instructions. The listing evaluation shall include documentation that the concentration of ethylene gas does not exceed 25 percent of the lower explosive limit (LEL).

N2506.2 Ethylene generator rooms. Ethylene generators shall be used in rooms having a volume of not less than 1,000 cubic feet (28 m³). Rooms shall have air circulation to ensure even distribution of ethylene gas and shall be free from sparks, open flames or other ignition sources.

SECTION N2507 WARNING SIGNS

N2507.1 When required. *Approved* warning signs indicating the danger involved and necessary precautions shall be posted on all doors and entrances to the premises.

CHAPTER N27 SEMICONDUCTOR FABRICATION FACILITIES

SECTION N2701 GENERAL

N2701.1 Scope. Semiconductor fabrication facilities and comparable research and development areas classified as Group H-5 shall comply with Sections N2701 through N2705 and this code. The use, storage and handling of hazardous materials in Group H-5 shall comply with Sections N2701 through N2705 and other applicable provisions of this code.

N2701.2 Application. The requirements set forth in Sections N2701 through N2705 are requirements specific only to Group H-5 and shall be applied as exceptions or additions to applicable requirements set forth elsewhere in this code.

N2701.3 Multiple hazards. Where a material poses multiple hazards, all hazards shall be addressed in accordance with Section N5001.1.

SECTION N2702 DEFINITIONS

N2702.1 Definitions. The following terms are defined in Section N202:

PASS-THROUGH.
SEMICONDUCTOR FABRICATION FACILITY.
SERVICE CORRIDOR.
TOOL.

**SECTION N2703
GENERAL SAFETY PROVISIONS**

N2703.1 Emergency control station. An *emergency control station* shall be provided in accordance with Sections N2703.1.1 through N2703.1.2.

N2703.1.1 Location. The *emergency control station* shall be located on the premises at an *approved* location outside the fabrication area.

N2703.1.2 [2703.1.3] Signals. The *emergency control station* shall receive signals from emergency equipment and alarm and detection systems. Such emergency equipment and alarm and detection systems shall include, but not be limited to, the following where such equipment or systems are required to be provided either in this code or elsewhere in this code:

1. *Automatic sprinkler system* alarm and monitoring systems.
2. Manual fire alarm systems.
3. Emergency alarm systems.
4. Continuous gas detection systems.
5. Smoke detection systems.
6. Emergency power system.
7. Automatic detection and alarm systems for pyrophoric liquids and Class 3 water-reactive liquids required by Section N2705.2.3.4.
8. Exhaust ventilation flow alarm devices for pyrophoric liquids and Class 3 water-reactive liquids cabinet exhaust ventilation systems required by Section N2705.2.3.4.

N2703.2 Systems, equipment and processes. Systems, equipment and processes shall be in accordance with Sections N2703.2.1 through N2703.2.2

N2703.2.1 Application. Systems, equipment and processes shall include, but not be limited to, containers, cylinders, tanks, piping, tubing, valves and fittings.

N2703.2.2 General requirements. In addition to the requirements in Section N2703.2, systems, equipment and processes shall also comply with, other applicable provisions of this code and the *Mechanical Code*.

N2703.3 Construction requirements. Construction of semiconductor fabrication facilities shall be in accordance with Sections N2703.3.1 through N2703.3.9.

N2703.3.1 Fabrication areas. Construction and location of *fabrication areas* shall comply with this code.

N2703.3.2 Pass-throughs in exit access corridors. Pass-throughs in *exit access corridors* shall be constructed in accordance with this code.

N2703.3.3 Liquid storage rooms. Liquid storage rooms shall comply with Sections N5701 through N5706 and applicable provisions of this code.

N2703.3.4 Reserved.

N2703.3.5 Gas cabinets. Gas cabinets shall comply with Section N5003.8.6.

N2703.3.6 Exhausted enclosures. Exhausted enclosures shall comply with Section N5003.8.5.

N2703.3.7 Gas rooms. Gas rooms shall comply with Section N5003.8.4.

N2703.3.8 Service corridors. Service corridors shall comply with Sections N2705.3.1 and N2705.3.3 and applicable provisions of this code.

N2703.3.9 Cabinets containing pyrophoric liquids or water-reactive Class 3 liquids. Cabinets in *fabrication areas* containing pyrophoric liquids or Class 3 water-reactive liquids in containers or in amounts greater than ½ gallon (2 L) shall comply with Section N2705.2.3.4.

N2703.4-N2703.6 Reserved.

N2703.7 Electrical wiring and equipment. Electrical wiring and equipment in HPM facilities shall comply with Sections N2703.7.1 through N2703.7.3.

N2703.7.1 Fabrication areas. Electrical wiring and equipment in *fabrication areas* shall comply with the *Electrical Code*.

N2703.7.2 Workstations. Electrical equipment and devices within 5 feet (1524 mm) of workstations in which flammable or pyrophoric gases or flammable liquids are used shall comply with the *Electrical Code* for Class I, Division 2 hazardous locations. Workstations shall not be energized without adequate exhaust ventilation in accordance with Section N2703.14.

Exception: Class I, Division 2 hazardous electrical equipment is not required when the air removal from the workstation or dilution will prevent the accumulation of flammable vapors and fumes on a continuous basis.

N2703.7.3 Hazardous production material (HPM) rooms, gas rooms and liquid storage rooms. Electrical wiring and equipment in HPM rooms, gas rooms and liquid storage rooms shall comply with the *Electrical Code*.

N2703.8-N2703.9 Reserved.

N2703.10 Automatic sprinkler system. An *approved automatic sprinkler system* shall be provided in accordance with Sections N2703.10.1 through N2703.10.5 and Chapter 9 of this code.

N2703.10.1 Workstations and tools. The design of the sprinkler system in the area shall take into consideration the spray pattern and the effect on the equipment.

N2703.10.1.1 Combustible workstations. A sprinkler head shall be installed within each branch exhaust connection or individual plenums of workstations of combustible construction. The sprinkler head in the exhaust connection or plenum shall be located not more than 2 feet (610 mm) from the point of the duct connection or the connection to the plenum. When necessary to prevent corrosion, the sprinkler head and connecting piping in the duct shall be coated with *approved* or *listed* corrosion-resistant materials. The sprinkler head shall be accessible for periodic inspection.

Exceptions:

1. *Approved* alternative automatic fire-extinguishing systems are allowed. Activation of such systems shall deactivate the related processing equipment.

2. Process equipment which operates at temperatures exceeding 932°F (500°C) and is provided with automatic shutdown capabilities for hazardous materials.
3. Exhaust ducts 10 inches (254 mm) or less in diameter from flammable gas storage cabinets that are part of a workstation.
4. Ducts *listed* or *approved* for use without internal automatic sprinkler protection.

N2703.10.1.2 Combustible tools. Where the horizontal surface of a combustible tool is obstructed from ceiling sprinkler discharge, automatic sprinkler protection that covers the horizontal surface of the tool shall be provided.

Exceptions:

1. An automatic gaseous fire-extinguishing local surface application system shall be allowed as an alternative to sprinklers. Gaseous-extinguishing systems shall be actuated by infrared (IR) or ultraviolet/infrared (UV/IR) optical detectors.
2. Tools constructed of materials that are listed as Class 1 or Class 2 in accordance with UL 2360 or *approved* for use without internal fire extinguishing system protection.

N2703.10.2 Gas cabinets and exhausted enclosures. An *approved automatic sprinkler system* shall be provided in gas cabinets and exhausted enclosures containing HPM *compressed gases*.

Exception: Gas cabinets located in an HPM room other than those cabinets containing pyrophoric gases.

N2703.10.3 Reserved.

N2703.10.4 Exhaust ducts for HPM. An *approved automatic sprinkler system* shall be provided in exhaust ducts conveying gases, vapors, fumes, mists or dusts generated from HPM in accordance with this section and the *Mechanical Code*.

N2703.10.4.1 Metallic and noncombustible nonmetallic exhaust ducts. An *approved automatic sprinkler system* shall be provided in metallic and noncombustible nonmetallic exhaust ducts when all of the following conditions apply:

1. When the largest cross-sectional diameter is equal to or greater than 10 inches (254 mm).
2. The ducts are within the building.
3. The ducts are conveying flammable gases, vapors or fumes.

N2703.10.4.2 Combustible nonmetallic exhaust ducts. An *approved automatic sprinkler system* shall be provided in combustible nonmetallic exhaust ducts when the largest cross-sectional diameter of the duct is equal to or greater than 10 inches (254 mm).

Exceptions:

1. Ducts *listed* or *approved* for applications without *automatic sprinkler system* protection.
2. Ducts not more than 12 feet (3658 mm) in length installed below ceiling level.

N2703.10.4.3 Exhaust connections and plenums of combustible workstations. Automatic fire-extinguishing system protection for exhaust connections and plenums of combustible workstations shall comply with Section N2703.10.1.1.

N2703.10.4.4 Exhaust duct sprinkler system requirements. Automatic sprinklers installed in exhaust duct systems shall be hydraulically designed to provide 0.5 gallons per minute (gpm) (1.9 L/min) over an area derived by multiplying the distance between the sprinklers in a horizontal duct by the width of the duct. Minimum discharge shall be 20 gpm (76 L/min) per sprinkler from the five hydraulically most remote sprinklers.

N2703.10.4.4.1 Sprinkler head locations. Automatic sprinklers shall be installed at 12-foot (3658 mm) intervals in horizontal ducts and at changes in direction. In vertical runs, automatic sprinklers shall be installed at the top and at alternate floor levels.

N2703.10.4.4.2 Control valve. A separate indicating control valve shall be provided for sprinklers installed in exhaust ducts.

N2703.10.4.4.3 Drainage. Drainage shall be provided to remove sprinkler water discharged in exhaust ducts.

N2703.10.4.4.4 Corrosive atmospheres. Where corrosive atmospheres exist, exhaust duct sprinklers and pipe fittings shall be manufactured of corrosion resistant materials or coated with *approved* materials.

N2703.10.5 Sprinkler alarms and supervision. *Automatic sprinkler systems* shall be electrically supervised and provided with alarms in accordance with Chapter 9 of this code. *Automatic sprinkler system* alarm and supervisory signals shall be transmitted to the *emergency control station*.

N2703.11 Manual fire alarm system. A manual fire alarm system shall be installed throughout buildings containing a Group H-5 occupancy. Activation of the alarm system shall initiate a local alarm and transmit a signal to the *emergency control station*. Manual fire alarm systems shall be designed and installed in accordance with Section 907 of this code.

N2703.12 Emergency alarm system. Emergency alarm systems shall be provided in accordance with Section 414.7.1, 414.7.2 and 415.10.3.5 of this code. The *maximum allowable quantity per control area* provisions of Section N5004.1 shall not apply to emergency alarm systems required for HPM.

N2703.13 Continuous gas detection systems. A continuous gas detection system shall be provided for HPM gases when the physiological warning threshold level of the gas is at a higher level than the accepted permissible exposure limit (PEL) for the gas and for flammable gases in accordance with Sections 415.10.7.1 and 415.10.7.2 of this code.

[M] N2703.14 Exhaust ventilation systems for HPM. Exhaust ventilation systems and materials for exhaust ducts utilized for the exhaust of HPM shall comply with Section N2703.14.1 and Section 510.2 of the *Mechanical Code*.

N2703.14.1 [2703.14.3] Treatment systems. Treatment systems for highly toxic and toxic gases shall comply with Sections N6001 through N6005.

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N2703.15 Emergency power system. An emergency power system shall be provided in Group H-5 occupancies where required by Section 415.10.10.1 of this code. The emergency power system shall be designed, in accordance with Section 415.10.10 of this code, to supply power automatically to required electrical systems when the normal supply system is interrupted.

N2703.16 Sub-atmospheric pressure gas systems. Subatmospheric pressure gas systems (SAGS) shall be in accordance with NFPA 318.

**SECTION N2704
STORAGE**

N2704.1 General. Storage of hazardous materials shall comply with Section N2703 and this section and other applicable provisions of this code.

N2704.2 Fabrication areas. Hazardous materials storage and the maximum quantities of hazardous materials in use and storage allowed in *fabrication areas* shall be in accordance with Sections N2704.2.1 through N2704.2.2.1.

N2704.2.1 Location of HPM storage in fabrication areas. Storage of HPM in *fabrication areas* shall be within *approved* or *listed* storage cabinets, gas cabinets, exhausted enclosures or within a workstation as follows:

1. Flammable and *combustible liquid* storage cabinets shall comply with Section N5704.3.
2. Hazardous materials storage cabinets shall comply with Section N5003.8.7.
3. Gas cabinets shall comply with Section N5003.8.6. Gas cabinets for highly toxic or toxic gases shall also comply with Section N6004.1.2.
4. Exhausted enclosures shall comply with Section N5003.8.5. Exhausted enclosures for highly toxic or toxic gases shall also comply with Section N6004.1.3.
5. Workstations shall comply with Section N2705.2.3.

N2704.2.2 Maximum aggregate quantities in fabrication areas. The aggregate quantities of hazardous materials stored or used in a single *fabrication area* shall be limited as specified in this section.

Exception: *Fabrication areas* containing quantities of hazardous materials not exceeding the maximum allowable quantities per *control area* established by Sections N5003.1.1, N5704.3.4 and N5704.3.5.

N2704.2.2.1 Storage and use in fabrication areas. The maximum quantities of hazardous materials stored or used in a single *fabrication area* shall not exceed the quantities set forth in Table 415.10.1.1.1 of this code.

N2704.3 Indoor storage outside of fabrication areas. The indoor storage of hazardous materials outside of *fabrication areas* shall be in accordance with Sections N2704.3.1 through N2704.3.3.

N2704.3.1 HPM storage. The indoor storage of HPM in quantities greater than those *listed* in Sections N5003.1.1 and N5704.3.4.3 shall be in a room complying with the

requirements of this code for a liquid storage room, HPM room or gas room as appropriate for the materials stored.

N2704.3.2 Other hazardous materials storage. The indoor storage of other hazardous materials shall comply with Sections N5001, N5003 and N5004 and other applicable provisions of this code.

N2704.3.3 Separation of incompatible hazardous materials. Incompatible hazardous materials in storage shall be separated from each other in accordance with Section N5003.9.2.

**SECTION N2705
USE AND HANDLING**

N2705.1 General. The use and handling of hazardous materials shall comply with this section, Section N2703 and other applicable provisions of this code.

N2705.2 Fabrication areas. The use of hazardous materials in *fabrication areas* shall be in accordance with Sections N2705.2.1 through N2705.2.3.4.

N2705.2.1 Location of HPM in use in fabrication areas. Hazardous production materials in use in *fabrication areas* shall be within *approved* or *listed* gas cabinets, exhausted enclosures or a workstation.

N2705.2.2 Maximum aggregate quantities in fabrication areas. The aggregate quantities of hazardous materials in a single *fabrication area* shall comply with Section N2704.2.2, and Table 415.10.1.1.1 of this code. The quantity of HPM in use at a workstation shall not exceed the quantities *listed* in Table N2705.2.2.

N2705.2.3 Workstations. Workstations in *fabrication areas* shall be in accordance with Sections N2705.2.3.1 through N2705.2.3.4.

N2705.2.3.1 Construction. Workstations in *fabrication areas* shall be constructed of materials compatible with the materials used and stored at the workstation. The portion of the workstation that serves as a cabinet for HPM gases and HPM flammable liquids shall be noncombustible and, if of metal, shall be not less than 0.0478-inch (18 gage) (1.2 mm) steel.

**TABLE N2705.2.2
MAXIMUM QUANTITIES OF HPM AT WORKSTATION^d**

HPM CLASSIFICATION	STATE	MAXIMUM QUANTITY
Flammable, highly toxic, pyrophoric and toxic combined	Gas	Combined aggregate volume of all cylinders at a workstation shall not exceed an internal cylinder volume of 39.6 gallons or 5.29 cubic feet
Flammable	Liquid Solid	15 gallons ^{a, b} 5 pounds ^{a, b}
Corrosive	Gas	Combined aggregate volume of all cylinders at a workstation shall not exceed an internal cylinder volume of 39.6 gallons or 5.29 cubic feet
	Liquid	Use-open system: 25 gallons ^b Use-closed system: 150 gallons ^{b, e}

	Solid	20 pounds ^{a, b}
Highly toxic	Liquid	15 gallons ^a
	Solid	5 pounds ^a
Oxidizer	Gas	Combined aggregate volume of all cylinders at a workstation shall not exceed an internal cylinder volume of 39.6 gallons or 5.29 cubic feet
	Liquid	Use-open system: 12 gallons ^b Use-closed system: 60 gallons ^b
	Solid	20 pounds ^{a, b}
Pyrophoric	Liquid	0.5 gallon ^{c, f}
	Solid	4.4 pounds ^{c, f}
Toxic	Liquid	Use-open system: 15 gallons ^b Use-closed system: 60 gallons ^b
	Solid	5 pounds ^{a, b}
Unstable reactive Class 3	Liquid	0.5 gallon ^{a, b}
	Solid	5 pounds ^{a, b}
Water-reactive Class 3	Liquid	0.5 gallon ^{c, f}
	Solid	See Table 415.10.1.1.1

For SI: 1 pound = 0.454 kg, 1 gallon = 3.785 L

- a. Maximum allowable quantities shall be increased 100 percent for closed system operations. When Note b also applies, the increase for both notes shall be allowed.
- b. Quantities shall be allowed to be increased 100 percent when workstations are internally protected with an approved automatic fire-extinguishing or suppression system complying with Chapter 9 of this code. When Note b also applies, the increase for both notes shall be allowed. When Note e also applies, the maximum increase allowed for both Notes b and e shall not exceed 100 percent.
- c. Allowed only in workstations that are internally protected with an approved automatic fire-extinguishing or fire protection system complying with Chapter 9 of this code and compatible with the reactivity of materials in use at the workstation.
- d. The quantity limits apply only to materials classified as HPM.
- e. Quantities shall be allowed to be increased 100 percent for nonflammable, noncombustible corrosive liquids when the materials of construction for workstations are listed or approved for use without internal fire extinguishing or suppression system protection. When Note b also applies, the maximum increase allowed for both Notes b and e shall not exceed 100 percent.
- f. A maximum quantity of 5.3 gallons of liquids and 44 pounds of total liquids and solids shall be allowed at a workstation when conditions are in accordance with Section N2705.2.3.4.

N2705.2.3.2 Protection of vessels. Vessels containing hazardous materials located in or connected to a workstation shall be protected as follows:

1. HPM: Vessels containing HPM shall be protected from physical damage and shall not project from the workstation.
2. Hazardous *cryogenic fluids*, gases and liquids: Hazardous cryogenic fluid, gas and liquid vessels located within a workstation shall be protected from seismic forces in an *approved* manner in accordance with this code.

N2705.2.3.3 Drainage and containment for HPM liquids. Each workstation utilizing HPM liquids shall have all of the following:

1. Drainage piping systems connected to a compatible system for disposition of such liquids;

2. The work surface provided with a slope or other means for directing spilled materials to the containment or drainage system; and
3. An *approved* means of containing or directing spilled or leaked liquids to the drainage system.

N2705.2.3.4 Pyrophoric solids, liquids and Class 3 water-reactive liquids. Pyrophoric liquids and Class 3 water-reactive liquids in containers greater than 0.5- gallon (2 L) but not exceeding 5.3-gallon (20 L) capacity and pyrophoric solids in containers greater than 4.4 pounds (2 kg) but not exceeding 44 pounds (20 kg) shall be allowed at workstations when located inside cabinets and the following conditions are met:

1. Maximum amount per cabinet: The maximum amount per cabinet shall be limited to 5.3 gallons (20 L) of liquids and 44 pounds (20 kg) of total liquids and solids.
2. Cabinet construction: Cabinets shall be constructed in accordance with the following:
 - 2.1. Cabinets shall be constructed of not less than 0.097-inch (2.5 mm) (12 gage) steel.
 - 2.2. Cabinets shall be permitted to have self-closing limited access ports or noncombustible windows that provide access to equipment controls.
 - 2.3. Cabinets shall be provided with self- or manual-closing doors. Manual-closing doors shall be equipped with a door switch that will initiate local audible and visual alarms when the door is in the open position.
3. Cabinet exhaust ventilation system: An exhaust ventilation system shall be provided for cabinets and shall comply with the following:
 - 3.1. The system shall be designed to operate at a negative pressure in relation to the surrounding area.
 - 3.2. The system shall be equipped with monitoring equipment to ensure that required exhaust flow or static pressure is provided.
 - 3.3. Low-flow or static pressure conditions shall send an alarm to the on-site emergency control station. The alarm shall be both visual and audible.
4. Cabinet spill containment: Spill containment shall be provided in each cabinet, with the spill containment capable of holding the contents of the aggregate amount of liquids in containers in each cabinet.
5. Valves: Valves in supply piping between the product containers in the cabinet and the workstation served by the containers shall fail in the closed position upon power failure, loss of exhaust ventilation and upon actuation of the fire control system.
6. Fire detection system: Each cabinet shall be equipped with an automatic fire detection system complying with the following conditions:
 - 6.1. Automatic detection system: UV/IR, high-sensitivity smoke detection (HSSD) or other

approved detection systems shall be provided inside each cabinet.

- 6.2. Automatic shutoff: Activation of the detection system shall automatically close the shutoff valves at the source on the liquid supply.
- 6.3. Alarms and signals: Activation of the detection system shall initiate a local alarm within the *fabrication area* and transmit a signal to the *emergency control station*. The alarms and signals shall be both visual and audible.

N2705.3.1 Corridors and enclosures for stairways and ramps. *Corridors* and enclosures for *exit stairways* and *ramps* in new buildings or serving new fabrication areas shall not contain HPM, except as permitted in corridors by Section 415.10.6.4 of this code.

N2705.3.2 [2705.3.3] Service corridors. When a new *fabrication area* is constructed, a service corridor shall be provided where it is necessary to transport HPM from a liquid storage room, HPM room, gas room or from the outside of a building to the perimeter wall of a *fabrication area*. Service corridors shall be designed and constructed in accordance with this code.

CHAPTER N28 LUMBER YARDS AND WOODWORKING FACILITIES

SECTION N2801 GENERAL

N2801.1 Scope. The storage, manufacturing and processing of timber, lumber, plywood, veneers and byproducts shall be in accordance with this code.

SECTION N2802 DEFINITIONS

N2802.1 Definitions. The following terms are defined in Section N202:

- HOGGED MATERIALS.
- PLYWOOD AND VENEER MILLS.
- RAW PRODUCT.
- TIMBER AND LUMBER PRODUCTION FACILITIES.

SECTION N2803 GENERAL REQUIREMENTS

N2803.1 Reserved.

N2803.2 Dust control. Equipment or machinery located inside buildings that generates or emits *combustible dust* shall be provided with an *approved* dust collection and exhaust system installed in accordance with Sections N2201 through N2205 and the *Mechanical Code*. Equipment or systems that are used to collect, process or convey *combustible dusts* shall be provided with an *approved* explosion control system.

N2803.2.1 Explosion venting. Where a dust explosion hazard exists in equipment rooms, buildings or other

enclosures, such areas shall be provided with explosion (*deflagration*) venting or an *approved* explosion suppression system complying with Section N901.

N2803.3 Waste removal. Sawmills, planing mills and other woodworking plants shall be equipped with a waste removal system that will collect and remove sawdust and shavings. Such systems shall be installed in accordance with Sections N2201 through N2205 and the *Mechanical Code*.

Exception: Manual waste removal when *approved*.

N2803.4 Electrical equipment. Electrical wiring and equipment shall comply with the *Electrical Code*.

SECTION N2804 FIRE PROTECTION

N2804.1 General. Fire protection in timber and lumber production mills and plywood and veneer mills shall comply with Sections N2804.2 and N2804.4.

N2804.2 Fire alarms. An *approved* means for transmitting alarms to the fire department shall be provided in timber and lumber production mills and plywood and veneer mills.

N2804.2.1 Manual fire alarms. A manual fire alarm system complying with Section 907.2 of this code shall be installed in areas of timber and lumber production mills and for plywood and veneer mills that contain product dryers.

Exception: Where dryers or other sources of ignition are protected by a supervised *automatic sprinkler system* complying with Section 903 of this code.

N2804.3 Portable fire extinguishers or standpipes and hose. Portable fire extinguishers or standpipes and hose supplied from a water system approved by the fire code official shall be provided within 50 feet (15 240 mm) of travel distance to any machine producing shavings or sawdust.

NOTE: Provisions which determine when standpipes are required are reprinted from the Oregon Fire Code. Installation and construction standards for standpipe systems are adopted by the Oregon Building Codes Division.

NOTE: See Oregon Fire Code for portable fire extinguisher requirements.

N2804.4 Automatic sprinkler systems. *Automatic sprinkler systems* shall be installed in accordance with Section 903.3.1.1 of this code.

SECTION N2805 PLYWOOD, VENEER AND COMPOSITE BOARD MILLS

N2805.1 General. Plant operations of plywood, veneer and composite board mills shall comply with Sections N2805.2 and N2805.3.

N2805.2 Dryer protection. Dryers shall be protected throughout by an *approved*, automatic deluge water-spray suppression system complying with Chapter 9 of this code. Manual activation valves shall be located within 75 feet (22 860 mm) of the drying equipment.

N2805.3 Thermal oil-heating systems. Facilities that use heat transfer fluids to provide process equipment heat through piped,

indirect heating systems shall comply with this code and NFPA 664.

SECTION N2806 RESERVED

SECTION N2807 STORAGE OF WOOD CHIPS AND HOGGED MATERIAL ASSOCIATED WITH TIMBER AND LUMBER PRODUCTION FACILITIES

N2807.1 [2807.3] Pile fire protection. Automatic sprinkler protection shall be provided in conveyor tunnels and combustible enclosures that pass under a pile. Combustible or enclosed conveyor systems shall be equipped with an *approved automatic sprinkler system*.

SECTION N2808 STORAGE AND PROCESSING OF WOOD CHIPS, HOGGED MATERIAL, FINES, COMPOST AND RAW PRODUCT ASSOCIATED WITH YARD WASTE AND RECYCLING FACILITIES

N2808.1 [2808.7] Pile fire protection. Automatic sprinkler protection shall be provided in conveyor tunnels and combustible enclosures that pass under a pile. Combustible conveyor systems and enclosed conveyor systems shall be equipped with an *approved automatic sprinkler system*.

CHAPTER N29 MANUFACTURE OF ORGANIC COATINGS

SECTION N2901 GENERAL

N2901.1 Scope. Organic coating manufacturing processes shall comply with Sections N2901 through N2909, except that these sections shall not apply to processes manufacturing nonflammable or water-thinned coatings or to operations applying coating materials.

SECTION N2902 DEFINITION

N2902.1 Definition. The following term is defined in Section N202:

ORGANIC COATING.

SECTION N2903 GENERAL PRECAUTIONS

N2903.1 Building features. Manufacturing of organic coatings shall be done only in buildings that do not have pits or *basements*.

N2903.2 Location. Organic coating manufacturing operations and operations incidental to or connected with organic coating manufacturing shall not be located in buildings having other occupancies.

N2903.3 [2903.4] Fire protection systems. *Fire protection systems* shall be installed in accordance with Chapter 9 of this code.

N2903.4 [2903.6] Open flames. Open flames and direct-fired heating devices shall be prohibited in areas where flammable vapor-air mixtures exist.

N2903.5 [2903.10] Drainage. Drainage facilities shall be provided to direct *flammable* and *combustible liquid* leakage and fire protection water to an *approved* location away from the building, any other structure, storage area or adjoining premises.

N2903.6 [2903.11] Alarm system. An *approved* fire alarm system shall be provided in accordance with Section 907 of this code.

SECTION N2904 ELECTRICAL EQUIPMENT AND PROTECTION

N2904.1 Wiring and equipment. Electrical wiring and equipment shall comply with this code and shall be installed in accordance with the *Electrical Code*.

N2904.2 Hazardous locations. Where Class I liquids are exposed to the air, the design of equipment and ventilation of structures shall be such as to limit the Class I, Division 1, locations to the following:

1. Piping trenches
2. The interior of equipment
3. The immediate vicinity of pumps or equipment locations, such as dispensing stations, open centrifuges, plate and frame filters, opened vacuum filters, change cans and the surfaces of open equipment. The immediate vicinity shall include a zone extending from the vapor liberation point 5 feet (1524 mm) horizontally in all directions and vertically from the floor to a level 3 feet (914 mm) above the highest point of vapor liberation.

N2904.2.1 Other locations. Locations within the confines of the manufacturing room where Class I liquids are handled shall be Class I, Division 2, except locations indicated in Section N2904.2.

N2904.2.2 Ordinary equipment. Ordinary electrical equipment, including switchgear, shall be prohibited, except where installed in a room maintained under positive pressure with respect to the hazardous area. The air or other media utilized for pressurization shall be obtained from a source that will not cause any amount or type of flammable vapor to be introduced into the room.

SECTION N2905 PROCESS STRUCTURES

N2905.1 Design. Process structures shall be designed and constructed in accordance with this code.

N2905.2 Reserved.

N2905.3 Drainage. Drainage facilities shall be provided in accordance with Section N2903.6 where topographical conditions are such that flammable and *combustible liquids* are

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capable of flowing from the organic coating manufacturing operation so as to constitute a fire hazard to other premises.

N2905.4 Explosion control. Explosion control shall be provided in areas subject to potential *deflagration* hazards as indicated in NFPA 35. Explosion control shall be provided in accordance with Section N901.

[M] N2905.5 Ventilation. Enclosed structures in which Class I liquids are processed or handled shall be ventilated at a rate of not less than 1 cubic foot per minute per square foot [0.00508 m³/(s· m²)] of solid floor area. Ventilation shall be accomplished by exhaust fans that take suction at floor levels and discharge to a safe location outside the structure. Noncontaminated intake air shall be introduced in such a manner that all portions of solid floor areas are provided with continuous uniformly distributed air movement.

N2905.6 Heating. Heating provided in hazardous areas shall be by indirect means. Ignition sources such as open flames or electrical heating elements, except as provided for in Section N2904, shall not be permitted within the structure.

SECTION N2906 PROCESS MILLS AND KETTLES

N2906.1 Mills. Mills, operating with close clearances, which process flammable and heat-sensitive materials, such as nitrocellulose, shall be located in a detached building or in a noncombustible structure without other occupancies.

N2906.2 Mixers. Mixers shall be of the enclosed type or, where of the open type, shall be provided with properly fitted covers. Where flow is by gravity, a shutoff valve shall be installed as close as practical to the mixer, and a control valve shall be provided near the end of the fill pipe.

N2906.3 Open kettles. Open kettles shall be located in an outside area provided with a protective roof; in a separate structure of noncombustible construction; or separated from other areas by a noncombustible wall having a fire-resistance rating of at least 2 hours.

N2906.4 Closed kettles. Contact-heated kettles containing solvents shall be equipped with safety devices that, in case of a fire, will turn off the process heat, turn on the cooling medium and inject inert gas into the kettle.

N2906.4.1 Vaporizer location. The vaporizer section of heat-transfer systems that heat closed kettles containing solvents shall be remotely located.

N2906.5 Kettle controls. The kettle and thin-down tank shall be instrumented, controlled and interlocked so that any failure of the controls will result in a safe condition. The kettle shall be provided with a pressure-rupture disc in addition to the primary vent. The vent piping from the rupture disc shall be of minimum length and shall discharge to an *approved* location. The thin-down tank shall be adequately vented. Thinning operations shall be provided with an adequate vapor removal system.

SECTION N2907 RESERVED

SECTION N2908 RESERVED

SECTION N2909 RAW MATERIALS AND FINISHED PRODUCTS

N2909.1 General. The storage, handling and use of flammable and *combustible liquids* in process areas shall be in accordance with Sections N5701 through N5706.

N2909.2 Tank storage. Tank storage for flammable and *combustible liquids* located inside of structures shall be limited to storage areas at or above grade which are separated from the processing area in accordance with this code. Processing equipment containing flammable and *combustible liquids* and storage in quantities essential to the continuity of the operations shall not be prohibited in the processing area.

N2909.3 [2909.4] Nitrocellulose storage. Nitrocellulose storage shall be located on a detached pad or in a separate structure or a room enclosed in accordance with the this code. The nitrocellulose storage area shall not be utilized for any other purpose. Electrical wiring and equipment installed in storage areas adjacent to process areas shall comply with Section N2904.2.

N2909.4 [2909.6] Finished products. Finished products that are flammable or *combustible liquids* shall be stored outside of structures, in a separate structure, or in a room separated from the processing area in accordance with this code. The storage of finished products shall be in tanks or closed containers in accordance with Sections N5701 through N5706.

CHAPTER N30 INDUSTRIAL OVENS

SECTION N3001 GENERAL

N3001.1 Scope. This chapter shall apply to the installation and operation of industrial ovens and furnaces. Industrial ovens and furnaces shall comply with the applicable provisions of NFPA 86, the *Mechanical Code* and Sections N3001 through N3007. The terms “ovens” and “furnaces” are used interchangeably in Sections N3001 through N3007.

SECTION N3002 DEFINITIONS

N3002.1 Definitions. The following terms are defined in Section N202:

FURNACE CLASS A
FURNACE CLASS B
FURNACE CLASS C
FURNACE CLASS D

SECTION N3003 LOCATION

N3003.1 Ventilation. Enclosed rooms or *basements* containing industrial ovens or furnaces shall be provided with combustion and ventilation air in accordance with the *Mechanical Code*.

N3003.2 Exposure. When locating ovens, oven heaters and related equipment, the possibility of fire resulting from overheating or from the escape of fuel gas or fuel oil and the possibility of damage to the building and injury to persons resulting from explosion shall be considered.

N3003.3 Ignition source. Industrial ovens and furnaces shall be located so as not to pose an ignition hazard to flammable vapors or mists or *combustible dusts*.

N3003.4 Temperatures. Roofs and floors of ovens shall be insulated and ventilated to prevent temperatures at combustible ceilings and floors from exceeding 160°F (71°C).

SECTION N3004 FUEL PIPING

N3004.1 Fuel-gas piping. Fuel-gas piping serving industrial ovens shall comply with the *Mechanical Code*. Piping for other fuel sources shall comply with this section.

N3004.2 Shutoff valves. Each industrial oven or furnace shall be provided with an *approved* manual fuel shutoff valve in accordance with the *Mechanical Code*

N3004.2.1 Fuel supply lines. Valves for fuel supply lines shall be located within 6 feet (1829 mm) of the appliance served.

Exception: When *approved* and the valve is located in the same general area as the appliance served.

N3004.3 Valve position. The design of manual fuel shutoff valves shall incorporate a permanent feature which visually indicates the open or closed position of the valve. Manual fuel shutoff valves shall not be equipped with removable handles or wrenches unless the handle or wrench can only be installed parallel with the fuel line when the valve is in the open position.

SECTION N3005 INTERLOCKS

N3005.1 Shut down. Interlocks shall be provided for Class A ovens so that conveyors or sources of flammable or combustible materials shall shut down if either the exhaust or recirculation air supply fails.

SECTION N3006 FIRE PROTECTION

N3006.1 Required protection. Class A and B ovens which contain, or are utilized for the processing of, combustible materials shall be protected by an *approved* automatic fire extinguishing system complying with Chapter 9 of this code.

N3006.2 Fixed fire-extinguishing systems. Fixed fire-extinguishing systems shall be provided for Class C or D ovens to protect against such hazards as overheating, spillage of

molten salts or metals, quench tanks, ignition of hydraulic oil and escape of fuel.

SECTION N3007 NAMEPLATE

N3007.1 Furnace system information. An *approved*, clearly worded, and prominently displayed safety design data form or manufacturer's nameplate shall be provided stating the safe operating condition for which the furnace system was designed, built, altered or extended

N3007.2 Oven nameplate. Safety data for Class A solvent atmosphere ovens shall be furnished on the manufacturer's nameplate. The nameplate shall provide the following design data:

1. The solvent used.
2. The number of gallons (L) used per batch or per hour of solvent entering the oven.
3. The required purge time.
4. The oven operating temperature.
5. The exhaust blower rating for the number of gallons (L) of solvent per hour or batch at the maximum operating temperature.

Exception: For low-oxygen ovens, the maximum allowable oxygen concentration shall be included in place of the exhaust blower ratings.

CHAPTER N31 TENTS AND MEMBRANE STRUCTURES

SECTION N3101 [3104] TENTS AND MEMBRANE STRUCTURES

N3101.1 [3104.1] General. All tents and membrane structures, erected for longer than 180 days, shall be in accordance with this section and Section 3102 of this code.

N3101.2 [3104.2] Flame propagation performance treatment. Before a permit is granted, the *owner* or agent shall file with the *building official* a certificate executed by an *approved* testing laboratory certifying that the tents and membrane structures and their appurtenances; sidewalls, drops and tarpaulins; floor coverings, bunting and combustible decorative materials and effects, including sawdust when used on floors or passageways, are composed of material meeting the flame propagation performance criteria of NFPA 701 or shall be treated with a flame retardant in an *approved* manner and meet the flame propagation performance criteria of NFPA 701, and that such flame propagation performance criteria are effective for the period specified by the permit.

N3101.3 [3104.3] Label. Membrane structures or tents shall have a permanently affixed label bearing the identification of size and fabric or material type.

N3101.4 [3104.4] Certification. An affidavit or affirmation shall be submitted to the *building official* and a copy retained on the premises on which the tent or air-supported structure is located. The affidavit shall attest to the following information

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relative to the flame propagation performance criteria of the fabric:

1. Names and address of the *owners* of the tent or air-supported structure.
2. Date the fabric was last treated with flame-retardant solution.
3. Trade name or kind of chemical used in treatment.
4. Name of person or firm treating the material.
5. Name of testing agency and test standard by which the fabric was tested.

N3101.5 [3104.9] Spot lighting. Spot or effect lighting shall only be by electricity, and all combustible construction located within 6 feet (1829 mm) of such equipment shall be protected with *approved* noncombustible insulation not less than 9/4 inches (235 mm) thick.

N3101.6 [3104.14] Occupant load factors. The *occupant load* allowed in an assembly structure, or portion thereof, shall be determined in accordance with Chapter 10 of this code.

N3101.7 [3104.15] Heating and cooking equipment. Heating and cooking equipment shall be in accordance with Sections N3101.7.1 through N3101.7.6.

N3101.7.1 [3104.15.1] Installation. Heating or cooking equipment, tanks, piping, hoses, fittings, valves, tubing and other related components shall be installed as specified in the *Mechanical Code*.

N3101.7.2 [3104.15.2] Venting. Gas, liquid and solid fuel-burning equipment designed to be vented shall be vented to the outside air as specified in the *Mechanical Code*. Such vents shall be equipped with *approved* spark arresters when required. Where vents or flues are used, all portions of the tent or membrane structure shall be not less than 12 inches (305 mm) from the flue or vent.

N3101.7.3 [3104.15.3] Location. Cooking and heating equipment shall not be located within 10 feet (3048 mm) of *exits* or combustible materials.

N3101.7.4 [3104.15.5] Cooking tents. Tents with sidewalls or drops where cooking is performed shall be separated from other tents or membrane structures by a minimum of 20 feet (6096 mm).

N3101.7.5 [3104.15.6] Outdoor cooking. Outdoor cooking that produces sparks or grease-laden vapors shall not be performed within 20 feet (6096 mm) of a tent or membrane structure.

N3101.7.6 [3104.15.7] Electrical heating and cooking equipment. Electrical cooking and heating equipment shall comply with the *Electrical Code*.

N3101.8 [3104.19] Separation of generators. Generators and other internal combustion power sources shall be separated from tents or membrane structures by a minimum of 20 feet (6096 mm) and shall be placed on an approved surface. Such equipment shall be isolated from contact with the public by fencing, enclosure or other *approved* means.

CHAPTER N32 HIGH-PILED COMBUSTIBLE STORAGE

SECTION N3201 GENERAL

N3201.1 Scope. *High-piled combustible storage* shall be in accordance with Sections N3201 through N3210. In addition to the requirements of this code, the following material-specific requirements shall apply:

1. Aerosols shall be in accordance with Sections N5101 through N5107.
2. Flammable and *combustible liquids* shall be in accordance with Sections N5701 through N5706.
3. Hazardous materials shall be in accordance with Sections N5001 through N5005.
4. Storage of combustible paper records shall be in accordance with NFPA 13.
5. Storage of *combustible fibers* shall be in accordance with Section N5202 through N5204.

N3201.2 [3201.3] Construction documents. At the time of building permit application for new structures designed to accommodate high-piled storage or for requesting a change of occupancy/ use, and at the time of application for a permit, plans and specifications shall be submitted for review and approval. In addition to the information required by Chapter 1 of this code, the storage rack submittal shall include the information specified in this section. The plans shall include the following:

1. Floor plan of the building showing locations and dimensions of *high-piled storage areas*.
2. Usable storage height for each storage area.
3. Number of tiers within each rack, if applicable.
4. Proposed commodity clearance between top of storage and the sprinkler deflector for each storage arrangement.
5. Aisle dimensions between each storage array.
6. Maximum pile volume for each storage array.
7. Proposed location and classification of commodities in accordance with Section N3203.
8. Proposed location of commodities which are banded or encapsulated.
9. Location of required fire department access doors.
10. Type of fire suppression and fire detection systems.
11. Location of valves controlling the water supply of ceiling and in-rack sprinklers.
12. Type, location and specifications of smoke removal and curtain board systems.
13. Dimension and location of transverse and longitudinal flue spaces.
14. Additional information regarding required design features, commodities, storage arrangement and fire protection features within the high-piled storage area shall be provided at the time of permit application, when required by the *building official*.

SECTION N3202 DEFINITIONS

N3202.1 Definitions. The following terms are defined in Section N202:

ARRAY.
ARRAY, CLOSED.
AUTOMATED RACK STORAGE.
BIN BOX.
COMMODITY.
DRAFT CURTAIN.
**EARLY SUPPRESSION FAST-RESPONSE (ESFR)
 SPRINKLER**
EXPANDED PLASTIC.
EXTRA-HIGH-RACK COMBUSTIBLE STORAGE.
HIGH-PILED COMBUSTIBLE STORAGE.
HIGH-PILED STORAGE AREA.
LONGITUDINAL FLUE SPACE.
MANUAL STOCKING METHODS.
MECHANICAL STOCKING METHODS.
SHELF STORAGE.
SOLID SHELVING.
TRANSVERSE FLUE SPACE.

SECTION N3203

HIGH-PILED COMBUSTIBLE STORAGE COMMODITY CLASSIFICATION

N3203.1 Classification of commodities. Commodities shall be classified as Class I, II, III, IV or high hazard in accordance with this section. Materials listed within each commodity classification are assumed to be unmodified for improved combustibility characteristics. Use of flame-retarding modifiers or the physical form of the material could change the classification. See Section N3203.7 for classification of Group A, B and C plastics.

N3203.2 Class I commodities. Class I commodities are essentially noncombustible products on wooden or nonexpanded polyethylene solid deck pallets, in ordinary corrugated cartons with or without single-thickness dividers, or in ordinary paper wrappings with or without pallets. Class I commodities are allowed to contain a limited amount of Group A plastics in accordance with Section N3203.7.4. Examples of Class I commodities include, but are not limited to, the following:

- Alcoholic beverages not exceeding 20-percent alcohol
- Appliances noncombustible, electrical
- Cement in bags
- Ceramics
- Dairy products in nonwax-coated containers (excluding bottles)
- Dry insecticides
- Foods in noncombustible containers
- Fresh fruits and vegetables in nonplastic trays or containers
- Frozen foods
- Glass
- Glycol in metal cans
- Gypsum board
- Inert materials, bagged
- Insulation, noncombustible

Noncombustible liquids in plastic containers having less than a 5-gallon (19 L) capacity
 Noncombustible metal products.

N3203.3 Class II commodities. Class II commodities are Class I products in slatted wooden crates, solid wooden boxes, multiple-thickness paperboard cartons or equivalent combustible packaging material with or without pallets. Class II commodities are allowed to contain a limited amount of Group A plastics in accordance with Section N3203.7.4. Examples of Class II commodities include, but are not limited to, the following:

- Alcoholic beverages not exceeding 20-percent alcohol, in combustible containers
- Foods in combustible containers
- Incandescent or fluorescent light bulbs in cartons
- Thinly coated fine wire on reels or in cartons.

N3203.4 Class III commodities. Class III commodities are commodities of wood, paper, natural fiber cloth, or Group C plastics or products thereof, with or without pallets. Products are allowed to contain limited amounts of Group A or B plastics, such as metal bicycles with plastic handles, pedals, seats and tires. Group A plastics shall be limited in accordance with Section N3203.7.4. Examples of Class III commodities include, but are not limited to, the following:

- Aerosol, Level 1
- Combustible fiberboard
- Cork, baled
- Feed, bagged
- Fertilizers, bagged
- Food in plastic containers
- Furniture: wood, natural fiber, upholstered, nonplastic, wood or metal with plastic-padded and covered armrests
- Glycol in combustible containers not exceeding 25 percent
- Lubricating or hydraulic fluid in metal cans
- Lumber
- Mattresses, excluding foam rubber and foam plastics
- Noncombustible liquids in plastic containers having a capacity of more than 5 gallons (19 L)
- Paints, oil base, in metal cans
- Paper, waste, baled
- Paper and pulp, horizontal storage, or vertical storage that is banded or protected with *approved* wrap
- Paper in cardboard boxes
- Pillows, excluding foam rubber and foam plastics
- Plastic-coated paper food containers
- Plywood
- Rags, baled
- Rugs, without foam backing
- Sugar, bagged
- Wood, baled
- Wood doors, frames and cabinets
- Yarns of natural fiber and viscose.

N3203.5 Class IV commodities. Class IV commodities are Class I, II or III products containing Group A plastics in ordinary corrugated cartons and Class I, II and III products with Group A plastic packaging, with or without pallets. Group B plastics and free-flowing Group A plastics are also included in this class. The total amount of nonfree-flowing Group A plastics shall be in accordance with Section N3203.7.4.

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Examples of Class IV commodities include, but are not limited to, the following:

- Aerosol, Level 2
- Alcoholic beverages, exceeding 20-percent but less than 80-percent alcohol, in cans or bottles in cartons
- Clothing, synthetic or nonviscose
- Combustible metal products (solid)
- Furniture, plastic upholstered
- Furniture, wood or metal with plastic covering and padding
- Glycol in combustible containers (greater than 25 percent and less than 50 percent)
- Linoleum products
- Paints, oil base in combustible containers
- Pharmaceutical, alcoholic elixirs, tonics, etc.
- Rugs, foam back
- Shingles, asphalt
- Thread or yarn, synthetic or nonviscose.

N3203.6 High-hazard commodities. High-hazard commodities are high-hazard products presenting special fire hazards beyond those of Class I, II, III or IV. Group A plastics not otherwise classified are included in this class. Examples of high-hazard commodities include, but are not limited to, the following:

- Aerosol, Level 3
- Alcoholic beverages, exceeding 80-percent alcohol, in bottles or cartons
- Commodities of any class in plastic containers in carousel storage
- Flammable solids (except solid combustible metals)
- Glycol in combustible containers (50 percent or greater)
- Lacquers, which dry by solvent evaporation, in metal cans or cartons
- Lubricating or hydraulic fluid in plastic containers
- Mattresses, foam rubber or foam plastics
- Pallets and flats which are idle combustible
- Paper and pulp, rolled, in vertical storage which is unbanded or not protected with an *approved* wrap
- Paper, asphalt, rolled, horizontal storage
- Paper, asphalt, rolled, vertical storage
- Pillows, foam rubber and foam plastics
- Pyroxylin Rubber tires
- Vegetable oil and butter in plastic containers.

N3203.7 Classification of plastics. Plastics shall be designated as Group A, B or C in accordance with Sections N3203.7.1 through N3203.7.4.

N3203.7.1 Group A plastics. Group A plastics are plastic materials having a heat of combustion that is much higher than that of ordinary combustibles, and a burning rate higher than that of Group B plastics. Examples of Group A plastics include, but are not limited to, the following:

- ABS (acrylonitrile-butadiene-styrene copolymer)
- Acetal (polyformaldehyde)

- Acrylic (polymethyl methacrylate)
- Butyl rubber EPDM (ethylene propylene rubber)
- FRP (fiberglass-reinforced polyester)
- Natural rubber (expanded)
- Nitrile rubber (acrylonitrile butadiene rubber)
- PET or PETE (polyethylene terephthalate)
- Polybutadiene
- Polycarbonate
- Polyester elastomer
- Polyethylene
- Polypropylene
- Polystyrene (expanded and unexpanded)
- Polyurethane (expanded and unexpanded)
- PVC (polyvinyl chloride greater than 15-percent plasticized, e.g., coated fabric unsupported film)
- SAN (styrene acrylonitrile)
- SBR (styrene butadiene rubber).

N3203.7.2 Group B plastics. Group B plastics are plastic materials having a heat of combustion and a burning rate higher than that of ordinary combustibles, but not as high as those of Group A plastics. Examples of Group B plastics include, but are not limited to, the following:

- Cellulosics (cellulose acetate, cellulose acetate butyrate, ethyl cellulose)
- Chloroprene rubber
- Fluoroplastics (ECTFE, ethylene-chlorotrifluoroethylene copolymer; ETFE, ethylene-tetrafluoroethylene copolymer; FEP, fluorinated ethylene-propylene copolymer)
- Natural rubber (nonexpanded)
- Nylon (Nylon 6, Nylon 6/6)
- PVC (polyvinyl chloride greater than 5-percent, but not exceeding 15-percent plasticized)
- Silicone rubber.

N3203.7.3 Group C plastics. Group C plastics are plastic materials having a heat of combustion and a burning rate similar to those of ordinary combustibles. Examples of Group C plastics include, but are not limited to, the following:

- Fluoroplastics (PCTFE, polychlorotrifluoroethylene; PTFE, polytetrafluoroethylene)
- Melamine (melamine formaldehyde)
- Phenol PVC (polyvinyl chloride, rigid or plasticized less than 5 percent, e.g., pipe, pipe fittings)
- PVDC (polyvinylidene chloride)
- PVDF (polyvinylidene fluoride)
- PVF (polyvinyl fluoride)
- Urea (urea formaldehyde).

N3203.7.4 Limited quantities of Group A plastics in mixed commodities. Figure N3203.7.4 shall be used to determine the quantity of Group A plastics allowed to be stored in a package or carton or on a pallet without increasing the commodity classification.

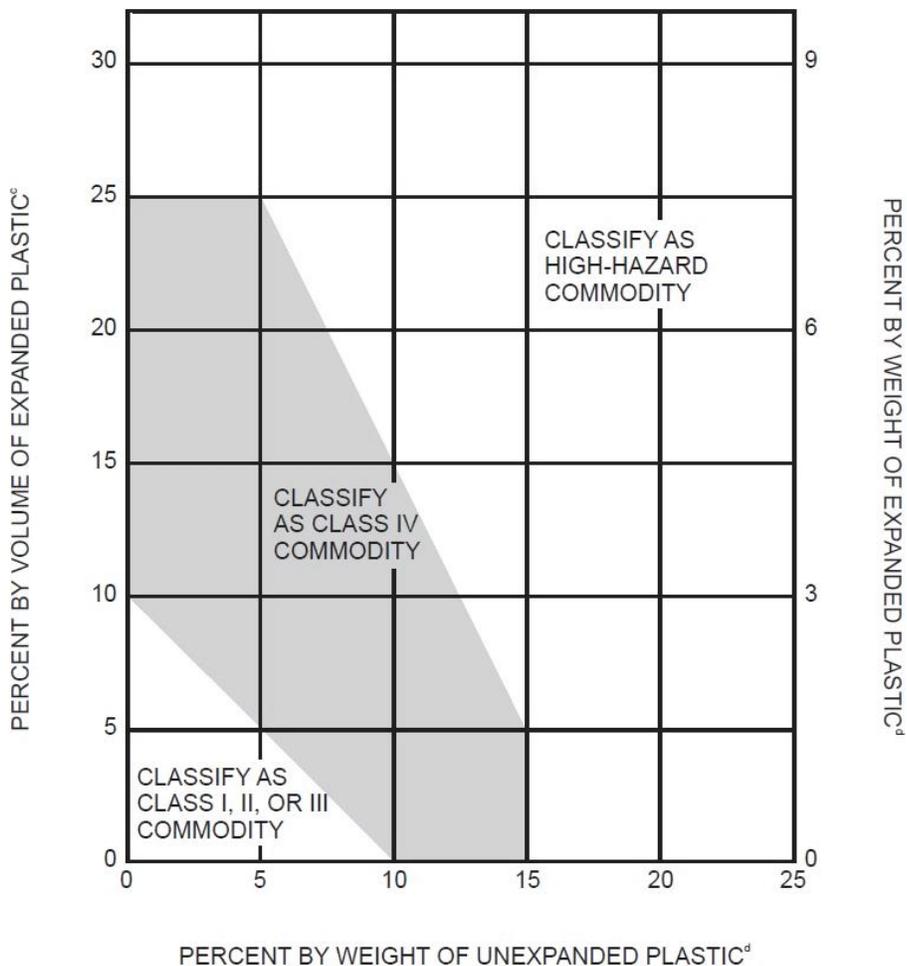


FIGURE N3203.7.4
MIXED COMMODITIES^{a,b}

- a. This figure is intended to determine the commodity classification of a mixed commodity in a package, carton or on a pallet where plastics are involved.
- b. The following is an example of how to apply the figure: A package containing a Class III commodity has 12-percent Group A expanded plastic by volume. The weight of the unexpanded Group A plastic is 10 percent. This commodity is classified as a Class IV commodity. If the weight of the unexpanded plastic is increased to 14 percent, the classification changes to a high-hazard commodity.
- c. Percent by volume = $\frac{\text{Volume of plastic in pallet load}}{\text{Total volume of pallet load, including pallet}}$
- d. Percent by weight = $\frac{\text{Weight of plastic in pallet load}}{\text{Total weight of pallet load, including pallet}}$

SECTION N3204
DESIGNATION OF HIGH-PILED STORAGE AREAS

N3204.1 General. *High-piled storage areas*, and portions of *high-piled storage areas* intended for storage of a different commodity class than adjacent areas, shall be designed and specifically designated to contain Class I, Class II, Class III, Class IV or high-hazard commodities. The designation of a *high-piled combustible storage area*, or portion thereof intended for storage of a different commodity class, shall be based on the highest hazard commodity class stored except as provided in Section N3204.2.

N3204.2 Designation based on engineering analysis. The designation of a *high-piled combustible storage area*, or portion thereof, is allowed to be based on a lower hazard class than that

of the highest class of commodity stored when a limited quantity of the higher hazard commodity has been demonstrated by engineering analysis to be adequately protected by the *automatic sprinkler system* provided. The engineering analysis shall consider the ability of the sprinkler system to deliver the higher density required by the higher hazard commodity. The higher density shall be based on the actual storage height of the pile or rack and the minimum allowable design area for sprinkler operation as set forth in the density/area figures provided in NFPA 13. The contiguous area occupied by the higher hazard commodity shall not exceed 120 square feet (11 m²) and additional areas of higher hazard commodity shall be separated from other such areas by 25 feet (7620 mm) or more. The sprinkler system shall be capable of delivering the higher density over a minimum area of 900 square feet (84 m) for wet

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pipe systems and 1,200 square feet (111 m²) for dry pipe systems. The shape of the design area shall be in accordance with Section 903 of this code.

SECTION N3205 RESERVED

SECTION N3206 HIGH-PILED COMBUSTIBLE STORAGE GENERAL FIRE PROTECTION AND LIFE SAFETY FEATURES

N3206.1 General. Fire protection and life safety features for *high-piled storage areas* shall be in accordance with Sections N3206.2 through N3206.9.

N3206.2 Extent and type of protection. Where required by Table N3206.2, fire detection systems, smoke and heat removal, draft curtains and automatic sprinkler design densities shall extend the lesser of 15 feet (4572 mm) beyond the *high-piled storage area* or to a permanent partition. Where portions of *high-piled storage areas* have different fire protection requirements because of commodity, method of storage or storage height, the fire protection features required by Table N3206.2 within this area shall be based on the most restrictive design requirements.

N3206.3 Separation of high-piled storage areas. *High-piled storage areas* shall be separated from other portions of the building where required by Sections N3206.3.1 through N3206.3.2.2.

N3206.3.1 Separation from other uses. Mixed occupancies shall be separated in accordance with this code.

N3206.3.2 Multiple high-piled storage areas. Multiple *high-piled storage areas* shall be in accordance with Section N3206.3.2.1 or N3206.3.2.2.

N3206.3.2.1 Aggregate area. The aggregate of all *highpiled storage areas* within a building shall be used for the application of Table N3206.2 unless such areas are separated from each other by 1-hour *fire barriers* constructed in accordance with Section 707 of this code. Openings in such *fire barriers* shall be protected by opening protectives having a 1- hour *fire protection rating*.

N3206.3.2.2 Multiclass high-piled storage areas. *Highpiled storage areas* classified as Class I through IV not separated from *high-piled storage areas* classified as high hazard shall utilize the aggregate of all *high-piled storage areas* as high hazard for the purposes of the application of Table N3206.2. To be considered as separated, 1-hour *fire barriers* shall be constructed in accordance with Section 707 of this code. Openings in such *fire barriers* shall be protected by opening protectives having a 1-hour *fire protection rating*.

Exception: As provided for in Section N3204.2.

N3206.4 Automatic sprinklers. *Automatic sprinkler systems* shall be provided in accordance with Sections N3207, N3208 and N3209.

N3206.5 Fire detection. Where fire detection is required by Table N3206.2, an *approved* automatic fire detection system shall be installed throughout the *high-piled storage area*. The system shall be monitored and be in accordance with Section 907 of this code.

N3206.6 Building access.

N3206.6.1 Access doors. Where building access is required by Table N3206.2, fire department access doors shall be provided in accordance with this section. Access doors shall be accessible without the use of a ladder.

N3206.6.1.1 Number of doors required. A minimum of one access door shall be provided in each 100 lineal feet (30 480 mm), or fraction thereof, of the exterior walls that face required fire apparatus access roads. The required access doors shall be distributed such that the lineal distance between adjacent access doors does not exceed 100 feet (30 480 mm).

N3206.6.1.2 Door size and type. Access doors shall not be less than 3 feet (914 mm) in width and 6 feet 8 inches (2032 mm) in height. Roll-up doors shall not be used unless *approved*.

N3206.6.1.3 Locking devices. Only *approved* locking devices shall be used.

N3206.7 Smoke and heat removal. Where smoke and heat removal are required by Table N3206.2, smoke and heat vents shall be provided in accordance with Section 910 of this code. Where draft curtains are required by Table N3206.2, they shall be provided in accordance with Section 910.3.5 of this code.

N3206.8 Fire department hose connections. Where *exit* passageways are required by this code for egress, a Class I standpipe system shall be provided in accordance with Section 905 of this code.

NOTE: Provisions which determine when standpipes are required are reprinted from the Oregon Fire Code. Installation and construction standards for standpipe systems are adopted by the Oregon Building Codes Division.

N3206.9 Aisles. Aisles providing access to *exits* and fire department access doors shall be provided in *high-piled storage areas* exceeding 500 square feet (46 m²), in accordance with Sections N3206.9.1 through N3206.9.3. Aisles separating storage piles or racks shall comply with NFPA 13. Aisles shall also comply with Chapter 10 of this code.

Exception: Where aisles are precluded by rack storage systems, alternate methods of access and protection are allowed when *approved*.

TABLE N3206.2
GENERAL FIRE PROTECTION AND LIFE SAFETY REQUIREMENTS

COMMODITY CLASS	SIZE OF HIGH-PILED STORAGE AREA ^a (see Sections N3206.2 and N3206.4)	ALL STORAGE AREAS (See Sections N3206, N3207 and N3208) ^b					SOLID-PILED STORAGE, SHELF STORAGE AND PALLETIZED STORAGE (see Section N3207.3)		
		Automatic fire-extinguishing system (see Section N3206.4)	Fire detection system (see Section N3206.5)	Building access (see Section N3206.6)	Smoke and heat removal (see Section N3206.7)	Draft curtains (see Section N3206.7)	Maximum pile dimension ^c (feet)	Maximum permissible storage height ^d (feet)	Maximum pile volume (cubic feet)
I-IV	0-500	Not Required ^a	Not Required	Not Required ^e	Not Required	Not Required	Not Required	Not Required	Not Required
	501-2,500	Not Required ^a	Yes ⁱ	Not Required ^e	Not Required	Not Required	100	40	100,000
	2,501-12,000 Public accessible	Yes	Not Required	Not Required ^e	Not Required	Not Required	100	40	400,000
	2,501-12,000 Nonpublic accessible (Option 1)	Yes	Not Required	Not Required ^e	Not Required	Not Required	100	40	400,000
	2,501-12,000 Nonpublic accessible (Option 2)	Not Required ^a	Yes	Yes	Yes ^j	Yes ^j	100	30 ^f	200,000
	12,001-20,000	Yes	Not Required	Yes	Yes ^j	Not Required	100	40	400,000
	20,001-500,000	Yes	Not Required	Yes	Yes ^j	Not Required	100	40	400,000
	Greater than 500,000 ^g	Yes	Not Required	Yes	Yes ^j	Not Required	100	40	400,000
High hazard	0-500	Not Required ^a	Not Required	Not Required ^e	Not Required	Not Required	50	Not Required	Not Required
	501-2,500 Public accessible	Yes	Not Required	Not Required ^e	Not Required	Not Required	50	30	75,000
	501-2,500 Nonpublic accessible (Option 1)	Yes	Not Required	Not Required ^e	Not Required	Not Required	50	30	75,000
	501-2,500 Nonpublic accessible (Option 2)	Not Required ^a	Yes	Yes	Yes ^j	Yes ^j	50	20	50,000
	2,501-300,000	Yes	Not Required	Yes	Yes ^j	Not Required	50	30	75,000
	300,001-500,000 ^{e, h}	Yes	Not Required	Yes	Yes ^j	Not Required	50	30	75,000

For SI: 1 foot = 304.8 mm, 1 cubic foot = 0.02832 m³, 1 square foot = 0.0929 m²

- a. When automatic sprinklers are required for reasons other than those in Sections N3201 through N3210, the portion of the sprinkler system protecting the high-piled storage area shall be designed and installed in accordance with Sections N3207 and N3208.
- b. For aisles, see Section N3206.9.
- c. Piles shall be separated by aisles complying with Section N3206.9.
- d. For storage in excess of the height indicated, special fire protection shall be provided in accordance with Note g when required by the *building official*. See also Sections N5101 through N5107 and N5701 through N5706 for special limitations for aerosols and flammable and combustible liquids, respectively.
- f. For storage exceeding 30 feet in height, Option 1 shall be used.
- g. Special fire protection provisions including, but not limited to, fire protection of exposed steel columns; increased sprinkler density; additional in-rack sprinklers, without associated reductions in ceiling sprinkler density; or additional fire department hose connections shall be provided when required by the *building official*.
- h. High-piled storage areas shall not exceed 500,000 square feet. A 2-hour fire wall constructed in accordance with Section 706 of this code shall be used to divide high-piled storage exceeding 500,000 square feet in area.
- i. Not required when an automatic fire-extinguishing system is designed and installed to protect the high-piled storage area in accordance with Sections N3207 and N3208.
- j. Not required when storage areas are protected by early suppression fast response (ESFR) sprinkler systems installed in accordance with NFPA 13.

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N3206.9.1 Width. Aisle width shall be in accordance with Sections N3206.9.1.1 and N3206.9.1.2.

Exceptions:

1. Aisles crossing rack structures or storage piles, which are used only for employee access, shall be a minimum of 24 inches (610 mm) wide.
2. Aisles separating shelves classified as shelf storage shall be a minimum of 30 inches (762 mm) wide.

N3206.9.1.1 Sprinklered buildings. Aisles in sprinklered buildings shall be a minimum of 44 inches (1118 mm) wide. Aisles shall be a minimum of 96 inches (2438 mm) wide in *high-piled storage areas* exceeding 2,500 square feet (232 m²) in area, that are accessible to the public and designated to contain high-hazard commodities.

Exception: Aisles in *high-piled storage areas* exceeding 2,500 square feet (232 m²) in area, that are accessible to the public and designated to contain high-hazard commodities, are protected by a sprinkler system designed for multiple-row racks of high-hazard commodities shall be a minimum of 44 inches (1118 mm) wide.

Aisles shall be a minimum of 96 inches (2438 mm) wide in areas accessible to the public where mechanical stocking methods are used.

N3206.9.1.2 Nonsprinklered buildings. Aisles in nonsprinklered buildings shall be a minimum of 96 inches (2438 mm) wide.

N3206.9.2 Clear height. The required aisle width shall extend from floor to ceiling. Rack structural supports and catwalks are allowed to cross aisles at a minimum height of 6 feet 8 inches (2032 mm) above the finished floor level, provided that such supports do not interfere with fire department hose stream trajectory as determined by the fire code official.

N3206.9.3 Dead ends. Dead-end aisles shall be in accordance with Chapter 10 of this code.

SECTION N3207 HIGH-PILED COMBUSTIBLE STORAGE SOLID-PILED AND SHELF STORAGE

N3207.1 General. Shelf storage and storage in solid piles, solid piles on pallets and bin box storage in bin boxes not exceeding 5 feet (1524 mm) in any dimension, shall be in accordance with Section N3206 and this section.

N3207.2 Fire protection. Where automatic sprinklers are required by Table N3206.2, an *approved automatic sprinkler system* shall be installed throughout the building or to 1-hour *fire barriers* constructed in accordance with Section 707 of this code. Openings in such *fire barriers* shall be protected by opening protectives having a 1-hour *fire protection rating*. The design and installation of the *automatic sprinkler system* and other applicable fire protection shall be in accordance with this code and NFPA 13.

N3207.2.1 Shelf storage. Shelf storage greater than 12 feet (3658 mm) but less than 15 feet (4572 mm) in height shall be in accordance with the fire protection requirements set forth in NFPA 13. Shelf storage 15 feet (4572 mm) or more in height shall be protected in an *approved* manner with special fire protection, such as in-rack sprinklers.

N3207.3 Pile dimension and height limitations. Pile dimensions, the maximum permissible storage height and pile volume shall be in accordance with Table N3206.2.

N3207.4 Array. Where an *automatic sprinkler system* design utilizes protection based on a closed array, array clearances shall be provided and maintained as specified by the standard used.

SECTION N3208 RACK STORAGE

N3208.1 General. Rack storage shall be in accordance with Section N3206 and this section. Bin boxes exceeding 5 feet (1524 mm) in any dimension shall be regulated as rack storage.

N3208.2 Fire protection. Where automatic sprinklers are required by Table N3206.2, an *approved automatic sprinkler system* shall be installed throughout the building or to 1-hour *fire barriers* constructed in accordance with Section 707 of this code. Openings in such *fire barriers* shall be protected by opening protectives having a 1-hour *fire protection rating*. The design and installation of the *automatic sprinkler system* and other applicable fire protection shall be in accordance with Section 903.3.1.1 and the applicable provisions of this code.

N3208.2.1 Plastic pallets and shelves. Storage on plastic pallets or plastic shelves shall be protected by *approved* specially engineered *fire protection systems*.

Exception: Plastic pallets *listed* and *labeled* in accordance with UL 2335 shall be treated as wood pallets for determining required sprinkler protection.

N3208.2.2 Racks with solid shelving. Racks with solid shelving having an area greater than 32 square feet (3 m²), measured between *approved* flue spaces at all four edges of the shelf, shall be in accordance with this section.

Exceptions:

1. Racks with mesh, grated, slatted or similar shelves having uniform openings not more than 6 inches (152 mm) apart, comprised of at least 50 percent of the overall shelf area, and with *approved* flue spaces are allowed to be treated as racks without solid shelves.
2. Racks used for the storage of combustible paper records, with solid shelving, shall be in accordance with NFPA 13.

N3208.2.2.1 Fire protection. Fire protection for racks with solid shelving shall be in accordance with NFPA 13.

N3208.3 Flue spaces. Flue spaces shall be provided in accordance with Table N3208.3.

TABLE N3208.3
REQUIRED FLUE SPACES FOR RACK STORAGE

RACK CONFIGURATION	AUTOMATIC SPRINKLER PROTECTION		SPRINKLER AT THE CEILING WITH OR WITHOUT MINIMUM IN-RACK SPRINKLERS			IN-RACK SPRINKLERS AT EVERY TIER	NONSPRINKLERED
			≤ 25 feet		> 25 feet		
	Storage height		Option 1	Option 2		Any height	Any height
Single-row rack	Transverse flue space	Size ^b	3 inches	Not Applicable	3 inches	Not Required	Not Required
		Vertically aligned	Not Required	Not Applicable	Yes	Not Applicable	Not Required
	Longitudinal flue space		Not Required	Not Applicable	Not Required	Not Required	Not Required
Double-row rack	Transverse flue space	Size ^b	6 inches ^a	3 inches	3 inches	Not Required	Not Required
		Vertically aligned	Not Required	Not Required	Yes	Not Applicable	Not Required
	Longitudinal flue space		Not Required	6 inches	6 inches	Not Required	Not Required
Multi-row rack	Transverse flue space	Size ^b	6 inches	Not Applicable	6 inches	Not Required	Not Required
		Vertically aligned	Not Required	Not Applicable	Yes	Not Applicable	Not Required
	Longitudinal flue space		Not Required	Not Applicable	Not Required	Not Required	Not Required

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Three-inch transverse flue spaces shall be provided at least every 10 feet where ESFR sprinkler protection is provided.
- b. Random variations are allowed, provided that the configuration does not obstruct water penetration.

N3208.3.1 Flue space protection. Where required by the *building official*, flue spaces required by Table N3208.3, in single-, double-, or multiple-row rack storage installations shall be equipped with *approved* devices to protect the required flue spaces. Such devices shall not be removed or modified.

N3208.4 Column protection. Steel building columns shall be protected in accordance with NFPA 13.

N3208.5 Extra-high-rack storage systems. Approval of the *building official* shall be obtained prior to installing extra-high-rack combustible storage.

N3208.5.1 Fire protection. Buildings with extra-high-rack combustible storage shall be protected with a specially engineered *automatic sprinkler system*. Extra-high-rack combustible storage shall be provided with additional special fire protection, such as separation from other buildings and additional built-in fire protection features and fire department access, when required by the *building official*.

**SECTION N3209
HIGH-PILED COMBUSTIBLE AUTOMATED STORAGE**

N3209.1 General. Automated storage shall be in accordance with this section.

N3209.2 Automatic sprinklers. Where automatic sprinklers are required by Table N3206.2, the building shall be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code.

N3209.3 Carousel storage. *High-piled storage areas* having greater than 500 square feet (46 m²) of carousel storage shall be provided with automatic shutdown in accordance with one of the following:

1. An automatic smoke detection system installed in accordance with Section 907 of this code, with coverage extending 15 feet (4575 mm) in all directions beyond unenclosed carousel storage systems and which sounds a local alarm at the operator’s station and stops the carousel storage system upon the activation of a single detector.
2. An automatic smoke detection system installed in accordance with Section 907 of this code and within enclosed carousel storage systems, which sounds a local alarm at the operator’s station and stops the carousel storage system upon the activation of a single detector.
3. A single dead-man-type control switch that allows the operation of the carousel storage system only when the operator is present. The switch shall be in the same room as the carousel storage system and located to provide for observation of the carousel system.

N3209.4 Automated rack storage. *High-piled storage areas* with automated rack storage shall be provided with a manually activated emergency shutdown switch for use by emergency personnel. The switch shall be clearly identified and shall be in a location *approved* by the *building official*.

**SECTION N3210
HIGH-PILED COMBUSTIBLE STORAGE SPECIALTY STORAGE**

N3210.1 General. Records storage facilities used for the rack or shelf storage of combustible paper records greater than 12 feet (3658 mm) in height shall be in accordance with Sections N3206 and N3208 and NFPA 13. Palletized storage of records shall be in accordance with Section N3207.

**CHAPTER N34
TIRE REBUILDING AND TIRE STORAGE**

**SECTION N3401 [3403]
TIRE REBUILDING**

N3401.1 [3403.1] Construction. Tire rebuilding plants shall comply with the requirements of Section 502.17 of the *Mechanical Code* and this code, as to construction, separation from other buildings or other portions of the same building, and protection.

N3401.2 [3403.2] Location. Buffing operations shall be located in a room separated from the remainder of the building housing the tire rebuilding or tire recapping operations by a 1-hour *fire barrier*.

Exception: Buffing operations are not required to be separated where all of the following conditions are met:

1. Buffing operations are equipped with an *approved* continuous automatic water-spray system directed at the point of cutting action;
2. Buffing machines are connected to particle-collecting systems providing a minimum air movement of 1,500 cubic feet per minute (cfm) (0.71 m³/s) in volume and 4,500 feet per minute (fpm) (23 m/s) in-line velocity; and
3. The collecting system shall discharge the rubber particles to an *approved* outdoor noncombustible or fire-resistant container.

N3401.3 [3403.4] Spray rooms and booths. Each spray room or spray booth where flammable or combustible solvents are applied, shall comply with applicable requirements in Sections N2401 through N2409.

**CHAPTER N50
HAZARDOUS MATERIALS**

**SECTION N5001
GENERAL**

N5001.1 Scope. Prevention, control and mitigation of dangerous conditions related to storage, dispensing, use and handling of hazardous materials shall be in accordance with Sections N5001 through N5005. These sections shall apply to all hazardous materials, including those materials regulated elsewhere in this code, except that when specific requirements are provided in other sections, those specific requirements shall apply in accordance with the applicable section. Where a material has multiple hazards, all hazards shall be addressed.

Exceptions:

1. In retail or wholesale sales occupancies, the quantities of medicines, foodstuffs, consumer or industrial products and cosmetics containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable shall not be limited, provided such materials are

packaged in individual containers not exceeding 1.3 gallons (5 L).

2. Quantities of alcoholic beverages in retail or wholesale sales occupancies shall not be limited providing the liquids are packaged in individual containers not exceeding 1.3 gallons (5 L).
3. Building materials not otherwise regulated by this code.
4. Refrigeration systems (see Section N606).
5. Stationary storage battery systems regulated by Section N608.
6. The display, storage, or sale of fireworks and *explosives*.
7. *Corrosives* utilized in personal and household products in the manufacturers' original consumer packaging in Group M occupancies.
8. The storage of distilled spirits and wines in wooden barrels and casks.
9. The use of wall-mounted dispensers containing alcohol-based hand rubs classified as Class I or II liquids

**SECTION N5002
DEFINITIONS**

N5002.1 Definitions. The following terms are defined in Section N202:

- CHEMICAL.**
- CHEMICAL NAME.**
- CLOSED CONTAINER.**
- CYLINDER.**
- DESIGN PRESSURE.**
- EXCESS FLOW CONTROL.**
- EXHAUSTED ENCLOSURE.**
- LIQUID.**
- LOWER EXPLOSIVE LIMIT (LEL).**
- MATERIAL SAFETY DATA SHEET (MSDS).**
- MAXIMUM ALLOWABLE QUANTITY PER CONTROL AREA.**
- OUTDOOR CONTROL AREA.**
- PERMISSIBLE EXPOSURE LIMIT (PEL).**
- PRESSURE VESSEL.**
- SECONDARY CONTAINMENT.**
- SEGREGATED.**
- SYSTEM.**
- TANK, ATMOSPHERIC.**
- TANK, PORTABLE.**
- TANK, STATIONARY.**
- TANK VEHICLE.**
- UNAUTHORIZED DISCHARGE.**

**SECTION N5003
HAZARDOUS MATERIALS
GENERAL REQUIREMENTS**

N5003.1 Scope. The storage, use and handling of all hazardous materials shall be in accordance with this section.

N5003.1.1 Maximum allowable quantity per control area. The *maximum allowable quantity per control area* shall be as specified in Tables 307.1(1) and 307.1(2) of this code.

N5003.1.2 Conversion. Where quantities are indicated in pounds and when the weight per gallon of the liquid is not provided to the *building official*, a conversion factor of 10 pounds per gallon (1.2 kg/L) shall be used.

N5003.1.3 Quantities not exceeding the maximum allowable quantity per control area. The storage, use and handling of hazardous materials in quantities not exceeding the *maximum allowable quantity per control area* indicated in Tables 307.1(1) and 307.1(2) of this code shall be in accordance with Sections N5001 and N5003.

N5003.1.4 Quantities exceeding the maximum allowable quantity per control area. The storage and use of hazardous materials in quantities exceeding the *maximum allowable quantity per control area* indicated in Tables 307.1(1) and 307.1(2) of this code shall be in accordance with Sections N5001 through N5005.

N5003.2 Systems, equipment and processes.

N5003.2.1 [5003.2.3] Equipment, machinery and alarms. Equipment, machinery and required detection and alarm systems associated with the use, storage or handling of hazardous materials shall be listed or *approved*.

N5003.2.2 [5003.2.4] Installation of tanks. Installation of tanks shall be in accordance with Sections N5003.2.2.1 through N5003.2.2.2.

N5003.2.2.2 [5003.2.4.2] Above-ground tanks. Above-ground stationary tanks used for the storage of hazardous materials shall be located and protected in accordance with the requirements for outdoor storage of the particular material involved.

Exception: Above-ground tanks that are installed in vaults complying with Section N5303.1 or N5704.2.8 shall not be required to comply with location and protection requirements for outdoor storage.

N5003.2.3 [5003.2.8] Seismic protection. Machinery and equipment utilizing hazardous materials shall be braced and anchored in accordance with the seismic design requirements of this code for the seismic design category in which the machinery or equipment is classified.

N5003.3-N5003.7 Reserved.

N5003.8 Construction requirements. Buildings, *control areas*, enclosures and cabinets for hazardous materials shall be in accordance with Sections N5003.8.1 through N5003.8.6.3.

N5003.8.1 Buildings. Buildings, or portions thereof, in which hazardous materials are stored, handled or used shall be constructed in accordance with this code.

N5003.8.2 Required detached buildings. Group H occupancies containing quantities of hazardous materials in excess of those set forth in Table 415.5.2 of this code shall be in detached buildings.

N5003.8.3 Control areas. *Control areas* shall comply with Section 414.2 of this code.

N5003.8.4 Gas rooms. Where a gas room is provided to comply with the provisions of Sections N6001 through N6005, the gas room shall be in accordance with Sections N5003.8.4.1 and N5003.8.4.2.

N5003.8.4.1 Construction. Gas rooms shall be protected with an *automatic sprinkler system*. Gas rooms shall be separated from the remainder of the building in accordance with the requirements of this code based on the occupancy group into which it has been classified.

N5003.8.4.2 Ventilation system. The ventilation system for gas rooms shall be designed to operate at a negative pressure in relation to the surrounding area. Highly toxic and toxic gases shall also comply with Section N6004.2.2.6. The ventilation system shall be installed in accordance with the *Mechanical Code*.

N5003.8.5 Exhausted enclosures. Where an exhausted enclosure is used to increase *maximum allowable quantity per control area* or when the location of hazardous materials in exhausted enclosures is provided to comply with the provisions of Sections N6001 through N6005, the exhausted enclosure shall be in accordance with Sections N5003.8.5.1 through N5003.8.5.3.

N5003.8.5.1 Construction. Exhausted enclosures shall be of noncombustible construction.

N5003.8.5.2 Ventilation. Exhausted enclosures shall be provided with an exhaust ventilation system. The ventilation system for exhausted enclosures shall be designed to operate at a negative pressure in relation to the surrounding area. Ventilation systems used for highly toxic and toxic gases shall also comply with Items 1, 2 and 3 of Section N6004.1.2. The ventilation system shall be installed in accordance with the *Mechanical Code*.

N5003.8.5.3 Fire-extinguishing system. Exhausted enclosures where flammable materials are used shall be protected by an approved automatic fire-extinguishing system in accordance with Chapter 9 of this code.

N5003.8.6 Gas cabinets. Where a gas cabinet is used to increase the *maximum allowable quantity per control area* or when the location of *compressed gases* in gas cabinets is provided to comply with the provisions of Sections N6001 through N6005, the gas cabinet shall be in accordance with Sections N5003.8.6.1 through N5003.8.6.3.

N5003.8.6.1 Construction. Gas cabinets shall be constructed in accordance with the following:

1. Constructed of not less than 0.097-inch (2.5 mm) (No. 12 gage) steel.
2. Be provided with self-closing limited access ports or noncombustible windows to give access to equipment controls.
3. Be provided with self-closing doors.
4. Gas cabinet interiors shall be treated, coated or constructed of materials that are compatible with the

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hazardous materials stored. Such treatment, coating or construction shall include the entire interior of the cabinet.

N5003.8.6.2 Ventilation. Gas cabinets shall be provided with an exhaust ventilation system. The ventilation system for gas cabinets shall be designed to operate at a negative pressure in relation to the surrounding area. Ventilation systems used for highly toxic and toxic gases shall also comply with Items 1, 2 and 3 of Section N6004.1.2. The ventilation system shall be installed in accordance with the *Mechanical Code*.

N5003.8.6.3 Maximum number of cylinders per gas cabinet. The number of cylinders contained in a single gas cabinet shall not exceed three.

N5003.8.7 Hazardous materials storage cabinets. Where storage cabinets are used to increase *maximum allowable quantity per control area* or to comply with this code, such cabinets shall be in accordance with Sections N5003.8.7.1 and N5003.8.7.2.

N5003.8.7.1 Construction. The interior of cabinets shall be treated, coated or constructed of materials that are nonreactive with the hazardous material stored. Such treatment, coating or construction shall include the entire interior of the cabinet. Cabinets shall either be *listed* in accordance with UL 1275 as suitable for the intended storage or constructed in accordance with the following:

1. Cabinets shall be of steel having a thickness of not less than 0.0478 inch (1.2 mm) (No. 18 gage). The cabinet, including the door, shall be double walled with a 1½ -inch (38 mm) airspace between the walls. Joints shall be riveted or welded and shall be tight fitting. Doors shall be well fitted, self-closing and equipped with a self-latching device.
2. The bottoms of cabinets utilized for the storage of liquids shall be liquid tight to a minimum height of 2 inches (51 mm). Electrical equipment and devices within cabinets used for the storage of hazardous gases or liquids shall be in accordance with the *Electrical Code*.

N5003.8.7.2 Warning markings. Cabinets shall be clearly identified in an approved manner with red letters on a contrasting background to read: HAZARDOUS—KEEP FIRE AWAY.

N5003.9 General safety precautions.

N5003.9.1 [5003.9.3] Protection from vehicles. Guard posts or other approved means shall be provided to protect storage tanks and connected piping, valves and fittings; dispensing areas; and use areas subject to vehicular damage in accordance with Section N303.

N5003.9.2 [5003.9.8] Separation of incompatible materials. *Incompatible materials* in storage and storage of materials that are incompatible with materials in use shall be separated when the stored materials are in containers having a capacity of more than 5 pounds (2 kg) or 0.5 gallon (2 L). Separation shall be accomplished by:

1. Segregating *incompatible materials* in storage by a distance of not less than 20 feet (6096 mm).
2. Isolating *incompatible materials* in storage by a noncombustible partition extending not less than 18 inches (457 mm) above and to the sides of the stored material.
3. Storing liquid and solid materials in hazardous material storage cabinets.
4. Storing *compressed gases* in gas cabinets or exhausted enclosures in accordance with Sections N5003.8.5 and N5003.8.6. Materials that are incompatible shall not be stored within the same cabinet or exhausted enclosure.

N5003.9.3 [5003.9.9] Shelf storage. Shelving shall be of substantial construction, and shall be braced and anchored in accordance with the seismic design requirements of this code for the seismic zone in which the material is located. Shelving shall be treated, coated or constructed of materials that are compatible with the hazardous materials stored. Shelves shall be provided with a lip or guard when used for the storage of individual containers.

Exception: Storage in hazardous material storage cabinets or laboratory furniture specifically designed for such use.

N5003.9.4 [5003.9.10] Safety cans. Safety cans shall be *listed* in accordance with UL 30 when used to increase the *maximum allowable quantities per control area* of flammable or *combustible liquids* in accordance with Table 307.1(1) of this code. Safety cans *listed* in accordance with UL 1313 are allowed for flammable and *combustible liquids* when not used to increase the *maximum allowable quantities per control area* and for other hazardous material liquids in accordance with the listing.

N5003.10 Reserved.

N5003.11 Group M storage and display and Group S storage. The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single *control area* of a Group M occupancy, or stored in a single *control area* of a Group S occupancy, is allowed to exceed the *maximum allowable quantity per control area* indicated in Section N5003.1 when in accordance with Sections N5003.11.1 through N5003.11.3.3.

N5003.11.1 Maximum allowable quantity per control area in Group M or S occupancies. The aggregate amount of nonflammable solid and nonflammable or noncombustible liquid hazardous materials stored and displayed within a single *control area* of a Group M occupancy or stored in a single *control area* of a Group S occupancy shall not exceed the amounts set forth in Table 414.2.5(1) of this code.

N5003.11.2 Reserved.

N5003.11.3 Storage and display. Storage and display shall be in accordance with Sections N5003.11.3.1 through N5003.11.3.3.

N5003.11.3.1 Density. Storage and display of solids shall not exceed 200 pounds per square foot (976 kg/m²) of floor area actually occupied by solid merchandise. Storage and display of liquids shall not exceed 20 gallons per square

foot (0.50 L/m²) of floor area actually occupied by liquid merchandise.

N5003.11.3.2 [5003.11.3.4] Racks and shelves. Racks and shelves used for storage or display shall be in accordance with Section N5003.9.2.

N5003.11.3.3 [5003.11.3.8] Floors. Floors shall be in accordance with Section N5004.12

SECTION N5004 STORAGE

N5004.1 Scope. Storage of hazardous materials in amounts exceeding the *maximum allowable quantity per control area* as set forth in Section N5003.1 shall be in accordance with Sections N5001, N5003 and N5004. Storage of hazardous materials in amounts not exceeding the *maximum allowable quantity per control area* as set forth in Section N5003.1 shall be in accordance with Sections N5001 and N5003. Retail and wholesale storage and display of nonflammable solid and nonflammable and noncombustible liquid hazardous materials in Group M occupancies and Group S storage shall be in accordance with Section N5003.11

N5004.2 Spill control and secondary containment for liquid and solid hazardous materials. Rooms or buildings used for the storage of liquid or solid hazardous materials shall be provided with spill control and secondary containment in accordance with Sections N5004.2.1 and N5004.2.2.

N5004.2.1 Spill control for hazardous material liquids. Rooms or buildings used for the storage of hazardous material liquids in individual vessels having a capacity of more than 55 gallons (208 L), or in which the aggregate capacity of multiple vessels exceeds 1,000 gallons (3785 L), shall be provided with spill control to prevent the flow of liquids to adjoining areas. Floors shall be constructed to contain a spill from the largest single vessel by one of the following methods:

1. Liquid-tight sloped or recessed floors
2. Liquid-tight floors provided with liquid-tight raised or recessed sills or dikes.
3. Sumps and collection systems.
4. Other *approved* engineered systems.

Except for surfacing, the floors, sills, dikes, sumps and collection systems shall be constructed of noncombustible material, and the liquid-tight seal shall be compatible with the material stored. When liquid-tight sills or dikes are provided, they are not required at perimeter openings having an open-gate trench across the opening that connects to an approved collection system.

N5004.2.2 Secondary containment for hazardous material liquids and solids. Where required by Table N5004.2.2 buildings or rooms used for the storage of hazardous materials liquids or solids shall be provided with secondary containment in accordance with this section when the capacity of an individual vessel or the aggregate capacity of multiple vessels exceeds the following:

1. Liquids: Capacity of an individual vessel exceeds 55 gallons (208 L) or the aggregate capacity of multiple vessels exceeds 1,000 gallons (3785 L); and
2. Solids: Capacity of an individual vessel exceeds 550 pounds (250 kg) or the aggregate capacity of multiple vessels exceeds 10,000 pounds (4540 kg).

N5004.2.2.1 Containment and drainage methods. The building, room or area shall contain or drain the hazardous materials and fire protection water through the use of one of the following methods:

1. Liquid-tight sloped or recessed floors .
2. Liquid-tight floors provided with liquid-tight raised or recessed sills or dikes.
3. Sumps and collection systems.
4. Drainage systems leading to an *approved* location.
5. Other *approved* engineered systems.

N5004.2.2.2 Incompatible materials. *Incompatible materials* used in *open systems* shall be separated from each other in the secondary containment system.

N5004.2.2.3 Indoor design. Secondary containment for indoor storage areas shall be designed to contain a spill from the largest vessel plus the design flow volume of fire protection water calculated to discharge from the fire-extinguishing system over the minimum required system design area or area of the room or area in which the storage is located, whichever is smaller. The containment capacity shall be designed to contain the flow for a period of 20 minutes.

N5004.2.2.4 Reserved.

N5004.2.2.5 Monitoring. An *approved* monitoring method shall be provided to detect hazardous materials in the secondary containment system. The monitoring method is allowed to be visual inspection of the primary or secondary containment, or other *approved* means. Where secondary containment is subject to the intrusion of water, a monitoring method for detecting water shall be provided. Where monitoring devices are provided, they shall be connected to *approved* visual or audible alarms.

N5004.2.2.6 Drainage system design. Drainage systems shall be in accordance with the *Plumbing Code* and all of the following:

1. The slope of floors to drains shall not be less than 1 percent.
2. Drains shall be sized to carry the volume of the fire protection water as determined by the design density discharged from the automatic fire-extinguishing system over the minimum required system design area or area of the room or area in which the storage is located, whichever is smaller.
3. Materials of construction for drainage systems shall be compatible with the materials stored.

**TABLE N5004.2.2
REQUIRED SECONDARY CONTAINMENT—HAZARDOUS MATERIAL SOLIDS AND LIQUIDS STORAGE**

MATERIAL	INDOOR STORAGE		OUTDOOR STORAGE		
	Solids	Liquids	Solids	Liquids	
1. Physical-hazard materials					
Combustible liquids	Class II	Not Applicable	See Sections N5701 - N5706	Not Applicable	See Sections N5701 - N5706
	Class IIIA				
	Class IIIB				
Cryogenic fluids			See Sections N5501 - N5505		See Sections N5501 - N5505
Explosives		See Sections N5601 - N5605		See Sections N5601 - N5605	
Flammable liquids	Class IA	Not Applicable	See Sections N5701 - N5706	Not Applicable	See Sections N5701 - N5706
	Class IB				
	Class IC				
Flammable solids		Not Required	Not Applicable	Not Required	Not Applicable
Organic peroxides	Unclassified Detonable	Required	Required	Not Required	Not Required
	Class I				
	Class II				
	Class III				
	Class IV				
	Class V	Not Required	Not Required	Not Required	Not Required
Oxidizers	Class 4	Required	Required	Not Required	Not Required
	Class 3				
	Class 2				
	Class 1				
Pyrophorics		Not Required	Required	Not Required	Required
Unstable (reactives)	Class 4	Required	Required	Required	Required
	Class 3				
	Class 2				
	Class 1				
Water reactives	Class 3	Required	Required	Required	Required
	Class 2				
	Class 1				
2. Health-hazard materials					
Corrosives		Not Required	Required	Not Required	Required
Highly toxics		Required	Required	Required	Required
Toxics					

4. *Incompatible materials* used in *open systems* shall be separated from each other in the drainage system.
5. Drains shall terminate in an *approved* location away from buildings, valves, *means of egress*, fire access roadways, adjoining property and storm drains.

[M] N5004.3 Ventilation. Indoor storage areas and storage buildings shall be provided with mechanical exhaust ventilation or natural ventilation where natural ventilation can be shown to be acceptable for the materials as stored.

Exception: Storage areas for flammable solids complying with Sections N5901 through N5906.

[M] N5004.3.1 System requirements. Exhaust ventilation systems shall comply with all of the following:

1. Installation shall be in accordance with the *Mechanical Code*.

2. Mechanical ventilation shall be at a rate of not less than 1 cubic foot per minute per square foot [0.00508 m³/(s • m²)] of floor area over the storage area.
3. Systems shall operate continuously unless alternative designs are *approved*.
4. A manual shutoff control shall be provided outside of the room in a position adjacent to the access door to the room or in an *approved* location. The switch shall be a break-glass or other *approved* type and shall be *labeled*: VENTILATION SYSTEM EMERGENCY SHUTOFF.
5. Exhaust ventilation shall be designed to consider the density of the potential fumes or vapors released. For fumes or vapors that are heavier than air, exhaust shall be taken from a point within 12 inches (305 mm) of the floor. For fumes or vapors that are lighter than air, exhaust shall be taken from a point within 12 inches (305 mm) of the highest point of the room.

6. The location of both the exhaust and inlet air openings shall be designed to provide air movement across all portions of the floor or room to prevent the accumulation of vapors.
7. Exhaust air shall not be recirculated to occupied areas if the materials stored are capable of emitting hazardous vapors and contaminants have not been removed. Air contaminated with explosive or flammable vapors, fumes or dusts; flammable, highly toxic or toxic gases; or radioactive materials shall not be recirculated.

N5004.4 Separation of incompatible hazardous materials. *Incompatible materials* shall be separated in accordance with Section N5003.9.2.

N5004.5 Automatic sprinkler systems. Indoor storage areas and storage buildings shall be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code. The design of the sprinkler system shall not be less than that required for Ordinary Hazard Group 2 with a minimum design area of 3,000 square feet (279 m²). Where the materials or storage arrangement are required by other regulations to be provided with a higher level of sprinkler system protection, the higher level of sprinkler system protection shall be provided.

N5004.6 Explosion control. Indoor storage rooms, areas and buildings shall be provided with explosion control in accordance with Section N901.

N5004.7 Standby or emergency power. Where mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with the *Electrical Code* and Chapter 27 of this code.

Exceptions:

1. Mechanical ventilation for storage of Class IB and Class IC flammable and *combustible liquids* in closed containers not exceeding 6½ gallons (25 L) capacity.
2. Storage areas for Class 1 and 2 oxidizers.
3. Storage areas for Class II, III, IV and V organic peroxides.
4. Storage areas for asphyxiant, irritant and radioactive gases.
5. For storage areas for highly toxic or toxic materials, see Sections N6004.2.2.8 and N6004.3.4.2.
6. Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an *approved* fail-safe engineered system is installed.

N5004.8 Limit controls. Limit controls shall be provided in accordance with Sections N5004.8.1 and N5004.8.2.

N5004.8.1 Temperature control. Materials that must be kept at temperatures other than normal ambient temperatures to prevent a hazardous reaction shall be provided with an *approved* means to maintain the temperature within a safe range. Redundant temperature control equipment that will

operate on failure of the primary temperature control system shall be provided. Where *approved*, alternative means that prevent a hazardous reaction are allowed.

N5004.8.2 Pressure control. Stationary tanks and equipment containing hazardous material liquids that can generate pressures exceeding design limits because of exposure fires or internal reaction shall have some form of construction or other *approved* means that will relieve excessive internal pressure. The means of pressure relief shall vent to an *approved* location or to an exhaust scrubber or treatment system where required by Sections N6001 through N6005.

N5004.9 Emergency alarm. An *approved* manual emergency alarm system shall be provided in buildings, rooms or areas used for storage of hazardous materials. Emergency alarm-initiating devices shall be installed outside of each interior *exit* or *exit access* door of storage buildings, rooms or areas. Activation of an emergency alarm-initiating device shall sound a local alarm to alert occupants of an emergency situation involving hazardous materials.

N5004.10 Supervision and monitoring. Emergency alarm, detection and automatic fire-extinguishing systems required by Section N5004 shall be electrically supervised and monitored by an *approved* supervising station or, when approved, shall initiate an audible and visual signal at a constantly attended on-site location.

N5004.11 Reserved.

N5004.12 Noncombustible floor. Except for surfacing, floors of storage areas shall be of noncombustible construction.

N5004.13 Weather protection. Where overhead noncombustible construction is provided for sheltering outdoor hazardous material storage areas, such storage shall not be considered indoor storage when the area is constructed in accordance with the requirements for weather protection as required by this code.

Exception: Storage of *explosive* materials shall be considered as indoor storage.

SECTION N5005 USE, DISPENSING AND HANDLING

N5005.1 General. Use, dispensing and handling of hazardous materials in amounts exceeding the *maximum allowable quantity per control area* set forth in Section N5003.1 shall be in accordance with Sections N5001, N5003 and N5005. Use, dispensing and handling of hazardous materials in amounts not exceeding the *maximum allowable quantity per control area* set forth in Section N5003.1 shall be in accordance with Sections N5001 and N5003.

N5005.1.1 Separation of incompatible materials. Separation of *incompatible materials* shall be in accordance with Section N5003.9.1.

N5005.1.2 Noncombustible floor. Except for surfacing, floors of areas where liquid or solid hazardous materials are dispensed or used in *open systems* shall be of noncombustible, liquid-tight construction.

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N5005.1.3 Spill control and secondary containment for hazardous material liquids. Where required by other provisions of Section N5005, spill control and secondary containment shall be provided for hazardous material liquids in accordance with Section N5004.2.

N5005.1.4 Limit controls. Limit controls shall be provided in accordance with Sections N5005.1.4.1 through N5005.1.4.4.

N5005.1.4.1 High-liquid-level control. Open tanks in which liquid hazardous materials are used shall be equipped with a liquid-level limit control or other means to prevent overfilling of the tank.

N5005.1.4.2 Low-liquid-level control. *Approved* safeguards shall be provided to prevent a low-liquid level in a tank from creating a hazardous condition, including but not limited to, overheating of a tank or its contents.

N5005.1.4.3 Temperature control. Temperature control shall be provided in accordance with Section N5004.8.1.

N5005.1.4.4 Pressure control. Pressure control shall be provided in accordance with Section N5004.8.2.

N5005.1.5 Standby or emergency power. Where mechanical ventilation, treatment systems, temperature control, manual alarm, detection or other electrically operated systems are required, such systems shall be provided with an emergency or standby power system in accordance with *the Electrical Code*, Chapter 27 of this code and Section N604.

Exceptions:

1. Standby power for mechanical ventilation, treatment systems and temperature control systems shall not be required where an *approved* fail-safe engineered system is installed.
2. Systems for highly toxic or toxic gases shall be provided with emergency power in accordance with Sections N6004.2.2.8 and N6004.3.4.2.

N5005.1.6 Supervision and monitoring. Manual alarm, detection and automatic fire-extinguishing systems required by other provisions of Section N5005 shall be electrically supervised and monitored by an *approved* supervisory service or, when *approved*, shall initiate an audible and visual signal at a constantly attended on-site location.

N5005.1.7 Lighting. Adequate lighting by natural or artificial means shall be provided.

N5005.1.8 Fire-extinguishing systems. Indoor rooms or areas in which hazardous materials are dispensed or used shall be protected by an automatic fire-extinguishing system in accordance with Chapter 9 of this code. Sprinkler system design shall not be less than that required for Ordinary Hazard, Group 2, with a minimum design area of 3,000 square feet (279 m²). Where the materials or storage arrangement are required by other regulations to be provided with a higher level of sprinkler system protection, the higher level of sprinkler system protection shall be provided.

[M] N5005.1.9 Ventilation. Indoor dispensing and use areas shall be provided with exhaust ventilation in accordance with Section N5004.3.

Exception: Ventilation is not required for dispensing and use of flammable solids other than finely divided particles.

N5005.2 Indoor dispensing and use. Indoor dispensing and use of hazardous materials shall be in buildings complying with this code and in accordance with Section N5005.1 and Sections N5005.2.1 through N5005.2.2.4.

N5005.2.1 Open systems. Dispensing and use of hazardous materials in open containers or systems shall be in accordance with Sections N5005.2.1.1 through N5005.2.1.4.

[M] N5005.2.1.1 Ventilation. Where gases, liquids or solids having a hazard ranking of 3 or 4 in accordance with NFPA 704 are dispensed or used, mechanical exhaust ventilation shall be provided to capture gases, fumes, mists or vapors at the point of generation.

Exception: Gases, liquids or solids that can be demonstrated not to create harmful gases, fumes, mists or vapors.

N5005.2.1.2 Explosion control. Explosion control shall be provided in accordance with Section N5004.6 when an explosive environment can occur because of the characteristics or nature of the hazardous materials dispensed or used, or as a result of the dispensing or use process.

N5005.2.1.3 Spill control for hazardous material liquids. Buildings, rooms or areas where hazardous material liquids are dispensed into vessels exceeding a 1.3-gallon (5 L) capacity or used in *open systems* exceeding a 5.3-gallon (20 L) capacity shall be provided with spill control in accordance with Section N5004.2.1.

N5005.2.1.4 Secondary containment for hazardous material liquids. Where required by Table N5005.2.1.4, buildings, rooms or areas where hazardous material liquids are dispensed or used in *open systems* shall be provided with secondary containment in accordance with Section N5004.2.2 when the capacity of an individual vessel or system or the capacity of multiple vessels or systems exceeds the following:

1. Individual vessel or system: greater than 1.3 gallons (5 L).
2. Multiple vessels or systems: greater than 5.3 gallons (20 L).

N5005.2.2 Closed systems. Use of hazardous materials in closed containers or systems shall be in accordance with Sections N5005.2.2.1 through N5005.2.2.4.

[M] N5005.2.2.1 Ventilation. Where *closed systems* are designed to be opened as part of normal operations, ventilation shall be provided in accordance with Section N5005.2.1.1.

**TABLE N5005.2.1.4
REQUIRED SECONDARY CONTAINMENT—HAZARDOUS MATERIAL LIQUIDS USE**

MATERIAL	INDOOR LIQUIDS USE	OUTDOOR LIQUIDS USE	
1. Physical-hazard materials			
Combustible liquids	Class II	See Sections N5701 - N5706	
	Class IIIA	See Sections N5701 - N5706	
	Class IIIB	See Sections N5701 - N5706	
Cryogenic fluids	See Sections N5501 - N5505		
Explosives	See Sections N5601 - N5605		
Flammable liquids	Class IA	See Sections N5701 - N5706	
	Class IB	See Sections N5701 - N5706	
	Class IC	See Sections N5701 - N5706	
Flammable solids	Not Applicable	Not Applicable	
Organic peroxides	Unclassified Detonable	Required	Required
	Class I	Required	Required
	Class II		
	Class III		
	Class IV	Not Required	Not Required
Class V			
Oxidizers	Class 4	Required	Required
	Class 3		
	Class 2		
	Class 1		
Pyrophorics	Required	Required	
Unstable (reactives)	Class 4	Required	Required
	Class 3		
	Class 2	Not Required	Required
	Class 1		
Water reactives	Class 3	Required	Required
	Class 2	Not Required	Required
	Class 1		
2. Health-hazard materials			
Corrosives	Required	Required	
Highly toxics			
Toxics			

N5005.2.2.2 Explosion control. Explosion control shall be provided in accordance with Section N5004.6 where an explosive environment exists because of the hazardous materials dispensed or used, or as a result of the dispensing or use process.

Exception: Where process vessels are designed to contain fully the worst-case explosion anticipated within the vessel under process conditions based on the most likely failure.

N5005.2.2.3 Spill control for hazardous material liquids. Buildings, rooms or areas where hazardous material liquids are used in individual vessels exceeding a 55-gallon (208 L) capacity shall be provided with spill control in accordance with Section N5004.2.1.

N5005.2.2.4 Secondary containment for hazardous material liquids. Where required by Table N5005.2.1.4, buildings, rooms or areas where hazardous material liquids are used in vessels or systems shall be provided with secondary containment in accordance with Section N5004.2.2 when the capacity of an individual vessel or

system or the capacity of multiple vessels or systems exceeds the following:

1. Individual vessel or system: greater than 55 gallons (208 L).
2. Multiple vessels or systems: greater than 1,000 gallons (3785 L).

N5005.3 Outdoor dispensing.

N5005.3.1 [5005.3.9] Weather protection. Where overhead noncombustible construction is provided for sheltering outdoor hazardous material use areas, such use shall not be considered indoor use when the area is constructed in accordance with the requirements for weather protection as required by this code.

N5005.4 Handling.

N5005.4.1 [5005.4.4] Dispensing, use and handling. Where hazardous materials having a hazard ranking of 3 or 4 in accordance with NFPA 704 are transported through *corridors*, interior *exit stairways* or *ramps* or *exit passageways*, there shall be an emergency telephone system, a local manual alarm station

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or an *approved* alarm-initiating device at not more than 150-foot (45 720 mm) intervals and at each *exit* and *exit access* doorway throughout the transport route. The signal shall be relayed to an approved central, proprietary or remote station service or constantly attended onsite location and shall also initiate a local audible alarm.

**CHAPTER N51
AEROSOLS**

**SECTION N5101
GENERAL**

N5101.1 Scope. The provisions of Sections N5101 through N5107, other applicable provisions of this code and NFPA 30B shall apply to the manufacturing, storage and display of aerosol products. Manufacturing of aerosol products using hazardous materials shall also comply with Sections N5001 through N5005.

**SECTION N5102
DEFINITIONS**

N5102.1 Definitions. The following terms are defined in Section N202:

- AEROSOL WAREHOUSE.**
- PROPELLANT.**
- RETAIL DISPLAY AREA.**

**SECTION N5103
CLASSIFICATION OF AEROSOL PRODUCTS**

N5103.1 Classification levels. Aerosol products shall be classified as Level 1, 2 or 3 in accordance with Table N5103.1 and NFPA 30B. Aerosol products in cartons which are not identified in accordance with this section shall be classified as Level 3.

**TABLE N5103.1
CLASSIFICATION OF AEROSOL PRODUCTS**

CHEMICAL HEAT OF COMBUSTION		AEROSOL CLASSIFICATION
Greater than (Btu/lb)	Less than or equal to (Btu/lb)	
0	8,600	1
8,600	13,000	2
13,000	—	3

For SI: 1 British thermal unit per pound = 0.002326 kJ/g.

**SECTION N5104
INSIDE STORAGE OF AEROSOL PRODUCTS**

N5104.1 General. The inside storage of Level 2 and 3 aerosol products shall comply with Sections N5104.2 through N5104.7 and NFPA 30B. Level 1 aerosol products shall be considered equivalent to a Class III commodity and shall comply with the requirements for palletized or rack storage in NFPA 13.

N5104.2 Storage in Groups A, B, E, F, I and R. Storage of Level 2 and 3 aerosol products in occupancies in Groups A, B,

E, F, I and R shall be limited to the following maximum quantities:

1. A net weight of 1,000 pounds (454 kg) of Level 2 aerosol products.
2. A net weight of 500 pounds (227 kg) of Level 3 aerosol products.
3. A combined net weight of 1,000 pounds (454 kg) of Level 2 and 3 aerosol products.

The maximum quantity shall be increased 100 percent where the excess quantity is stored in storage cabinets in accordance with Section N5704.3.2.

N5104.2.1 Excess storage. Storage of quantities exceeding the maximum quantities indicated in Section N5104.2 shall be stored in separate inside flammable liquid storage rooms in accordance with Section N5104.5.

N5104.3 Storage in general purpose warehouses. Aerosol storage in general purpose warehouses utilized only for warehousing- type operations involving mixed commodities shall comply with Section N5104.3.1 or N5104.3.2.

N5104.3.1 Nonsegregated storage. Storage consisting of solid pile, palletized or rack storage of Level 2 and 3 aerosol products not segregated into areas utilized exclusively for the storage of aerosols shall comply with Table N5104.3.1.

**TABLE N5104.3.1
NONSEGREGATED STORAGE OF LEVEL 2 AND 3 AEROSOL PRODUCTS IN GENERAL PURPOSE WAREHOUSES^b**

AEROSOL LEVEL	MAXIMUM NET WEIGHT PER FLOOR (pounds) ^b			
	Palletized or solid-pile storage		Rack storage	
	Unprotected	Protected ^a	Unprotected	Protected ^a
2	2,500	12,000	2,500	24,000
3	1,000	12,000	1,000	24,000
Combination 2 and 3	2,500	12,000	2,500	24,000

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg, 1 square foot = 0.0929 m².

- a. Approved automatic sprinkler system protection and storage arrangements shall comply with NFPA 30B. Sprinkler system protection shall extend 20 feet beyond the storage area containing the aerosol products.
- b. Storage quantities indicated are the maximum permitted in any 50,000-square-foot area.

N5104.3.2 Segregated storage. Storage of Level 2 and 3 aerosol products segregated into areas utilized exclusively for the storage of aerosols shall comply with Table N5104.3.2 and Sections N5104.3.2.1 and N5104.3.2.2

N5104.3.2.1 Chain-link fence enclosures. Chain-link fence enclosures required by Table N5104.3.2 shall comply with the following:

1. The fence shall not be less than No. 9 gage steel wire, woven into a maximum 2-inch (51 mm) diamond mesh.
2. The fence shall be installed from the floor to the underside of the roof or ceiling above.
3. Class IV and high-hazard commodities shall be stored outside of the aerosol storage area and a minimum of 8 feet (2438 mm) from the fence.

4. Access openings in the fence shall be provided with either self- or automatic-closing devices or a labyrinth opening arrangement preventing aerosol containers from rocketing through the access openings.
5. Not less than two *means of egress* shall be provided from the fenced enclosure.

N5104.3.2.2 Aisles. The minimum aisle requirements for segregated storage in general purpose warehouses shall comply with Table N5104.3.2.2.

**TABLE N5104.3.2
SEGREGATED STORAGE OF LEVEL 2 AND 3 AEROSOL PRODUCTS IN GENERAL PURPOSE WAREHOUSES**

STORAGE SEPARATION	MAXIMUM SEGREGATED STORAGE AREA ^a		SPRINKLER REQUIREMENTS
	Percentage of building area (percent)	Area limitation (square feet)	
Separation area ^{e, f}	15	20,000	Notes b, c
Chain-link fence enclosure ^a	20	20,000	Notes b, c
1-hour fire-resistance-rated interior walls	20	30,000	Note b
2-hour fire-resistance-rated interior walls	25	40,000	Note b
3-hour fire-resistance-rated interior walls	30	50,000	Note b

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m².

- a. The maximum segregated storage area shall be limited to the smaller of the two areas resulting from the percentage of building area limitation and the area limitation.
- b. Automatic sprinkler system protection in aerosol product storage areas shall comply with NFPA 30B and be approved. Building areas not containing aerosol product storage shall be equipped throughout with an approved automatic sprinkler system in accordance with Section 903.3.1.1 of this code.
- c. Automatic sprinkler system protection in aerosol product storage areas shall comply with NFPA 30B and be approved. Sprinkler system protection shall extend a minimum 20 feet beyond the aerosol storage area.
- d. Chain-link fence enclosures shall comply with Section N5104.3.2.1.
- e. A separation area shall be defined as an area extending outward from the periphery of the segregated aerosol product storage area as follows.
 1. The limits of the aerosol product storage shall be clearly marked on the floor.
 2. The separation distance shall be a minimum of 25 feet and maintained clear of all materials with a commodity classification greater than Class III in accordance with Section 903.3.1.1 of this code.
- f. Separation areas shall only be permitted where approved.

**TABLE N5104.3.2.2
SEGREGATED STORAGE AISLE WIDTHS AND DISTANCE TO AISLES IN GENERAL PURPOSE WAREHOUSES**

STORAGE CONDITION	MINIMUM AISLE WIDTH (feet)	MAXIMUM DISTANCE FROM STORAGE TO AISLE (feet)
Solid pile or palletized ^a	4 feet between piles	25
Racks with ESFR sprinklers ^a	4 feet between racks and adjacent Level 2 and 3 aerosol product storage	25
Racks without ESFR sprinklers ^a	8 feet between racks and adjacent Level 2 and 3 aerosol product storage	25

For SI: 1 foot = 304.8 mm.

- a. Sprinklers shall comply with NFPA 30B.

N5104.4 Storage in aerosol warehouses. The total quantity of Level 2 and 3 aerosol products in a warehouse utilized for the storage, shipping and receiving of aerosol products shall not be restricted in structures complying with Sections N5104.4.1 and N5104.4.2.

N5104.4.1 Automatic sprinkler system. Aerosol warehouses shall be protected by an *approved wet-pipe automatic sprinkler system* in accordance with NFPA 30B. Sprinkler protection shall be designed based on the highest classification level of aerosol product present.

N5104.4.2 [5104.4.4] Combustible commodities. Combustible commodities other than flammable and *combustible liquids* shall be permitted to be stored in an aerosol warehouse.

Exception: Flammable and *combustible liquids* in 1- quart (946 mL) metal containers and smaller shall be permitted to be stored in an aerosol warehouse.

N5104.5 Storage in inside flammable liquid storage rooms. Inside flammable liquid storage rooms shall comply with Section N5704.3.7. The maximum quantities of aerosol products shall comply with Section N5104.5.1 or N5104.5.2.

N5104.5.1 Storage rooms of 500 square feet or less. The storage of aerosol products in flammable liquid storage rooms less than or equal to 500 square feet (46 m²) in area shall not exceed the following quantities:

1. A net weight of 1,000 pounds (454 kg) of Level 2 aerosol products.
2. A net weight of 500 pounds (227 kg) of Level 3 aerosol products.
3. A combined net weight of 1,000 pounds (454 kg) of Level 2 and 3 aerosol products.

N5104.5.2 Storage rooms greater than 500 square feet. The storage of aerosol products in flammable liquid storage rooms greater than 500 square feet (46 m²) in area shall not exceed the following quantities:

1. A net weight of 2,500 pounds (1135 kg) of Level 2 aerosol products.

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2. A net weight of 1,000 pounds (454 kg) of Level 3 aerosol products.
3. A combined net weight of 2,500 pounds (1135 kg) of Level 2 and 3 aerosol products.

The maximum aggregate storage quantity of Level 2 and 3 aerosol products permitted in separate inside storage rooms protected by an *approved automatic sprinkler system* in accordance with NFPA 30B shall be 5,000 pounds (2270 kg).

N5104.6 Storage in liquid warehouses. The storage of Level 2 and 3 aerosol products in liquid warehouses shall comply with NFPA 30B. The storage shall be located within segregated storage areas in accordance with Section N5104.3.2 and Sections N5104.6.1 through N5104.6.3.

N5104.6.1 Containment. Spill control or drainage shall be provided to prevent the flow of liquid to within 8 feet (2438 mm) of the segregated storage area.

N5104.6.2 Sprinkler design. Sprinkler protection shall be designed based on the highest level of aerosol product present.

N5104.6.3 Opening protection into segregated storage areas. Fire doors or gates opening into the segregated storage area shall either be self-closing or provided with automatic-closing devices activated by sprinkler water flow or an *approved* fire detection system.

N5104.7 Storage in Group M occupancies. Storage of Level 2 and 3 aerosol products in occupancies in Group M shall comply with Table N5104.7. Retail display shall comply with Section N5106.

**TABLE N5104.7
MAXIMUM QUANTITIES OF LEVEL 2 AND 3 AEROSOL
PRODUCTS IN RETAIL STORAGE AREAS**

MAXIMUM NET WEIGHT PER FLOOR (pounds)			
Floor	Nonsegregated storage ^{a, b}	Segregated storage	
		Storage cabinets ^b	Separated from retail area ^c
Basement	Not Permitted	Not Permitted	Not Permitted
Ground floor	2,500	5,000	Note d
Upper floors	500	1,000	Note d

For SI: 1 pound = 0.454 kg, 1 square foot = 0.0929 m².

- a. The total aggregate quantity on display and in storage shall not exceed the maximum retail display quantity indicated in Section N5106.3.
- b. Storage quantities indicated are the maximum permitted in any 50,000-square-foot area.
- c. The storage area shall be separated from the retail area with a 1-hour fire-resistance-rated assembly.
- d. See Table N5104.3.2.

**SECTION N5105
RESERVED**

**SECTION N5106
RETAIL DISPLAY OF AEROSOLS**

N5106.1 General. This section shall apply to the retail display of 500 pounds (227 kg) or more of Level 2 and 3 aerosol products.

N5106.2 Aerosol display and normal merchandising not exceeding 8 feet (2488 mm) high.

N5106.2.1 [5106.2.4] Retail display automatic sprinkler system. When an *automatic sprinkler system* is required for the protected retail display of aerosol products, the wet-pipe *automatic sprinkler system* shall be in accordance with Section 903.3.1.1 of this code. The minimum system design shall be for an Ordinary Hazard Group 2 occupancy. The system shall be provided throughout the retail display area.

N5106.3 Aerosol display and normal merchandising exceeding 8 feet (2438 mm) high.

N5106.3.1 [5106.3.2] Automatic sprinkler protection. Aerosol display and merchandising areas shall be protected by an *automatic sprinkler system* based on the requirements set forth in Tables 6.3.2.7(a) through 6.3.2.7(l) of NFPA 30B and the following:

1. Protection shall be based on the highest level of aerosol product in the array and the packaging method of the storage located more than 6 feet (1829 mm) above the finished floor.
2. When using the cartoned aerosol tables of NFPA 30B, uncartoned or display-cut Level 2 and 3 aerosols shall be permitted not more than 6 feet (1829 mm) above the finished floor.
3. The design area for Level 2 and 3 aerosols shall extend not less than 20 feet (6096 mm) beyond the Level 2 and 3 aerosol display and merchandising areas.
4. Where ordinary and high-temperature ceiling sprinkler systems are adjacent to each other, noncombustible draft curtains shall be installed at the interface.

N5106.4 Reserved.

N5106.5 Special protection design for Level 2 and 3 aerosols adjacent to flammable and combustible liquids in double-row racks. The display and merchandising of Level 2 and 3 aerosols adjacent to flammable and combustible liquids in double-row racks shall be in accordance with Sections N5106.5.1 through N5106.5.4.

N5106.5.1 Fire protection. Fire protection for the display and merchandising of Level 2 and 3 aerosols in double-row racks shall be in accordance with Table 7.4.1 and Figure 7.4.1 of NFPA 30B.

N5106.5.2 [5106.5.3] Shelving. Shelving in racks shall be limited to wire mesh shelving having uniform openings not more than 6 inches (152 mm) apart, with the openings comprising at least 50 percent of the overall shelf area.

N5106.5.3 [5106.5.6] Horizontal barriers. Horizontal barriers constructed of minimum 3/8-inch-thick (10 mm) plywood or minimum 0.034-inch (0.086 mm) (No. 22 gage) sheet metal shall be provided and located in accordance with Table 7.4.1 and Figure 7.4.1 of NFPA 30B when in-rack sprinklers are installed.

N5106.5.4 [5106.5.7] Class I, II, III, IV and plastic commodities. Class I, II, III, IV and plastic commodities

located adjacent to Level 2 and 3 aerosols shall be protected in accordance with NFPA 13.

SECTION N5107 AEROSOL MANUFACTURING FACILITIES

N5107.1 General. Manufacturing facilities shall be in accordance with NFPA 30B.

CHAPTER N52 COMBUSTIBLE FIBERS

SECTION N5202 DEFINITIONS

N5202.1 Definitions. The following terms are defined in Section N202:

BALED COTTON.
BALED COTTON, DENSELY PACKED.

SECTION N5203 GENERAL PRECAUTIONS

N5203.1 [5203.5] Dust collection. Where located within a building, equipment or machinery which generates or emits *combustible fibers* shall be provided with an *approved* dust-collecting and exhaust system. Such systems shall comply with Sections N2201 through N2205 of this code and Section 511 of the *Mechanical Code*.

SECTION N5204 LOOSE FIBER STORAGE

N5204.1 Reserved.

N5204.2 Storage of 100 cubic feet or less. Loose *combustible fibers* in quantities of not more than 100 cubic feet (3 m³) located in a structure shall be stored in a metal or metal-lined bin equipped with a self-closing cover.

N5204.3 Storage of more than 100 cubic feet to 500 cubic feet. Loose *combustible fibers* in quantities exceeding 100 cubic feet (3 m³) but not exceeding 500 cubic feet (14 m³) shall be stored in rooms enclosed with 1-hour *fire barriers* constructed in accordance with Section 707 of this code or *horizontal assemblies* constructed in accordance with Section 711 of this code, or both, with openings protected by an *approved* opening protective assembly having a *fire protection rating* of ¾ hour in accordance with this code.

N5204.4 Storage of more than 500 cubic feet to 1,000 cubic feet. Loose *combustible fibers* in quantities exceeding 500 cubic feet (14 m³) but not exceeding 1,000 cubic feet (28 m³) shall be stored in rooms enclosed with 2-hour *fire barriers* constructed in accordance with Section 707 of this code or *horizontal assemblies* constructed in accordance with Section 711 of this code, or both, with openings protected by an *approved* opening protective assembly having a *fire protection rating* of 1½ hours in accordance with this code.

N5204.5 Storage of more than 1,000 cubic feet. Loose *combustible fibers* in quantities exceeding 1,000 cubic feet (28

m³) shall be stored in rooms enclosed with 2-hour *fire barriers* constructed in accordance with Section 707 of this code or *horizontal assemblies* constructed in accordance with Section 711 of this code, or both, with openings protected by an *approved* opening protective assembly having a *fire protection rating* of 1½ hours in accordance with this code. The storage room shall be protected by an *automatic sprinkler system* installed in accordance with Section 903.3.1.1 of this code.

N5204.6 Detached storage structure. A maximum of 2,500 cubic feet (70 m³) of loose *combustible fibers* shall be stored in a detached structure suitably located, with openings protected against entrance of sparks. The structure shall not be occupied for any other purpose.

CHAPTER N53 COMPRESSED GASES

SECTION N5301 GENERAL

N5301.1 Scope. Storage of *compressed gases* in *compressed gas* containers, cylinders, tanks and systems shall comply with this code, including those gases regulated elsewhere in this code. Partially full *compressed gas* containers, cylinders or tanks containing residual gases shall be considered as full for the purposes of the controls required.

Exceptions:

1. Gases used as refrigerants in refrigeration systems (see Section N606).
2. Compressed natural gas (CNG) for use as a vehicular fuel shall comply with NFPA 52 and the *Mechanical Code*.

Cryogenic fluids shall comply with Sections N5501 through N5505.

Compressed gases classified as hazardous materials shall also comply with Sections N5001 through N5005 for general requirements addressing specific hazards, including Sections N5801 through N5805 (Flammable Gases), Sections N6001 through N6005 (Highly Toxic and Toxic Materials), Sections N6301 through N6304 (Oxidizers, Oxidizing Gases and Oxidizing Cryogenic Fluids) and Sections N6401 through N6404 (Pyrophoric Materials).

SECTION N5302 DEFINITIONS

N5302.1 Definitions. The following terms are defined in Section N202:

COMPRESSED GAS CONTAINER.
COMPRESSED GAS SYSTEM.

SECTION N5303 GENERAL REQUIREMENTS COMPRESSED GASES

N5303.1 [5303.16] Vaults. Generation, compression, storage and dispensing equipment for *compressed gases* shall be

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allowed to be located in either above- or below-grade vaults complying with Sections N5303.1.1 through N5303.1.12.

N5303.1.1 [5303.16.1] Listing required. Vaults shall be *listed* by a nationally recognized testing laboratory.

Exception: Where *approved* by the *building official*, below-grade vaults are allowed to be constructed on site, provided that the design is in accordance with this code and that special inspections are conducted to verify structural strength and compliance of the installation with the *approved* design in accordance with Section 1707 of this code. Installation plans for below-grade vaults that are constructed on site shall be prepared by, and the design shall bear the stamp of, a professional engineer. Consideration shall be given to soil and hydrostatic loading on the floors, walls and lid; anticipated seismic forces; uplifting by ground water or flooding; and to loads imposed from above, such as traffic and equipment loading on the vault lid.

N5303.1.2 [5303.16.2] Design and construction. The vault shall completely enclose generation, compression, storage or dispensing equipment located in the vault. There shall be no openings in the vault enclosure except those necessary for vault ventilation and access, inspection, filling, emptying or venting of equipment in the vault. The walls and floor of the vault shall be constructed of reinforced concrete at least 6 inches (152 mm) thick. The top of an above-grade vault shall be constructed of noncombustible material and shall be designed to be weaker than the walls of the vault to ensure that the thrust of any explosion occurring inside the vault is directed upward.

The top of an at- or below-grade vault shall be designed to relieve safely or contain the force of an explosion occurring inside the vault. The top and floor of the vault and the tank foundation shall be designed to withstand the anticipated loading, including loading from vehicular traffic, where applicable. The walls and floor of a vault installed below grade shall be designed to withstand anticipated soil and hydrostatic loading. Vaults shall be designed to be wind and earthquake resistant, in accordance with this code.

N5303.1.3 [5303.16.3] Secondary containment. Vaults shall be substantially liquid-tight and there shall be no backfill within the vault. The vault floor shall drain to a sump. For premanufactured vaults, liquid tightness shall be certified as part of the listing provided by a nationally recognized testing laboratory. For field-erected vaults, liquid tightness shall be certified in an *approved* manner.

N5303.1.4 [5303.16.4] Internal clearance. There shall be sufficient clearance within the vault to allow for visual inspection and maintenance of equipment in the vault.

N5303.1.5 [5303.16.5] Anchoring. Vaults and equipment contained therein shall be suitably anchored to withstand uplifting by groundwater or flooding. The design shall verify that uplifting is prevented even when equipment within the vault is empty.

N5303.1.6 [5303.16.6] Vehicle impact protection. Vaults shall be resistant to damage from the impact of a motor

vehicle, or vehicle impact protection shall be provided in accordance with Section N303.

N5303.1.7 [5303.16.9] Ventilation. Vaults shall be provided with an exhaust ventilation system installed in accordance with Section N5004.3. The ventilation system shall operate continuously or be designed to operate upon activation of the vapor or liquid detection system. The system shall provide ventilation at a rate of not less than 1 cubic foot per minute (cfm) per square foot [$0.00508 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of floor area, but not less than 150 cfm (4 m^3/min). The exhaust system shall be designed to provide air movement across all parts of the vault floor for gases having a density greater than air and across all parts of the vault ceiling for gases having a density less than air. Supply ducts shall extend to within 3 inches (76 mm), but not more than 12 inches (305 mm), of the floor. Exhaust ducts shall extend to within 3 inches (76 mm), but not more than 12 inches (305 mm) of the floor or ceiling, for heavier-than-air or lighter-than-air gases, respectively. The exhaust system shall be installed in accordance with the *Mechanical Code*.

N5303.1.8 [5303.16.10] Monitoring and detection. Vaults shall be provided with *approved* vapor and liquid detection systems and equipped with on-site audible and visual warning devices with battery backup. Vapor detection systems shall sound an alarm when the system detects vapors that reach or exceed 25 percent of the lower explosive limit (LEL) or one-half the immediately dangerous to life and health (IDLH) concentration for the gas in the vault. Vapor detectors shall be located no higher than 12 inches (305 mm) above the lowest point in the vault for heavier than- air gases and no lower than 12 inches (305 mm) below the highest point in the vault for lighter-than-air gases. Liquid detection systems shall sound an alarm upon detection of any liquid, including water. Liquid detectors shall be located in accordance with the manufacturers' instructions. Activation of either vapor or liquid detection systems shall cause a signal to be sounded at an *approved*, constantly attended location within the facility served by the tanks or at an *approved* location. Activation of vapor detection systems shall also shut off gas-handling equipment in the vault and dispensers.

N5303.1.9 [5303.16.11] Liquid removal. Means shall be provided to recover liquid from the vault. Where a pump is used to meet this requirement, it shall not be permanently installed in the vault. Electric-powered portable pumps shall be suitable for use in Class I, Division 1 locations, as defined in the *Electrical Code*.

N5303.1.10 [5303.16.12] Relief vents. Vent pipes for equipment in the vault shall terminate at least 12 feet (3658 mm) above ground level.

N5303.1.11 [5303.16.13] Accessway. Vaults shall be provided with an *approved* personnel accessway with a minimum dimension of 30 inches (762 mm) and with a permanently affixed, nonferrous ladder. Accessways shall be designed to be nonsparking. Travel distance from any point inside a vault to an accessway shall not exceed 20 feet (6096 mm). At each entry point, a warning sign indicating the need for procedures for safe entry into confined spaces shall be

posted. Entry points shall be secured against unauthorized entry and vandalism.

N5303.1.12 [5303.16.14] Classified area. The interior of a vault containing a flammable gas shall be designated a Class I, Division 1 location, as defined in the *Electrical Code*.

**SECTION N5304
RESERVED**

**SECTION N5305
RESERVED**

**SECTION N5306
MEDICAL GAS SYSTEMS**

N5306.1 General. *Compressed gases* at hospitals and similar facilities intended for inhalation or sedation including, but not limited to, analgesia systems for dentistry, podiatry, veterinary and similar uses shall comply with Sections N5306.2 through N5306.4 in addition to other requirements of this code.

N5306.2 Interior supply location. Medical gases shall be stored in areas dedicated to the storage of such gases without other storage or uses. Where containers of medical gases in quantities greater than the amount listed in Table N5306.2 are located inside buildings, they shall be in a 1-hour exterior room, a 1-hour interior room or a gas cabinet in accordance with Section N5306.2.1, N5306.2.2 or N5306.2.3, respectively. Rooms or areas where medical gases are stored or used in quantities exceeding the *maximum allowable quantity per control area* as set forth in Section N5003.1 shall be in accordance with this code for high-hazard Group H occupancies.

**TABLE N5306.2
PERMIT AMOUNTS FOR COMPRESSED GASES**

TYPE OF GAS	AMOUNT (cubic feet at NTP)
Corrosive	200
Flammable (except cryogenic fluids and liquefied petroleum gases)	200
Highly toxic	Any Amount
Inert and simple asphyxiant	6,000
Oxidizing (including oxygen)	504
Pyrophoric	Any Amount
Toxic	Any Amount

For SI: 1 cubic foot = 0.02832 m³

N5306.2.1 One-hour exterior rooms. A 1-hour exterior room shall be a room or enclosure separated from the remainder of the building by *fire barriers* constructed in accordance with Section 707 of this code or *horizontal assemblies* constructed in accordance with Section 711 of this code, or both, with a *fire-resistance rating* of not less than 1 hour. Openings between the room or enclosure and interior spaces shall be self-closing smoke- and draft-control assemblies having a *fire protection rating* of not less than 1 hour. Rooms shall have at least one exterior wall that is

provided with at least two vents. Each vent shall not be less than 36 square inches (0.023 m²) in area. One vent shall be within 6 inches (152 mm) of the floor and one shall be within 6 inches (152 mm) of the ceiling. Rooms shall be provided with at least one automatic sprinkler to provide container cooling in case of fire.

[M] N5306.2.2 One-hour interior room. When an exterior wall cannot be provided for the room, automatic sprinklers shall be installed within the room. The room shall be exhausted through a duct to the exterior. Supply and exhaust ducts shall be enclosed in a 1-hour-rated shaft enclosure from the room to the exterior. *Approved* mechanical ventilation shall comply with the *Mechanical Code* and be provided at a minimum rate of 1 cubic foot per minute per square foot [0.00508 m³/(s · m²)] of the area of the room.

N5306.2.3 Gas cabinets. Gas cabinets shall be constructed in accordance with Section N5003.8.6 and the following:

1. The average velocity of ventilation at the face of access ports or windows shall not be less than 200 feet per minute (1.02 m/s) with a minimum of 150 feet per minute (0.76 m/s) at any point of the access port or window.
2. They shall be connected to an exhaust system.
3. They shall be internally sprinklered.

N5306.3 [P][5306.4] Medical gas systems. Medical gas systems shall comply with the *Plumbing Code*.

**SECTION N5307
COMPRESSED GASES NOT OTHERWISE
REGULATED**

N5307.1 General. *Compressed gases* in storage or use not regulated by the material-specific provisions of These provisions, including asphyxiant, irritant and radioactive gases, shall comply with this section N5307.2 in addition to other requirements of Sections N5301 through N5307.

N5307.2 Ventilation. Indoor storage and use areas and storage buildings shall be provided with mechanical exhaust ventilation or natural ventilation in accordance with the requirements of Section N5004.3 or N5005.1.9. When mechanical ventilation is provided, the systems shall be operational during such time as the building or space is occupied.

**CHAPTER N54
CORROSIVE MATERIAL**

**SECTION N5401 [5404]
STORAGE**

N5401.1 [5404.1] Indoor storage. Indoor storage of *corrosive* materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Table N5003.1.1(2), shall be in accordance with Sections N5001, N5003, N5004 and this code.

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N5401.1.1 [5404.1.1] Liquid-tight floor. In addition to the provisions of Section N5004.12, floors in storage areas for *corrosive* liquids shall be of liquid-tight construction.

N5401.2 [5404.2] Outdoor storage. Outdoor storage of *corrosive* materials in amounts exceeding the *maximum allowable quantity per control area* shall be in accordance with Sections N5001, N5003, N5004 and this chapter.

N5401.2.1 [5404.2.1] Above-ground outside storage tanks. Aboveground outside storage tanks exceeding an aggregate quantity of 1,000 gallons (3785 L) of *corrosive* liquids shall be provided with secondary containment in accordance with Section N5004.2.2.

N5401.2.2 [5404.2.2] Distance from storage to exposures. Outdoor storage of *corrosive* materials shall not be within 20 feet (6096 mm) of buildings not associated with the manufacturing or distribution of such materials, *lot lines*, public streets, public alleys, *public ways* or *means of egress*. A 2-hour *fire barrier* without openings or penetrations, and extending not less than 30 inches (762 mm) above and to the sides of the storage area, is allowed in lieu of such distance. The wall shall either be an independent structure, or the *exterior wall* of the building adjacent to the storage area.

CHAPTER N55 CRYOGENIC FLUIDS

SECTION N5501 GENERAL

N5501.1 Scope. The storage of *cryogenic fluids* shall comply with Sections N5501 through N5505. *Cryogenic fluids* classified as hazardous materials shall also comply with Sections N5001 through N5005 for general requirements. Partially full containers containing residual *cryogenic fluids* shall be considered as full for the purposes of the controls required.

Exceptions:

1. Fluids used as refrigerants in refrigeration systems (see Section N606).
2. Liquefied natural gas (LNG).

Oxidizing *cryogenic fluids*, including oxygen, shall comply with NFPA 55 and Sections N6301 through N6304, as applicable.

Flammable *cryogenic fluids*, including hydrogen, methane and carbon monoxide, shall comply with NFPA 55 and Sections N5801 through N5805, as applicable.

Inert *cryogenic fluids*, including argon, helium and nitrogen, shall comply with CGA P-18.

SECTION N5502 DEFINITIONS

N5502.1 Definitions. The following terms are defined in Section N202.

CRYOGENIC FLUID.

FLAMMABLE CRYOGENIC FLUID.

LOW-PRESSURE TANK.

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SECTION N5503 GENERAL REQUIREMENTS

N5503.1 Containers.

N5503.1.1 Reserved.

N5503.1.2 Concrete containers. Concrete containers shall be built in accordance with this code. Barrier materials and membranes used in connection with concrete, but not functioning structurally, shall be compatible with the materials contained.

N5503.1.3 Foundations and supports. Containers shall be provided with substantial concrete or masonry foundations, or structural steel supports on firm concrete or masonry foundations. Containers shall be supported to prevent the concentration of excessive loads on the supporting portion of the shell. Foundations for horizontal containers shall be constructed to accommodate expansion and contraction of the container. Foundations shall be provided to support the weight of vaporizers or heat exchangers.

N5503.1.3.1 Temperature effects. When container foundations or supports are subject to exposure to temperatures below -150°F (-101°C), the foundations or supports shall be constructed of materials to withstand the low-temperature effects of *cryogenic fluid* spillage.

N5503.1.3.2 Corrosion protection. Portions of containers in contact with foundations or saddles shall be painted to protect against corrosion.

N5503.2 Pressure relief devices. Pressure relief devices shall be provided in accordance with Sections N5503.2.1 through N5503.2.5 to protect containers and systems containing *cryogenic fluids* from rupture in the event of overpressure. Pressure relief devices shall be designed in accordance with CGA S-1.1, CGA S-1.2 and CGA S-1.3.

N5503.2.1 Containers. Containers shall be provided with pressure relief devices.

N5503.2.2 Vessels or equipment other than containers. Heat exchangers, vaporizers, insulation casings surrounding containers, vessels and coaxial piping systems in which liquefied *cryogenic fluids* could be trapped because of leakage from the primary container shall be provided with a pressure relief device.

N5503.2.3 Sizing. Pressure relief devices shall be sized in accordance with the specifications to which the container was fabricated. The relief device shall have sufficient capacity to prevent the maximum design pressure of the container or system from being exceeded.

N5503.2.4 Accessibility. Pressure relief devices shall be located such that they are provided with ready access for inspection and repair.

N5503.2.5 Arrangement. Pressure relief devices shall be arranged to discharge unobstructed to the open air in such a manner as to prevent impingement of escaping gas on personnel, containers, equipment and adjacent structures or to enter enclosed spaces.

Exception: DOTn-specified containers with an internal volume of 2 cubic feet (0.057 m³) or less.

N5503.2.6 Shutoffs between pressure relief devices and containers. Shutoff valves shall not be installed between pressure relief devices and containers.

Exception: A shutoff valve is allowed on containers equipped with multiple pressure-relief device installations where the arrangement of the valves provides the full required flow through the minimum number of required relief devices at all times.

N5503.2.7 Temperature limits. Pressure relief devices shall not be subjected to *cryogenic fluid* temperatures except when operating.

N5503.3 Pressure relief vent piping. Pressure relief vent-piping systems shall be constructed and arranged so as to remain functional and direct the flow of gas to a safe location in accordance with Sections N5503.3.1 and N5503.3.2.

N5503.3.1 Sizing. Pressure relief device vent piping shall have a cross-sectional area not less than that of the pressure relief device vent opening and shall be arranged so as not to restrict the flow of escaping gas.

N5503.3.2 Arrangement. Pressure relief device vent piping and drains in vent lines shall be arranged so that escaping gas will discharge unobstructed to the open air and not impinge on personnel, containers, equipment and adjacent structures or enter enclosed spaces. Pressure relief device vent lines shall be installed in such a manner to exclude or remove moisture and condensation and prevent malfunction of the pressure relief device because of freezing or ice accumulation.

N5503.4 [5503.10] Lighting. When required, lighting, including emergency lighting, shall be provided for fire appliances and operating facilities such as walkways, control valves and gates ancillary to stationary containers.

SECTION N5504 RESERVED

SECTION N5505 DISPENSING AREAS

[M] N5505.1 [5505.4.1.1] Ventilation. Indoor areas where *cryogenic fluids* are dispensed shall be ventilated in accordance with the requirements of the *Mechanical Code* in a manner that captures any vapor at the point of generation.

Exception: *Cryogenic fluids* that can be demonstrated not to create harmful vapors.

CHAPTER N56 EXPLOSIVES AND FIREWORKS

SECTION N5601 GENERAL

N5601.1 Scope. The provisions of this code shall govern the manufacture, storage, of *explosives*, *explosive materials*, fireworks and small arms ammunition.

Exceptions:

1. The Armed Forces of the United States, Coast Guard or National Guard.
2. *Explosives* in forms prescribed by the official United States Pharmacopoeia.
3. The possession, storage and use of small arms ammunition when packaged in accordance with DOTn packaging requirements.
4. The possession, storage and use of not more than 1 pound (0.454 kg) of commercially manufactured sporting black powder, 20 pounds (9 kg) of smokeless powder and 10,000 small arms primers for hand loading of small arms ammunition for personal consumption.
5. The use of *explosive materials* by federal, state and local regulatory, law enforcement and fire agencies acting in their official capacities.
6. Special industrial *explosive* devices which in the aggregate contain less than 50 pounds (23 kg) of *explosive materials*.
7. The possession, storage and use of blank industrial power load cartridges when packaged in accordance with DOTn packaging regulations.
8. Transportation in accordance with DOTn 49 CFR Parts 100–185.
9. Items preempted by federal regulations.

SECTION N5602 DEFINITIONS

N5602.1 Definitions. The following terms are defined in Section N202:

DETONATION.

EXPLOSIVE MATERIAL.

INHABITED BUILDING.

MAGAZINE.

Indoor.

Type 1.

Type 2.

Type 3.

Type 4.

Type 5.

PUBLIC TRAFFIC ROUTE (PTR).

PYROTECHNIC COMPOSITION.

QUANTITY-DISTANCE (Q-D).

Inhabited building distance (IBD).

Intermagazine distance (IMD).

Intraline distance (ILD) or Intraplant distance (IPD).

Minimum separation distance (D₀).

SECTION N5603 RESERVED

SECTION N5604 EXPLOSIVE MATERIALS STORAGE

APPENDIX N

TABLE N5604.5.2(1)
 AMERICAN TABLE OF DISTANCES FOR STORAGE OF EXPLOSIVES AS
 APPROVED BY THE INSTITUTE OF MAKERS OF EXPLOSIVES AND REVISED JUNE 1991^a

QUANTITY OF EXPLOSIVE MATERIALS ^c		DISTANCES IN FEET							
		Inhabited buildings		Public highways with traffic volume less than 3,000 vehicles per day		Public highways with traffic volume greater than 3,000 vehicles per day and passenger railways		Separation of magazines ^d	
Pounds over	Pounds not over	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded
0	5	70	140	30	60	51	102	6	12
5	10	90	180	35	70	64	128	8	16
10	20	110	220	45	90	81	162	10	20
20	30	125	250	50	100	93	186	11	22
30	40	140	280	55	110	103	206	12	24
40	50	150	300	60	120	110	220	14	28
50	75	170	340	70	140	127	254	15	30
75	100	190	380	75	150	139	278	16	32
100	125	200	400	80	160	150	300	18	36
125	150	215	430	85	170	159	318	19	38
150	200	235	470	95	190	175	350	21	42
200	250	255	510	105	210	189	378	23	46
250	300	270	540	110	220	201	402	24	48
300	400	295	590	120	240	221	442	27	54
400	500	320	640	130	260	238	476	29	58
500	600	340	680	135	270	253	506	31	62
600	700	355	710	145	290	266	532	32	64
700	800	375	750	150	300	278	556	33	66
800	900	390	780	155	310	289	578	35	70
900	1,000	400	800	160	320	300	600	36	72
1,000	1,200	425	850	165	330	318	636	39	78
1,200	1,400	450	900	170	340	336	672	41	82
1,400	1,600	470	940	175	350	351	702	43	86
1,600	1,800	490	980	180	360	366	732	44	88
1,800	2,000	505	1,010	185	370	378	756	45	90
2,000	2,500	545	1,090	190	380	408	816	49	98
2,500	3,000	580	1,160	195	390	432	864	52	104
3,000	4,000	635	1,270	210	420	474	948	58	116
4,000	5,000	685	1,370	225	450	513	1,026	61	122
5,000	6,000	730	1,460	235	470	546	1,092	65	130
6,000	7,000	770	1,540	245	490	573	1,146	68	136
7,000	8,000	800	1,600	250	500	600	1,200	72	144
8,000	9,000	835	1,670	255	510	624	1,248	75	150
9,000	10,000	865	1,730	260	520	645	1,290	78	156
10,000	12,000	875	1,750	270	540	687	1,374	82	164
12,000	14,000	885	1,770	275	550	723	1,446	87	174
14,000	16,000	900	1,800	280	560	756	1,512	90	180
16,000	18,000	940	1,880	285	570	786	1,572	94	188
18,000	20,000	975	1,950	290	580	813	1,626	98	196
20,000	25,000	1,055	2,000	315	630	876	1,752	105	210

(continued)

TABLE N5604.5.2(1)-continued
 AMERICAN TABLE OF DISTANCES FOR STORAGE OF EXPLOSIVES AS
 APPROVED BY THE INSTITUTE OF MAKERS OF EXPLOSIVES AND REVISED JUNE 1991^a

QUANTITY OF EXPLOSIVE MATERIALS ^c		DISTANCES IN FEET							
		Inhabited buildings		Public highways with traffic volume less than 3,000 vehicles per day		Public highways with traffic volume greater than 3,000 vehicles per day and passenger railways		Separation of magazines ^d	
Pounds over	Pounds not over	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Unbarricaded
25,000	30,000	1,130	2,000	340	680	933	1,866	112	224
30,000	35,000	1,205	2,000	360	720	981	1,962	119	238
35,000	40,000	1,275	2,000	380	760	1,026	2,000	124	248
40,000	45,000	1,340	2,000	400	800	1,068	2,000	129	258
45,000	50,000	1,400	2,000	420	840	1,104	2,000	135	270
50,000	55,000	1,460	2,000	440	880	1,140	2,000	140	280
55,000	60,000	1,515	2,000	455	910	1,173	2,000	145	290
60,000	65,000	1,565	2,000	470	940	1,206	2,000	150	300
65,000	70,000	1,610	2,000	485	970	1,236	2,000	155	310
70,000	75,000	1,655	2,000	500	1,000	1,263	2,000	160	320
75,000	80,000	1,695	2,000	510	1,020	1,293	2,000	165	330
80,000	85,000	1,730	2,000	520	1,040	1,317	2,000	170	340
85,000	90,000	1,760	2,000	530	1,060	1,344	2,000	175	350
90,000	95,000	1,790	2,000	540	1,080	1,368	2,000	180	360
95,000	100,000	1,815	2,000	545	1,090	1,392	2,000	185	370
100,000	110,000	1,835	2,000	550	1,100	1,437	2,000	195	390
110,000	120,000	1,855	2,000	555	1,110	1,479	2,000	205	410
120,000	130,000	1,875	2,000	560	1,120	1,521	2,000	215	430
130,000	140,000	1,890	2,000	565	1,130	1,557	2,000	225	450
140,000	150,000	1,900	2,000	570	1,140	1,593	2,000	235	470
150,000	160,000	1,935	2,000	580	1,160	1,629	2,000	245	490
160,000	170,000	1,965	2,000	590	1,180	1,662	2,000	255	510
170,000	180,000	1,990	2,000	600	1,200	1,695	2,000	265	530
180,000	190,000	2,010	2,010	605	1,210	1,725	2,000	275	550
190,000	200,000	2,030	2,030	610	1,220	1,755	2,000	285	570
200,000	210,000	2,055	2,055	620	1,240	1,782	2,000	295	590
210,000	230,000	2,100	2,100	635	1,270	1,836	2,000	315	630
230,000	250,000	2,155	2,155	650	1,300	1,890	2,000	335	670
250,000	275,000	2,215	2,215	670	1,340	1,950	2,000	360	720
275,000	300,000 ^b	2,275	2,275	690	1,380	2,000	2,000	385	770

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg

- a. Black powder, when stored in magazines, is defined as low explosive by the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF).
- b. For quantities less than 1,000 pounds, the required distances are those specified for 1,000 pounds. The use of lesser distances is allowed when supported by approved test data and/or analysis.
- c. Linear interpolation of explosive quantities between table entries is allowed.

TABLE N5604.5.2(2)

TABLE OF DISTANCES (Q-D) FOR BUILDINGS AND MAGAZINES CONTAINING EXPLOSIVES—DIVISION 1.3 MASS-FIRE HAZARD^{a, b, c}

QUANTITY OF DIVISION 1.3 EXPLOSIVES (NET EXPLOSIVES WEIGHT)		DISTANCES IN FEET			
Pounds over	Pounds not over	Inhabited Building Distance (IBD)	Distance to Public Traffic Route (PTR)	Intermagazine Distance (IMD)	Intraline Distance (ILD) or Intraplant Distance (IPD)
0	1,000	75	75	50	50
1,000	5,000	115	115	75	75
5,000	10,000	150	150	100	100
10,000	20,000	190	190	125	125
20,000	30,000	215	215	145	145
30,000	40,000	235	235	155	155
40,000	50,000	250	250	165	165
50,000	60,000	260	260	175	175
60,000	70,000	270	270	185	185
70,000	80,000	280	280	190	190
80,000	90,000	295	295	195	195
90,000	100,000	300	300	200	200
100,000	200,000	375	375	250	250
200,000	300,000	450	450	300	300

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg

- a. Black powder, when stored in magazines, is defined as low explosive by the Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF).
- b. For quantities less than 1,000 pounds, the required distances are those specified for 1,000 pounds. The use of lesser distances is allowed when supported by approved test data and/or analysis.
- c. Linear interpolation of explosive quantities between table entries is allowed.

TABLE N5604.5.2(3)

TABLE OF DISTANCES (Q-D) FOR BUILDINGS AND MAGAZINES CONTAINING EXPLOSIVES—DIVISION 1.4^c

QUANTITY OF DIVISION 1.4 EXPLOSIVES (NET EXPLOSIVES WEIGHT)		DISTANCES IN FEET			
Pounds over	Pounds not over	Inhabited Building Distance (IBD)	Distance to Public Traffic Route (PTR)	Intermagazine Distance ^{a, b} (IMD)	Intraline Distance (ILD) or Intraplant Distance ^a (IPD)
50	Not Limited	100	100	50	50

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg.

- a. A separation distance of 100 feet is required for buildings of other than Type I or Type II construction as defined in the *Building Code*.
- b. For earth-covered magazines, no specified separation is required.
 - 1. Earth cover material used for magazines shall be relatively cohesive. Solid or wet clay and similar types of soil are too cohesive and shall not be used. Soil shall be free from unsanitary organic matter, trash, debris and stones heavier than 10 pounds or larger than 6 inches in diameter. Compaction and surface preparation shall be provided, as necessary, to maintain structural integrity and avoid erosion. Where cohesive material cannot be used, as in sandy soil, the earth cover over magazines shall be finished with a suitable material to ensure structural integrity.
 - 2. The earth fill or earth cover between earth-covered magazines shall be either solid or sloped, in accordance with the requirements of other construction features, but a minimum of 2 feet of earth cover shall be maintained over the top of each magazines. To reduce erosion and facilitate maintenance operations, the cover shall have a slope of 2 horizontal to 1 vertical.
- c. Restricted to articles, including articles packaged for shipment, that are not regulated as an explosive under Bureau of Alcohol, Tobacco, Firearms and Explosives regulations, or unpacked articles used in process operations that do not propagate a detonation or deflagration between articles. This table shall not apply to consumer fireworks, 1.4G.

**TABLE N5605.3
MINIMUM INTRALINE (INTRAPLANT) SEPARATION DISTANCES (ILD OR IPD) BETWEEN BARRICADED OPERATING BUILDINGS
CONTAINING EXPLOSIVES—DIVISION 1.1, 1.2 OR 1.5 MASS-EXPLOSION HAZARD^a**

NET EXPLOSIVE WEIGHT			NET EXPLOSIVE WEIGHT		
Pounds over	Pounds not over	Intraline Distance (ILD) or Intraplant Distance (IPD) (feet)	Pounds over	Pounds not over	Intraline Distance (ILD) or Intraplant Distance (IPD) (feet)
0	50	30	20,000	25,000	265
50	100	40	25,000	30,000	280
100	200	50	30,000	35,000	295
200	300	60	35,000	40,000	310
300	400	65	40,000	45,000	320
400	500	70	45,000	50,000	330
500	600	75	50,000	55,000	340
600	700	80	55,000	60,000	350
700	800	85	60,000	65,000	360
800	900	90	65,000	70,000	370
900	1,000	95	70,000	75,000	385
1,000	1,500	105	75,000	80,000	390
1,500	2,000	115	80,000	85,000	395
2,000	3,000	130	85,000	90,000	400
3,000	4,000	140	90,000	95,000	410
4,000	5,000	150	95,000	100,000	415
5,000	6,000	160	100,000	125,000	450
6,000	7,000	170	125,000	150,000	475
7,000	8,000	180	150,000	175,000	500
8,000	9,000	190	175,000	200,000	525
9,000	10,000	200	200,000	225,000	550
10,000	15,000	225	225,000	250,000	575
15,000	20,000	245	250,000	275,000	600
—	—	—	275,000	300,000	635

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg.

a. Where a building or magazine containing explosives is not barricaded, the intraline distances shown in this table shall be doubled.

**SECTION N5605
MANUFACTURE, ASSEMBLY AND TESTING OF
EXPLOSIVES, EXPLOSIVE MATERIALS AND
FIREWORKS**

N5605.1 General. The manufacture, of *explosives*, ammunition, blasting agents and fireworks shall comply with the requirements of this section and the applicable construction requirements of NFPA 495 or NFPA 1124.

Exceptions: The hand loading of small arms ammunition prepared for personal use and not offered for resale.

N5605.2 Reserved.

N5605.3 Intraplant separation of operating buildings. *Explosives* manufacturing buildings and fireworks manufacturing buildings, including those where *explosive* charges are assembled, manufactured, prepared or loaded utilizing Division 1.1, 1.2, 1.3, 1.4 or 1.5 *explosives*, shall be separated from all other buildings, including magazines, within the confines of the manufacturing plant, at a distance not less

than those shown in Table N5605.3 or N5604.5.2(3), as appropriate.

Exception: Fireworks manufacturing buildings separated in accordance with NFPA 1124.

The quantity of *explosives* in an operating building shall be the net weight of all *explosives* contained therein. Distances shall be based on the hazard division requiring the greatest separation, unless the aggregate *explosive* weight is divided by *approved* walls or shields designed for that purpose. When dividing a quantity of *explosives* into smaller stacks, a suitable barrier or adequate separation distance shall be provided to prevent propagation from one stack to another.

When distance is used as the sole means of separation within a building, such distance shall be established by testing. Testing shall demonstrate that propagation between stacks will not result. Barriers provided to protect against *explosive* effects shall be designed and installed in accordance with *approved* standards.

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N5605.4 Separation of manufacturing operating buildings from inhabited buildings, public traffic routes and magazines. When an operating building on an *explosive* materials plant site is designed to contain *explosive* materials, such a building shall be located away from inhabited buildings, public traffic routes and magazines in accordance with Table N5604.5.2(2) or N5604.5.2(3) as appropriate, based on the maximum quantity of *explosive* materials permitted to be in the building at one time

Exception: Fireworks manufacturing buildings constructed and operated in accordance with NFPA 1124.

N5605.5 Buildings and equipment. Buildings or rooms that exceed the *maximum allowable quantity per control area* of *explosive materials* shall be operated in accordance with this section and constructed in accordance with the requirements of this code for Group H occupancies.

Exception: Fireworks manufacturing buildings constructed and operated in accordance with NFPA 1124.

N5605.5.1 Explosives dust. *Explosives* dust shall not be exhausted to the atmosphere.

N5605.5.1.1 Wet collector. When collecting *explosives* dust, a wet collector system shall be used. Wetting agents shall be compatible with the *explosives*. Collector systems shall be interlocked with process power supplies so that the process cannot continue without the collector systems also operating.

[M]N5605.5.2 Exhaust fans. Squirrel cage blowers shall not be used for exhausting hazardous fumes, vapors or gases. Only nonferrous fan blades shall be used for fans located within the ductwork and through which hazardous materials are exhausted. Motors shall be located outside the duct.

N5605.5.3 Work stations. Work stations shall be separated by distance, barrier or other *approved* alternatives so that fire in one station will not ignite material in another work station. Where necessary, the operator shall be protected by a personnel shield located between the operator and the *explosive* device or *explosive material* being processed. This shield and its support shall be capable of withstanding a blast from the maximum amount of *explosives* allowed behind it.

CHAPTER N57 FLAMMABLE AND COMBUSTIBLE LIQUIDS

SECTION N5701 GENERAL

N5701.1 Scope and application. Prevention, control and mitigation of dangerous conditions related to storage, use, dispensing, mixing and handling of flammable and *combustible liquids* shall be in accordance with Sections N5001 through N5005, Section N5701 and N5706.

N5701.2 Nonapplicability. This code shall not apply to liquids as otherwise provided in other laws or regulations of this code, including:

1. Specific provisions for flammable liquids in motor fuel-dispensing facilities, repair garages and airports.
2. Medicines, foodstuffs, cosmetics, and commercial, institutional and industrial products containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solution not being flammable, provided that such materials are packaged in individual containers not exceeding 1.3 gallons (5 L).
3. Quantities of alcoholic beverages in retail or wholesale sales or storage occupancies, provided that the liquids are packaged in individual containers not exceeding 1.3 gallons (5 L).
4. Storage and use of fuel oil in tanks and containers connected to oil-burning equipment. Such storage and use shall be in accordance with Section N603. For abandonment of fuel oil tanks, this chapter applies.
5. Refrigerant liquids and oils in refrigeration systems (see Section N606).
6. Storage and display of aerosol products complying with Sections N5101 through N5107.
7. Storage and use of liquids that have no fire point when tested in accordance with ASTM D92.
8. Liquids with a *flash point* greater than 95°F (35°C) in a water-miscible solution or dispersion with a water and inert (noncombustible) solids content of more than 80 percent by weight, which do not sustain combustion.
9. Liquids without *flash points* that can be flammable under some conditions, such as certain halogenated hydrocarbons and mixtures containing halogenated hydrocarbons.
10. The storage of distilled spirits and wines in wooden barrels and casks.

N5701.3 [5701.5] Material classification. Flammable and *combustible liquids* shall be classified in accordance with the definitions in Section N202. When mixed with lower flash-point liquids, Class II or III liquids are capable of assuming the characteristics of the lower flash-point liquids. Under such conditions, the appropriate provisions of this code for the actual *flash point* of the mixed liquid shall apply. When heated above their *flash points*, Class II and III liquids assume the characteristics of Class I liquids. Under such conditions, the appropriate provisions of this code for flammable liquids shall apply.

SECTION N5702 DEFINITIONS

N5702.1 Definitions. The following terms are defined in Section N202:

BULK TRANSFER.
LIQUID STORAGE ROOM.
LIQUID STORAGE WAREHOUSE.
PROCESS TRANSFER.
SOLVENT DISTILLATION UNIT.
TANK, PRIMARY.

**SECTION N5703
GENERAL REQUIREMENTS - FLAMMABLE AND
COMBUSTIBLE LIQUIDS**

N5703.1 Electrical. Electrical wiring and equipment shall be installed in accordance with *the Electrical Code*

N5703.1.1 Classified locations for flammable liquids. Areas where flammable liquids are stored, handled, dispensed or mixed shall be in accordance with Table N5703.1.1. A classified area shall not extend beyond an unpierced floor, roof or other solid partition. The extent of the classified area is allowed to be reduced, or eliminated, where sufficient technical justification is provided to the *building official* that a concentration in the area in excess of 25 percent.

N5703.1.2 Classified locations for combustible liquids. Areas where Class II or III liquids are heated above their *flash points* shall have electrical installations in accordance with Section N5703.1.1.

Exception: Solvent distillation units .

N5703.1.3 Other applications. The *building official* is authorized to determine the extent of the Class I electrical equipment and wiring location when a condition is not specifically covered by these requirements or *the Electrical Code*.

N5703.2 Fire protection. Fire protection for the storage, use, dispensing, mixing, handling and on-site transportation of flammable and *combustible liquids* shall be in accordance with Sections N5701 through N5706 and applicable sections of Chapter 9 of this code.

N5703.3 Reserved.

N5703.4 Spill control and secondary containment. Where the *maximum allowable quantity per control area* is exceeded, and when required by Section N5004.2, rooms, buildings or areas used for storage, dispensing, use, mixing or handling of Class I, II and IIIA liquids shall be provided with spill control and secondary containment in accordance with Section N5004.2.

N5703.5 Reserved.

N5703.6 Piping systems. Piping systems, and their component parts, for flammable and *combustible liquids* shall be in accordance with Sections N5703.6.1 through N5703.6.11.

N5703.6.1 Nonapplicability. The provisions of Section N5703.6 shall not apply to gas or oil well installations; piping that is integral to stationary or portable engines, including aircraft, watercraft and motor vehicles; and piping in connection with boilers and pressure vessels regulated by the *Mechanical Code*.

N5703.6.4 Protection from vehicles. Guard posts or other *approved* means shall be provided to protect piping, valves or fittings subject to vehicular damage in accordance with Section N303.

**SECTION N5704
FLAMMABLE AND COMBUSTIBLE LIQUIDS
STORAGE**

N5704.1 General. The storage of flammable and *combustible liquids* in containers and tanks shall be in accordance with this section and the applicable sections of this code.

N5704.2 Tank storage. The provisions of this section shall apply to:

1. The storage of flammable and *combustible liquids* in fixed above-ground tanks.
2. The storage of flammable and *combustible liquids* in fixed above-ground tanks inside of buildings.
3. The storage of flammable and *combustible liquids* in portable tanks whose capacity exceeds 660 gallons (2498 L).
4. The installation of such tanks and portable tanks.

N5704.2.1 Change of tank contents. Tanks subject to change in contents shall be in accordance with Section N5704.2.7.

Tanks that have previously contained Class I liquids shall not be loaded with Class II or Class III liquids until such tanks and all piping, pumps, hoses and meters connected thereto have been completely drained and flushed.

N5704.2.2 Reserved.

N5704.2.3 Labeling and signs. Labeling and signs for storage tanks and storage tank areas shall comply with Sections N5704.2.3.1 and N5704.2.3.2.

N5704.2.3.1 Smoking and open flame. Signs shall be posted in storage areas prohibiting open flames and smoking. Signs shall comply with Section N5703.5.

N5704.2.3.2 Label or placard. Tanks more than 100 gallons (379 L) in capacity, which are permanently installed or mounted and used for the storage of Class I, II or III liquids, shall bear a label and placard identifying the material therein. Placards shall be in accordance with NFPA 704.

Exceptions:

1. Tanks of 300-gallon (1136 L) capacity or less located on private property and used for heating and cooking fuels in single-family *dwelling*s.
2. Tanks located underground.

N5704.2.4 Reserved.

N5704.2.5 Explosion control. Explosion control shall be provided in accordance with Section N901.

N5704.2.6 Separation from incompatible materials. Storage of flammable and *combustible liquids* shall be separated from *incompatible materials* in accordance with Section N5003.9.2

TABLE N5703.1.1
CLASS I ELECTRICAL EQUIPMENT LOCATIONS^a

LOCATION	GROUP D DIVISION	EXTENT OF CLASSIFIED AREA
Underground tank fill opening	1	Pits, boxes or spaces below grade level, any part of which is within the Division 1 or 2 classified area.
	2	Up to 18 inches above grade level within a horizontal radius of 10 feet from a loose-fill connection and within a horizontal radius of 5 feet from a tight-fill connection.
Vent—Discharging upward	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 5 feet of open end of vent, extending in all directions.
Drum and container filling Outdoor or indoor with adequate ventilation	1	Within 3 feet of vent and fill opening, extending in all directions.
	2	Area between 3 feet and 5 feet from vent of fill opening, extending in all directions. Also up to 18 inches above floor or grade level within a horizontal radius of 10 feet from vent or fill opening.
Pumps, bleeders, withdrawal fittings, meters and similar devices Indoor Outdoor	2	Within 5 feet of any edge of such devices, extending in all directions. Also up to 3 feet above floor or grade level within 25 feet horizontally from any edge of such devices.
	2	Within 3 feet of any edge of such devices, extending in all directions. Also up to 18 inches above floor or grade level within 10 feet horizontally from an edge of such devices.
Pits Without mechanical ventilation Containing valves, fittings or piping, and not within a Division 1 or 2 classified area	1	Entire area within pit if any part is within a Division 1 or 2 classified area.
	2	Entire area within pit if any part is within a Division 1 or 2 classified area.
	2	Entire pit.
Drainage ditches, separators, impounding basins Indoor Outdoor	1 or 2	Same as pits.
	2	Area up to 18 inches above ditch, separator or basin. Also up to 18 inches above grade within 15 feet horizontal from any edge.
Tank vehicle and tank car ^b	1	Within 3 feet of edge of dome, extending in all directions.
	2	Area between 3 feet and 15 feet from edge of dome, extending in all directions.
	1	Within 3 feet of point of venting to atmosphere, extending in all directions.
	2	Area between 3 feet and 15 feet from point of venting to atmosphere, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of loading connection.

TABLE N5703.1-1
CLASS I ELECTRICAL EQUIPMENT LOCATIONS...continued.

LOCATION	GROUP D DIVISION	EXTENT OF CLASSIFIED AREA
Tank vehicle and tank car^b—continued Loading through closed dome with atmospheric venting	1	Within 3 feet of open end of vent, extending in all directions.
	2	Area between 3 feet and 15 feet from open end of vent, extending in all directions. Also within 3 feet of edge of dome, extending in all directions.
Loading through closed dome with vapor control	2	Within 3 feet of point of connection of both fill and vapor lines, extending in all directions.
Bottom loading with vapor control or any bottom unloading	2	Within 3 feet of point of connection, extending in all directions. Also up to 18 inches above grade within a horizontal radius of 10 feet from point of connection.
Storage and repair garage for tank vehicles	1	Pits or spaces below floor level. Area up to 18 inches above floor or grade level for entire storage or repair garage.
	2	Where there is an opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Garages for other than tank vehicles	Ordinary	Where there is an opening to these rooms within the extent of an outdoor classified area, the entire room shall be classified the same as the area classification at the point of the opening.
Outdoor drum storage	Ordinary	—
Indoor warehousing where there is no flammable liquid transfer	Ordinary	Where there is an opening to these rooms within the extent of an indoor classified area, the room shall be classified the same as if the wall, curb or partition did not exist.
Indoor equipment where flammable vapor/air mixtures could exist under normal operations	1	Area within 5 feet of any edge of such equipment, extending in all directions.
	2	Area between 5 feet and 8 feet of any edge of such equipment, extending in all directions. Also, area up to 3 feet above floor or grade level within 5 feet to 25 feet horizontally from any edge of such equipment. ^c
Outdoor equipment where flammable vapor/air mixtures could exist under normal operations	1	Area within 3 feet of any edge of such equipment, extending in all directions.
	2	Area between 3 feet and 8 feet of any edge of such equipment extending in all directions. Also, area up to 3 feet above floor or grade level within 3 feet to 10 feet horizontally from any edge of such equipment.
Tank—Above ground Shell, ends or roof and dike area	1	Area inside dike where dike height is greater than the distance from the tank to the dike for more than 50 percent of the tank circumference.
	2	Area within 10 feet from shell, ends or roof of tank. Area inside dikes to level of top of dike.
	1	Area within 5 feet of open end of vent, extending in all directions.
	2	Area between 5 feet and 10 feet from open end of vent, extending in all directions.
Vent	1	Area above the roof and within the shell.
Floating roof	2	Where there is an opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb or partition did not exist.
Office and restrooms	Ordinary	Where there is an opening to these rooms within the extent of an indoor classified location, the room shall be classified the same as if the wall, curb or partition did not exist.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

- a. Locations as classified in NFPA 70.
- b. When classifying extent of area, consideration shall be given to the fact that tank cars or tank vehicles can be spotted at varying points. Therefore, the extremities of the loading or unloading positions shall be used.
- c. The release of Class I liquids can generate vapors to the extent that the entire building, and possibly a zone surrounding it, are considered a Class I, Division 2 location.

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N5704.2.7 Design, construction and general installation requirements for tanks. The design, fabrication and construction of tanks shall comply with NFPA 30. Each tank shall bear a permanent nameplate or marking indicating the standard used as the basis of design.

N5704.2.7.1 Materials used in tank construction. The materials used in tank construction shall be in accordance with NFPA 30.

N5704.2.7.2 Pressure limitations for tanks. Tanks shall be designed for the pressures to which they will be subjected in accordance with NFPA 30.

N5704.2.7.3 Tank vents for normal venting. Tank vents for normal venting shall be installed and maintained in accordance with Sections N5704.2.7.3.1 through N5704.2.7.3.6.

N5704.2.7.3.1 Vent lines. Vent lines from tanks shall not be used for purposes other than venting unless approved.

N5704.2.7.3.2 Vent-line flame arresters and pressure-vacuum vents. Listed or approved flame arresters or pressure-vacuum (PV) vents that remain closed unless venting under pressure or vacuum conditions shall be installed in normal vents of tanks containing Class IB and IC liquids.

Exception: When determined by the **building** official that the use of such devices can result in damage to the tank.

Vent-line flame arresters shall be installed in accordance with their listing or API 2000. In-line flame arresters in piping systems shall be installed in accordance with their listing or API 2028. Pressure-vacuum vents shall be installed in accordance with Section 21.4.3 of NFPA 30 or API 2000 in accordance with Section 21.8.6 of NFPA 30 or API 2000.

N5704.2.7.3.3 Vent pipe outlets. Vent pipe outlets for tanks storing Class I, II or IIIA liquids shall be located such that the vapors are released at a safe point outside of buildings and not less than 12 feet (3658 mm) above the finished ground level. Vapors shall be discharged upward or horizontally away from adjacent walls to assist in vapor dispersion. Vent outlets shall be located such that flammable vapors will not be trapped by eaves or other obstructions and shall be at least 5 feet (1524 mm) from building openings or lot lines of properties that can be built upon. Vent outlets on atmospheric tanks storing Class IIIB liquids are allowed to discharge inside a building if the vent is a normally closed vent.

Exception: Vent pipe outlets on tanks storing Class IIIB liquid inside buildings and connected to fuel-burning equipment shall be located such that the vapors are released to a safe location outside of buildings.

N5704.2.7.3.4 Installation of vent piping. Vent piping shall be designed, sized, constructed and installed in accordance with Section N5703.6. Vent pipes shall be installed such that they will drain toward the tank without sags or traps in which liquid can collect. Vent

pipes shall be installed in such a manner so as not to be subject to physical damage or vibration.

N5704.2.7.3.5 Manifolding. Tank vent piping shall not be manifolded unless required for special purposes such as vapor recovery, vapor conservation or air pollution control.

N5704.2.7.3.5.1 Above-ground tanks. For aboveground tanks, manifolded vent pipes shall be adequately sized to prevent system pressure limits from being exceeded when manifolded tanks are subject to the same fire exposure.

N5704.2.7.3.5.2 Underground tanks. For underground tanks, manifolded vent pipes shall be sized to prevent system pressure limits from being exceeded when manifolded tanks are filled simultaneously.

N5704.2.7.3.5.3 Tanks storing Class I liquids. Vent piping for tanks storing Class I liquids shall not be manifolded with vent piping for tanks storing Class II and III liquids unless positive means are provided to prevent the vapors from Class I liquids from entering tanks storing Class II and III liquids, to prevent contamination and possible change in classification of less volatile liquid.

N5704.2.7.3.6 Tank venting for tanks and pressure vessels storing Class IB and IC liquids. Tanks and pressure vessels storing Class IB or IC liquids shall be equipped with venting devices which shall be normally closed except when venting under pressure or vacuum conditions, or with listed flame arresters. The vents shall be installed and maintained in accordance with Section 21.4.3 of NFPA 30 or API 2000.

N5704.2.7.4 Emergency venting. Stationary, aboveground tanks shall be equipped with additional venting that will relieve excessive internal pressure caused by exposure to fires. Emergency vents for Class I, II and IIIA liquids shall not discharge inside buildings. The venting shall be installed and maintained in accordance with Section 22.7 of NFPA 30.

Exceptions:

1. Tanks larger than 12,000 gallons (45 420 L) in capacity storing Class IIIB liquids which are not within the diked area or the drainage path of Class I or II liquids do not require emergency relief venting.
2. Emergency vents on protected above-ground tanks complying with UL 2085 containing Class II or IIIA liquids are allowed to discharge inside the building.

N5704.2.7.5 Tank openings other than vents. Tank openings for other than vents shall comply with Sections N5704.2.7.5.1 through N5704.2.7.5.8.

N5704.2.7.5.1 Connections below liquid level. Connections for tank openings below the liquid level shall be liquid tight.

N5704.2.7.5.2 Filling, emptying and vapor recovery connections. Filling, emptying and vapor recovery connections to tanks containing Class I, II or IIIA liquids shall be located outside of buildings in accordance with Section N5704.2.7.5.6 at a location free from sources of ignition and not less than 5 feet (1524 mm) away from building openings or lot lines of property that can be built upon. Such openings shall be properly identified and provided with a liquid-tight cap which shall be closed when not in use. Filling and emptying connections to indoor tanks containing Class IIIB liquids and connected to fuelburning equipment shall be located at a finished ground level location outside of buildings. Such openings shall be provided with a liquid-tight cap which shall be closed when not in use.

N5704.2.7.5.3 Piping, connections and fittings. Piping, connections, fittings and other appurtenances shall be installed in accordance with Section N5703.6.

N5704.2.7.5.4 Manual gauging. Openings for manual gauging, if independent of the fill pipe, shall be provided with a liquid-tight cap or cover. Covers shall be kept closed when not gauging. If inside a building, such openings shall be protected against liquid overflow and possible vapor release by means of a spring-loaded check valve or other approved device.

N5704.2.7.5.5 Fill pipes and discharge lines. For top-loaded tanks, a metallic fill pipe shall be designed and installed to minimize the generation of static electricity by terminating the pipe within 6 inches (152 mm) of the bottom of the tank, and it shall be installed in a manner which avoids excessive vibration.

N5704.2.7.5.5.1 Class I liquids. For Class I liquids other than crude oil, gasoline and asphalt, the fill pipe shall be designed and installed in a manner which will minimize the possibility of generating static electricity by terminating within 6 inches (152 mm) of the bottom of the tank.

N5704.2.7.5.6 Location of connections that are made or broken. Filling, withdrawal and vapor recovery connections for Class I, II and IIIA liquids which are made and broken shall be located outside of buildings, not more than 5 feet (1524 mm) above the finished ground level, in an approved location in close proximity to the parked delivery vehicle. Such location shall be away from sources of ignition and not less than 5 feet (1524 mm) away from building openings. Such connections shall be closed and liquid tight when not in use and shall be properly identified.

N5704.2.7.5.7 Protection against vapor release. Tank openings provided for purposes of vapor recovery shall be protected against possible vapor release by means of a spring-loaded check valve or dry-break connections, or other approved device, unless the opening is a pipe connected to a vapor processing system. Openings designed for combined fill and vapor recovery shall also be protected against vapor release unless connection of

the liquid delivery line to the fill pipe simultaneously connects the vapor recovery line. Connections shall be vapor tight.

N5704.2.7.5.8 Overfill prevention. An approved means or method in accordance with Section N5704.2.9.7.6 shall be provided to prevent the overfill of all Class I, II and IIIA liquid storage tanks. Storage tanks in refineries, bulk plants or terminals regulated by Section N5706.4 or N5706.7 shall have overfill protection in accordance with API 2350.

An approved means or method in accordance with Section N5704.2.9.7.6 shall be provided to prevent the overfilling of Class IIIB liquid storage tanks connected to fuel-burning equipment inside buildings.

Exception: Outside above-ground tanks with a capacity of 1,320 gallons (5000 L) or less.

N5704.2.7.6 Repair, alteration or reconstruction of tanks and piping. The repair, alteration or reconstruction, including welding, cutting and hot tapping of storage tanks and piping that have been placed in service, shall be in accordance with NFPA 30.

N5704.2.7.7 Design of supports. The design of the supporting structure for tanks shall be in accordance with the International Building Code and NFPA 30.

N5704.2.7.8 Locations subject to flooding. Where a tank is located in an area where it is subject to buoyancy because of a rise in the water table, flooding or accumulation of water from fire suppression operations, uplift protection shall be provided in accordance with Sections 22.14 and 23.14 of NFPA 30.

N5704.2.7.9 Corrosion protection. Where subject to external corrosion, tanks shall be fabricated from corrosion-resistant materials, coated or provided with corrosion protection in accordance with Section 23.3.4 of NFPA 30.

N5704.2.7.10 Reserved.

N5704.2.7.11 Tank lining. Steel tanks are allowed to be lined only for the purpose of protecting the interior from corrosion or providing compatibility with a material to be stored. Only those liquids tested for compatibility with the lining material are allowed to be stored in lined tanks.

N5704.2.8 Vaults. Vaults shall be allowed to be either above or below grade and shall comply with Sections N5704.2.8.1 through N5704.2.8.17.

N5704.2.8.1 Listing required. Vaults shall be *listed* in accordance with UL 2245.

Exception: Where *approved* by the *building official*, below-grade vaults are allowed to be constructed on site, provided that the design is in accordance with the this code and that special inspections are conducted to verify structural strength and compliance of the installation with the *approved* design in accordance with Section 1707 of this code. Installation plans for below-grade vaults that are constructed on site shall be prepared by, and the design shall bear the stamp of, a professional

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engineer. Consideration shall be given to soil and hydrostatic loading on the floors, walls and lid; anticipated seismic forces; uplifting by groundwater or flooding; and to loads imposed from above such as traffic and equipment loading on the vault lid.

N5704.2.8.2 Design and construction. The vault shall completely enclose each tank. There shall be no openings in the vault enclosure except those necessary for access to, inspection of, and filling, emptying and venting of the tank. The walls and floor of the vault shall be constructed of reinforced concrete at least 6 inches (152 mm) thick. The top of an above-grade vault shall be constructed of noncombustible material and shall be designed to be weaker than the walls of the vault, to ensure that the thrust of an explosion occurring inside the vault is directed upward before significantly high pressure can develop within the vault.

The top of an at-grade or below-grade vault shall be designed to relieve safely or contain the force of an explosion occurring inside the vault. The top and floor of the vault and the tank foundation shall be designed to withstand the anticipated loading, including loading from vehicular traffic, where applicable. The walls and floor of a vault installed below grade shall be designed to withstand anticipated soil and hydrostatic loading. Vaults shall be designed to be wind and earthquake resistant, in accordance with this code.

N5704.2.8.3 Secondary containment. Vaults shall be substantially liquid tight and there shall be no backfill around the tank or within the vault. The vault floor shall drain to a sump. For premanufactured vaults, liquid tightness shall be certified as part of the listing provided by a nationally recognized testing laboratory. For field-erected vaults, liquid tightness shall be certified in an *approved* manner.

N5704.2.8.4 Internal clearance. There shall be sufficient clearance between the tank and the vault to allow for visual inspection and maintenance of the tank and its appurtenances. Dispensing devices are allowed to be installed on tops of vaults.

N5704.2.8.5 Anchoring. Vaults and their tanks shall be suitably anchored to withstand uplifting by ground water or flooding, including when the tank is empty.

N5704.2.8.6 Vehicle impact protection. Vaults shall be resistant to damage from the impact of a motor vehicle, or vehicle impact protection shall be provided in accordance with Section N303.

N5704.2.8.7 Arrangement. Tanks shall be *listed* for above-ground use, and each tank shall be in its own vault. Compartmentalized tanks shall be allowed and shall be considered as a single tank. Adjacent vaults shall be allowed to share a common wall. The common wall shall be liquid and vapor tight and shall be designed to withstand the load imposed when the vault on either side of the wall is filled with water.

N5704.2.8.8 Connections. Connections shall be provided to permit venting of each vault to dilute, disperse and remove vapors prior to personnel entering the vault.

[M] N5704.2.8.9 Ventilation. Vaults that contain tanks of Class I liquids shall be provided with an exhaust ventilation system installed in accordance with Section N5004.3. The ventilation system shall operate continuously or be designed to operate upon activation of the vapor or liquid detection system. The system shall provide ventilation at a rate of not less than 1 cubic foot per minute (cfm) per square foot of floor area [$0.00508 \text{ m}^3/(\text{s} \cdot \text{m}^2)$], but not less than 150 cfm (4 m^3/min). The exhaust system shall be designed to provide air movement across all parts of the vault floor. Supply and exhaust ducts shall extend to within 3 inches (76 mm), but not more than 12 inches (305 mm), of the floor. The exhaust system shall be installed in accordance with the *Mechanical Code*.

N5704.2.8.10 Liquid detection. Vaults shall be equipped with a detection system capable of detecting liquids, including water, and activating an alarm.

N5704.2.8.11 Monitoring and detection. Vaults shall be provided with *approved* vapor and liquid detection systems and equipped with on-site audible and visual warning devices with battery backup. Vapor detection systems shall sound an alarm when the system detects vapors that reach or exceed 25 percent of the lower explosive limit (LEL) of the liquid stored. Vapor detectors shall be located no higher than 12 inches (305 mm) above the lowest point in the vault. Liquid detection systems shall sound an alarm upon detection of any liquid, including water. Liquid detectors shall be located in accordance with the manufacturer's instructions. Activation of either vapor or liquid detection systems shall cause a signal to be sounded at an *approved*, constantly attended location within the facility serving the tanks or at an *approved* location. Activation of vapor detection systems shall also shut off dispenser pumps.

N5704.2.8.12 Liquid removal. Means shall be provided to recover liquid from the vault. Where a pump is used to meet this requirement, the pump shall not be permanently installed in the vault. Electric-powered portable pumps shall be suitable for use in Class I, Division 1, or Zone 0 locations, as defined in the *Electrical Code*.

N5704.2.8.13 Normal vents. Vent pipes that are provided for normal tank venting shall terminate at least 12 feet (3658 mm) above ground level.

N5704.2.8.14 Emergency vents. Emergency vents shall be vapor tight and shall be allowed to discharge inside the vault. Long-bolt manhole covers shall not be allowed for this purpose.

N5704.2.8.15 Accessway. Vaults shall be provided with an *approved* personnel accessway with a minimum dimension of 30 inches (762 mm) and with a permanently affixed, nonferrous ladder. Accessways shall be designed to be nonsparking. Travel distance from any point inside a vault to an accessway shall not exceed 20 feet (6096 mm). At each entry point, a warning sign indicating the need for

procedures for safe entry into confined spaces shall be posted. Entry points shall be secured against unauthorized entry and vandalism.

N5704.2.8.16 Fire protection. Vaults shall be provided with a suitable means to admit a fire suppression agent.

N5704.2.8.17 Classified area. The interior of a vault containing a tank that stores a Class I liquid shall be designated a Class I, Division 1, or Zone 0 location, as defined in the *Electrical Code*.

N5704.2.8.18 Overfill protection. Overfill protection shall be provided in accordance with Section N5704.2.9.7.6. The use of a float vent valve shall be prohibited.

N5704.2.9 Above-ground tanks. Above-ground storage of flammable and combustible liquids in tanks shall comply with Section N5704.2 and Sections N5704.2.9.1 through N5704.2.9.7.10.

N5704.2.9.1 Reserved.

N5704.2.9.2 Fire protection. Fire protection for aboveground tanks shall comply with Sections N5704.2.9.2.1 through N5704.2.9.2.4.

N5704.2.9.2.1 Required foam fire protection systems.

When required by the fire code official, foam fire protection shall be provided for above-ground tanks, other than pressure tanks operating at or above 1 pound per square inch gauge (psig) (6.89 kPa) when such tank, or group of tanks spaced less than 50 feet (15 240 mm) apart measured shell to shell, has a liquid surface area in excess of 1,500 square feet (139 m²), and is in accordance with one of the following:

1. Used for the storage of Class I or II liquids.
2. Used for the storage of crude oil.
3. Used for in-process products and is located within 100 feet (30 480 mm) of a fired still, heater, related fractioning or processing apparatus or similar device at a processing plant or petroleum refinery as herein defined.
4. Considered by the fire code official as posing an unusual exposure hazard because of topographical conditions; nature of occupancy, proximity on the same or adjoining property, and height and character of liquids to be stored; degree of private fire protection to be provided; and facilities of the fire department to cope with flammable liquid fires.

N5704.2.9.2.2 Foam fire protection system installation. Where foam fire protection is required, it shall be installed in accordance with NFPA 11.

N5704.2.9.2.2.1 Foam storage. Where foam fire protection is required, foam-producing materials shall be stored on the premises. Exception: Storage of foam-producing materials off the premises is allowed as follows:

1. Such materials stored off the premises shall be of the proper type suitable for use with the equipment at the installation where required.
2. Such materials shall be readily available at the storage location at all times.
3. Adequate loading and transportation facilities shall be provided.
4. The time required to deliver such materials to the required location in the event of fire shall be consistent with the hazards and fire scenarios for which the foam supply is intended.
5. At the time of a fire, these off-premises supplies shall be accumulated in sufficient quantities before placing the equipment in operation to ensure foam production at an adequate rate without interruption until extinguishment is accomplished.

N5704.2.9.2.3 Fire protection of supports. Supports or pilings for above-ground tanks storing Class I, II or IIIA liquids elevated more than 12 inches (305 mm) above grade shall have a *fire-resistance rating* of not less than 2 hours in accordance with the fire exposure criteria specified in ASTM E1529.

Exceptions:

1. Structural supports tested as part of a protected above-ground tank in accordance with UL 2085.
2. Stationary tanks located outside of buildings when protected by an *approved* waterspray system designed in accordance with Chapter 9 of this code and NFPA 15.
3. Stationary tanks located inside of buildings equipped throughout with an *approved* automatic sprinkler system designed in accordance with Section 903.3.1.1 of this code.

N5704.2.9.2.4 Inerting of tanks storing boiler liquids. Liquids with boiler characteristics shall not be stored in fixed roof tanks larger than 150 feet (45 720 mm) in diameter unless an *approved* gas enrichment or inerting system is provided on the tank.

Exception: Crude oil storage tanks in production fields with no other exposures adjacent to the storage tank.

N5704.2.9.3 Supports, foundations and anchorage. Supports, foundations and anchorages for aboveground tanks shall be designed and constructed in accordance with NFPA 30 and this code.

N5704.2.9.4 Stairs, platforms and walkways. Stairs, platforms and walkways shall be of noncombustible construction and shall be designed and constructed in accordance with NFPA 30 and this code.

N5704.2.9.5 Above-ground tanks inside of buildings. Above-ground tanks inside of buildings shall comply with Sections N5704.2.9.5.1 and N5704.2.9.5.2.

N5704.2.9.5.1 Overfill prevention. Above-ground tanks storing Class I, II and IIIA liquids inside buildings shall

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be equipped with a device or other means to prevent overflow into the building including, but not limited to: a float valve; a preset meter on the fill line; a valve actuated by the weight of the tank's contents; a low-head pump that is incapable of producing overflow; or a liquid-tight overflow pipe at least one pipe size larger than the fill pipe and discharging by gravity back to the outside source of liquid or to an *approved* location. Tanks containing Class IIIB liquids and connected to fuel-burning equipment shall be provided with a means to prevent overflow into buildings in accordance with Section N5704.2.7.5.8.

N5704.2.9.5.2 Fill pipe connections. Fill pipe connections for tanks storing Class I, II and IIIA liquids and Class IIIB liquids connected to fuel-burning equipment shall be in accordance with Section N5704.2.9.7.7.

N5704.2.9.6 Above-ground tanks outside of buildings. Above-ground tanks outside of buildings shall comply with Sections N5704.2.9.6.1 through N5704.2.9.6.3.

N5704.2.9.6.1 Reserved.

N5704.2.9.6.1.1 Location of tanks with pressures 2.5 psig or less. Above-ground tanks operating at pressures not exceeding 2.5 psig (17.2 kPa) for storage of Class I, II or IIIA liquids, which are designed with a floating roof, a weak roof-toshell seam or equipped with emergency venting devices limiting pressure to 2.5 psig (17.2 kPa), shall be located in accordance with Table 22.4.1.1(a) of NFPA 30.

Exceptions:

1. Vertical tanks having a weak roof-toshell seam and storing Class IIIA liquids are allowed to be located at one-half the distances specified in Table 22.4.1.1(a) of NFPA 30, provided the tanks are not within a diked area or drainage path for a tank storing Class I or II liquids.
2. Liquids with boilover characteristics and unstable liquids in accordance with Sections N5704.2.9.6.1.3 and N5704.2.9.6.1.4.
3. For protected above-ground tanks in accordance with Section N5704.2.9.7 and tanks in at-grade or above-grade vaults in accordance with Section N5704.2.8, the distances in Table 22.4.1.1(b) of NFPA 30 shall apply and shall be reduced by one-half, but not to less than 5 feet (1524 mm).

N5704.2.9.6.1.2 Location of tanks with pressures exceeding 2.5 psig. Above-ground tanks for the storage of Class I, II or IIIA liquids operating at pressures exceeding 2.5 psig (17.2 kPa) or equipped with emergency venting allowing pressures to exceed 2.5 psig (17.2 kPa) shall be located in accordance with Table 22.4.1.3 of NFPA 30.

Exception: Liquids with boilover characteristics and unstable liquids in accordance with Sections N5704.2.9.6.1.4 and N5704.2.9.6.1.5.

N5704.2.9.6.1.3 Location of tanks storing boilover liquids. Above-ground tanks for storage of liquids with boilover characteristics shall be located in accordance with Table 22.4.1.4 of NFPA 30.

N5704.2.9.6.1.4 Location of tanks storing unstable liquids. Above-ground tanks for the storage of unstable liquids shall be located in accordance with Table 22.4.1.5 of NFPA 30.

N5704.2.9.6.1.5 Location of tanks storing Class IIIB liquids. Above-ground tanks for the storage of Class IIIB liquids, excluding unstable liquids, shall be located in accordance with Table 22.4.1.6 of NFPA 30, except when located within a diked area or drainage path for a tank or tanks storing Class I or II liquids. Where a Class IIIB liquid storage tank is within the diked area or drainage path for a Class I or II liquid, distances required by Section N5704.2.9.6.1.1 shall apply.

N5704.2.9.6.2 Separation between adjacent stable or unstable liquid tanks. The separation between tanks containing stable liquids shall be in accordance with Table 22.4.2.1 of NFPA 30. Where tanks are in a diked area containing Class I or II liquids, or in the drainage path of Class I or II liquids, and are compacted in three or more rows or in an irregular pattern, the fire code official is authorized to require greater separation than specified in Table 22.4.2.1 of NFPA 30 or other means to make tanks in the interior of the pattern accessible for fire-fighting purposes. Exception: Tanks used for storing Class IIIB liquids are allowed to be spaced 3 feet (914 mm) apart unless within a diked area or drainage path for a tank storing Class I or II liquids. The separation between tanks containing unstable liquids shall not be less than one-half the sum of their diameters.

N5704.2.9.6.3 Separation between adjacent tanks containing flammable or combustible liquids and LP-gas. The minimum horizontal separation between an LP-gas container and a Class I, II or IIIA liquid storage tank shall be 20 feet (6096 mm) except in the case of Class I, II or IIIA liquid tanks operating at pressures exceeding 2.5 psig (17.2 kPa) or equipped with emergency venting allowing pressures to exceed 2.5 psig (17.2 kPa), in which case the provisions of Section N5704.2.9.6.2 shall apply. An approved means shall be provided to prevent the accumulation of Class I, II or IIIA liquids under adjacent LP-gas containers such as by dikes, diversion curbs or grading. When flammable or combustible liquid storage tanks are within a diked area, the LP-gas containers shall be outside the diked area and at least 10 feet (3048 mm) away from the centerline of the wall of the diked area.

Exceptions:

1. Liquefied petroleum gas containers of 125 gallons (473 L) or less in capacity installed adjacent to fuel-oil supply tanks of 660 gallons (2498 L) or less in capacity.
2. Horizontal separation is not required between above-ground LP-gas containers and

underground flammable and combustible liquid tanks.

N5704.2.9.7 Additional requirements for protected above-ground tanks. In addition to the requirements of this chapter for above-ground tanks, the installation of protected above-ground tanks shall be in accordance with Sections N5704.2.9.7.1 through N5704.2.9.7.10.

N5704.2.9.7.1 Tank construction. The construction of a protected above-ground tank and its primary tank shall be in accordance with Section N5704.2.7.

N5704.2.9.7.2 Normal and emergency venting. Normal and emergency venting for protected aboveground tanks shall be provided in accordance with Sections N5704.2.7.3 and N5704.2.7.4. The vent capacity reduction factor shall not be allowed.

N5704.2.9.7.3 Flame arresters. Approved flame arresters or pressure vacuum breather valves shall be installed in normal vents.

N5704.2.9.7.4 Secondary containment. Protected above-ground tanks shall be provided with secondary containment, drainage control or diking in accordance with Section N5004.2. A means shall be provided to establish the integrity of the secondary containment in accordance with NFPA 30.

N5704.2.9.7.5 Vehicle impact protection. Where protected above-ground tanks, piping, electrical conduit or dispensers are subject to vehicular impact, they shall be protected therefrom, either by having the impact protection incorporated into the system design in compliance with the impact test protocol of UL 2085, or by meeting the provisions of Section N303, or where necessary, a combination of both. Where guard posts or other approved barriers are provided, they shall be independent of each aboveground tank.

N5704.2.9.7.6 Overfill prevention. Protected aboveground tanks shall not be filled in excess of 95 percent of their capacity. An overfill prevention system shall be provided for each tank. During tank-filling operations, the system shall comply with one of the following:

1. The system shall:
 - 1.1. Provide an independent means of notifying the person filling the tank that the fluid level has reached 90 percent of tank capacity by providing an audible or visual alarm signal, providing a tank level gauge marked at 90 percent of tank capacity, or other approved means; and
 - 1.2. Automatically shut off the flow of fuel to the tank when the quantity of liquid in the tank reaches 95 percent of tank capacity. For rigid hose fuel-delivery systems, an approved means shall be provided to empty the fill hose into the tank after the automatic shutoff device is activated.

2. The system shall reduce the flow rate to not more than 15 gallons per minute (0.95 L/s) so that at the reduced flow rate, the tank will not overflow for 30 minutes, and automatically shut off flow into the tank so that none of the fittings on the top of the tank are exposed to product because of overflowing.

N5704.2.9.7.6.1 Information signs. A permanent sign shall be provided at the fill point for the tank, documenting the filling procedure and the tank calibration chart.

Exception: Where climatic conditions are such that the sign may be obscured by ice or snow, or weathered beyond readability or otherwise impaired, said procedures and chart shall be located in the office window, lock box or other area accessible to the person filling the tank.

N5704.2.9.7.6.2 Determination of available tank capacity. The filling procedure shall require the person filling the tank to determine the gallonage (literage) required to fill it to 90 percent of capacity before commencing the fill operation.

N5704.2.9.7.7 Fill pipe connections. The fill pipe shall be provided with a means for making a direct connection to the tank vehicle's fuel delivery hose so that the delivery of fuel is not exposed to the open air during the filling operation. Where any portion of the fill pipe exterior to the tank extends below the level of the top of the tank, a check valve shall be installed in the fill pipe not more than 12 inches (305 mm) from the fill hose connection.

N5704.2.9.7.8 Spill containers. A spill container having a capacity of not less than 5 gallons (19 L) shall be provided for each fill connection. For tanks with a top fill connection, spill containers shall be noncombustible and shall be fixed to the tank and equipped with a manual drain valve that drains into the primary tank. For tanks with a remote fill connection, a portable spill container shall be allowed.

N5704.2.9.7.9 Tank openings. Tank openings in protected above-ground tanks shall be through the top only.

N5704.2.9.7.10 Antisiphon devices. Approved antisiphon devices shall be installed in each external pipe connected to the protected above-ground tank when the pipe extends below the level of the top of the tank.

N5704.2.10 Drainage and diking. The area surrounding a tank or group of tanks shall be provided with drainage control or shall be diked to prevent accidental discharge of liquid from endangering adjacent tanks, adjoining property or reaching waterways.

Exceptions:

1. The fire code official is authorized to alter or waive these requirements based on a technical

report which demonstrates that such tank or group of tanks does not constitute a hazard to other tanks, waterways or adjoining property, after consideration of special features such as topographical conditions, nature of occupancy and proximity to buildings on the same or adjacent property, capacity, and construction of proposed tanks and character of liquids to be stored, and nature and quantity of private and public fire protection provided.

2. Drainage control and diking is not required for listed secondary containment tanks.

N5704.2.10.1 Volumetric capacity. The volumetric capacity of the diked area shall not be less than the greatest amount of liquid that can be released from the largest tank within the diked area. The capacity of the diked area enclosing more than one tank shall be calculated by deducting the volume of the tanks other than the largest tank below the height of the dike.

N5704.2.10.2 Diked areas containing two or more tanks. Diked areas containing two or more tanks shall be subdivided in accordance with NFPA 30.

N5704.2.10.3 Protection of piping from exposure fires. Piping shall not pass through adjacent diked areas or impounding basins, unless provided with a sealed sleeve or otherwise protected from exposure to fire.

N5704.2.10.4 Reserved.

N5704.2.10.5 Equipment, controls and piping in diked areas. Pumps, manifolds and fire protection equipment or controls shall not be located within diked areas or drainage basins or in a location where such equipment and controls would be endangered by fire in the diked area or drainage basin. Piping above ground shall be minimized and located as close as practical to the shell of the tank in diked areas or drainage basins.

Exceptions:

1. Pumps, manifolds and piping integral to the tanks or equipment being served which is protected by intermediate diking, berms, drainage or fire protection such as water spray, monitors or resistive coating.
2. Fire protection equipment or controls which are appurtenances to the tanks or equipment being protected, such as foam chambers or foam piping and water or foam monitors and hydrants, or hand and wheeled extinguishers.

N5704.3 Container and portable tank storage.

N5704.3.1 Indoor storage.

N5704.3.1.1 [5704.3.3.5] Shelf storage. Shelving shall be of approved construction, adequately braced and anchored. Seismic requirements shall be in accordance with.

N5704.3.1.1.1 [5704.3.3.5.1] Use of wood. Wood of at least 1 inch (25 mm) nominal thickness is allowed to be used as shelving, racks, dunnage, scuffboards, floor overlay and similar installations.

N5704.3.1.1.2 [5704.3.3.5.2] Displacement protection. Shelves shall be of sufficient depth and provided with a lip or guard to prevent individual containers from being displaced.

Exception: Shelves in storage cabinets or on laboratory furniture specifically designed for such use.

N5704.3.1.2 [5704.3.3.6] Rack storage. Where storage on racks is allowed elsewhere in this code, a minimum 4-foot-wide (1219 mm) aisle shall be provided between adjacent rack sections and any adjacent storage of liquids. Main aisles shall be a minimum of 8 feet (2438 mm) wide.

N5704.3.1.3 [5704.3.3.8] Limited combustible storage. Limited quantities of combustible commodities are allowed to be stored in liquid storage areas where the ordinary combustibles, other than those used for packaging the liquids, are separated from the liquids in storage by a minimum of 8 feet (2438 mm) horizontally, either by open aisles or by open racks, and where protection is provided in accordance with Chapter 9 of this code.

N5704.3.2 – N5704.3.3 Reserved.

N5704.3.4 Quantity limits for storage. Liquid storage quantity limitations shall comply with Sections N5704.3.4.1 through N5704.3.4.3.

N5704.3.4.1 Maximum allowable quantity per control area. For occupancies other than Group M wholesale and retail sales uses, indoor storage of flammable and *combustible liquids* shall not exceed the *maximum allowable quantities per control area* indicated in Table 307.1(1) of this code and shall not exceed the additional limitations set forth in this section.

For Group M occupancy wholesale and retail sales uses, indoor storage of flammable and *combustible liquids* shall not exceed the *maximum allowable quantities per control area* indicated in Table 414.2.5(2) of this code.

Storage of hazardous production material flammable and *combustible liquids* in Group H-5 occupancies shall be in accordance with Sections N2701 through N2705.

N5704.3.4.2 Occupancy quantity limits. The following limits for quantities of stored flammable or *combustible liquids* shall not be exceeded:

1. Group A occupancies: Quantities in Group A occupancies shall not exceed that necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
2. Group B occupancies: Quantities in drinking, dining, office and school uses within Group B occupancies shall not exceed that necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
3. Group E occupancies: Quantities in Group E occupancies shall not exceed that necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment,

and shall not exceed quantities set forth in Table 307.1(1) of this code.

4. Group F occupancies: Quantities in dining, office, and school uses within Group F occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
5. Group I occupancies: Quantities in Group I occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
6. Group M occupancies: Quantities in dining, office, and school uses within Group M occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code. The maximum allowable quantities for storage in wholesale and retail sales areas shall be in accordance with Section N5704.3.4.1
7. Group R occupancies: Quantities in Group R occupancies shall not exceed that necessary for maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
8. Group S occupancies: Quantities in dining and office uses within Group S occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.

N5704.3.4.3 Quantities exceeding limits for control areas. Quantities exceeding those allowed in *control areas* set forth in Section N5704.3.4.1 shall be in liquid storage rooms or liquid storage warehouses in accordance with Sections N5704.3.7 and N5704.3.8.

N5704.3.5 Storage in control areas. Storage of flammable and *combustible liquids* in *control areas* shall be in accordance with Section N5704.3.5.1.

N5704.3.5.1 Basement storage. Class I liquids shall be allowed to be stored in *basements* in amounts not exceeding the *maximum allowable quantity per control area* for *use-open systems* in Table 307.1(1) of this code, provided that automatic suppression and other fire protection are provided in accordance with Chapter 9 of this code. Class II and IIIA liquids shall also be allowed to be stored in *basements*, provided that automatic suppression and other fire protection are provided in accordance with Chapter 9 of this code.

N5704.3.6 Wholesale and retail sales uses. Flammable and combustible liquids in Group M occupancy wholesale and retail sales uses shall be in accordance with Sections N5704.3.6.1 through N5704.3.6.3, or Sections 10.10.2, 12.3.8, 16.4.1 through 16.4.3, 16.5.1 through 16.5.2.12, Tables 16.5.2.1

through 16.5.2.12, and Figures 16.4.1(a) through 16.14.1(c) of NFPA 30.

N5704.3.6.1 Container type. Containers for Class I liquids shall be metal.

Exception: In sprinklered buildings, an aggregate quantity of 120 gallons (454 L) of water-miscible Class IB and Class IC liquids is allowed in nonmetallic containers, each having a capacity of 16 ounces (0.473 L) or less.

N5704.3.6.2 Container capacity. Containers for Class I liquids shall not exceed a capacity of 5 gallons (19 L).

Exception: Metal containers not exceeding 55 gallons (208 L) are allowed to store up to 240 gallons (908 L) of the *maximum allowable quantity per control area* of Class IB and IC liquids in a control area. The building shall be equipped throughout with an *approved* automatic sprinkler system in accordance with Table 414.2.5(2) of this code. The containers shall be provided with plastic caps without cap seals and shall be stored upright. Containers shall not be stacked or stored in racks and shall not be located in areas accessible to the public.

N5704.3.6.3 Fire protection and storage arrangements. Fire protection and container storage arrangements shall be in accordance with Table N5704.3.6.3(1) or the following:

1. Storage on shelves shall not exceed 6 feet (1829 mm) in height, and shelving shall be metal.
2. Storage on pallets or in piles greater than 4 feet 6 inches (1372 mm) in height, or where the ceiling exceeds 18 feet (5486 mm) in height, shall be protected in accordance with Table N5704.3.6.3(4), and the storage heights and arrangements shall be limited to those specified in Table N5704.3.6.3(2).
3. Storage on racks greater than 4 feet 6 inches (1372 mm) in height, or where the ceiling exceeds 18 feet (5486 mm) in height shall be protected in accordance with Tables N5704.3.6.3(5), N5704.3.6.3(6), and N5704.3.6.3(7) as appropriate, and the storage heights and arrangements shall be limited to those specified in Table N5704.3.6.3(3).

Combustible commodities shall not be stored above flammable and *combustible liquids*.

N5704.3.7 Liquid storage rooms. Liquid storage rooms shall comply with Sections N5704.3.7.1 through N5704.3.7.5.2.

N5704.3.7.1 General. Quantities of liquids exceeding those set forth in Section N5704.3.4.1 for storage in *control areas* shall be stored in a liquid storage room complying with this section and constructed and separated as required by this code.

N5704.3.7.2 Quantities and arrangement of storage. The quantity limits and storage arrangements in liquid storage rooms shall be in accordance with Tables N5704.3.6.3(2) and N5704.3.6.3(3) and Sections N5704.3.7.2.1 and N5704.3.7.2.2.

N5704.3.7.2.1 Mixed storage. Where two or more classes of liquids are stored in a pile or rack section:

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1. The quantity in that pile or rack shall not exceed the smallest of the maximum quantities for the classes of liquids stored in accordance with Table N5704.3.6.3(2) or N5704.3.6.3(3); and
2. The height of storage in that pile or rack shall not exceed the smallest of the maximum heights for the classes of liquids stored in accordance with Table N5704.3.6.3(2) or N5704.3.6.3(3).

N5704.3.7.2.2 Separation and aisles. Piles shall be separated from each other by at least 4-foot (1219 mm) aisles. Aisles shall be provided so that all containers are

20 feet (6096 mm) or less from an aisle. Where the storage of liquids is on racks, a minimum 4-foot-wide (1219 mm) aisle shall be provided between adjacent rows of racks and adjacent storage of liquids. Main aisles shall be a minimum of 8 feet (2438 mm) wide. Additional aisles shall be provided for access to doors, required windows and ventilation openings, standpipe connections, mechanical equipment and switches. Such aisles shall be at least 3 feet (914 mm) in width, unless greater widths are required for separation of piles or racks, in which case the greater width shall be provided.

**TABLE N5704.3.6.3(1)
MAXIMUM STORAGE HEIGHT IN CONTROL AREA**

TYPE OF LIQUID	NONSPRINKLERED AREA (feet)	SPRINKLERED AREA ^a (feet)	SPRINKLERED WITH IN-RACK PROTECTION ^{a, b} (feet)
Flammable liquids:			
Class IA	4	4	4
Class IB	4	8	12
Class IC	4	8	12
Combustible liquids:			
Class II	6	8	12
Class IIIA	8	12	16
Class IIIB	8	12	20

For SI: 1 foot = 304.8 mm.

- a. In buildings protected by an automatic sprinkler system, the storage height for containers and portable tanks shall not exceed the maximum storage height permitted for the fire protection scheme set forth in NFPA 30 or the maximum storage height demonstrated in a full-scale fire test, whichever is greater. NFPA 30 criteria and fire test results for metallic containers and portable tanks shall not be applied to nonmetallic containers and portable tanks.
- b. In-rack protection shall be in accordance with Table N5704.3.6.3(5), N5704.3.6.3(6) or N5704.3.6.3(7).

**TABLE N5704.3.6.3(2)
STORAGE ARRANGEMENTS FOR PALLETIZED OR SOLID-PILE STORAGE IN LIQUID STORAGE ROOMS AND WAREHOUSES**

CLASS	STORAGE LEVEL	MAXIMUM STORAGE HEIGHT			MAXIMUM QUANTITY PER PILE (gallons)		MAXIMUM QUANTITY PER ROOM ^a (gallons)	
		Drums	Containers ^b (feet)	Portable tanks ^b (feet)	Containers	Portable tanks	Containers	Portable tanks
IA	Ground floor	1	5	Not Allowed	3,000	Not Allowed	12,000	Not Allowed
	Upper floors	1	5	Not Allowed	2,000	Not Allowed	8,000	Not Allowed
	Basements	0	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
IB	Ground floor	1	6.5	7	5,000	20,000	15,000	40,000
	Upper floors	1	6.5	7	3,000	10,000	12,000	20,000
	Basements	0	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
IC	Ground floor ^d	1	6.5 ^c	7	5,000	20,000	15,000	40,000
	Upper floors	1	6.5 ^c	7	3,000	10,000	12,000	20,000
	Basements	0	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed
II	Ground floor ^d	3	10	14	10,000	40,000	25,000	80,000
	Upper floors	3	10	14	10,000	40,000	25,000	80,000
	Basements	1	5	7	7,500	20,000	7,500	20,000
III	Ground floor	5	20	14	15,000	60,000	50,000	100,000
	Upper floors	5	20	14	15,000	60,000	50,000	100,000
	Basements	3	10	7	10,000	20,000	25,000	40,000

For SI: 1 foot = 304.8 mm, 1 gallon = 3.785 L.

- a. See Section N5704.3.8.1 for unlimited quantities in liquid storage warehouses.
- b. In buildings protected by an automatic sprinkler system, the storage height for containers and portable tanks shall not exceed the maximum storage height permitted for the fire protection scheme set forth in NFPA 30 or the maximum storage height demonstrated in a full-scale fire test, whichever is greater. NFPA 30 criteria and fire test results for metallic containers and portable tanks shall not be applied to nonmetallic containers and portable tanks.
- c. These height limitations are allowed to be increased to 10 feet for containers having a capacity of 5 gallons or less.
- d. For palletized storage of unsaturated polyester resins (UPR) in relieving-style metal containers with 50 percent or less by weight Class IC or II liquid and no Class IA or IB liquid, height and pile quantity limits shall be permitted to be 10 feet and 15,000 gallons, respectively, provided that such storage is protected by sprinklers in accordance with NFPA 30 and that the UPR storage area is not located in the same containment area or drainage path for other Class I or II liquids.

TABLE N5704.3.6.3(3)
STORAGE ARRANGEMENTS FOR RACK STORAGE IN LIQUID STORAGE ROOMS AND WAREHOUSES

CLASS	TYPE RACK	STORAGE LEVEL	MAXIMUM STORAGE HEIGHT ^b (feet)	MAXIMUM QUANTITY PER ROOM ^a (gallons)
			Containers	Containers
IA	Double row or Single row	Ground floor Upper floors Basements	25	7,500
			15	4,500
			Not Allowed	Not Allowed
IB IC	Double row or Single row	Ground floor Upper floors Basements	25	15,000
			15	9,000
			Not Allowed	Not Allowed
II	Double row or Single row	Ground floor	25	24,000
		Upper floors	25	24,000
		Basements	15	9,000
III	Multirow	Ground floor	40	48,000
	Double row	Upper floors	20	48,000
	Single row	Basements	20	24,000

For SI: 1 foot = 304.8 mm, 1 gallon = 3.785 L.

- See Section N5704.3.8.1 for unlimited quantities in liquid storage warehouses.
- In buildings protected by an automatic sprinkler system, the storage height for containers and portable tanks shall not exceed the maximum storage height permitted for the fire protection scheme set forth in NFPA 30 or the maximum storage height demonstrated in a full-scale fire test, whichever is greater. NFPA 30 criteria and fire test results for metallic containers and portable tanks shall not be applied to nonmetallic containers and portable tanks.

N5704.3.7.3 Spill control and secondary containment.

Liquid storage rooms shall be provided with spill control and secondary containment in accordance with Section N5004.2.

[M]N5704.3.7.4 Ventilation. Liquid storage rooms shall be ventilated in accordance with Section N5004.3.

N5704.3.7.5 Fire protection. Fire protection for liquid storage rooms shall comply with Section N5704.3.7.5.1.

N5704.3.7.5.1 Fire-extinguishing systems. Liquid storage rooms shall be protected by *automatic sprinkler systems* installed in accordance with Chapter 9 of this code and Tables N5704.3.6.3(4) through N5704.3.6.3(7) and Table N5704.3.7.5.1. In-rack sprinklers shall also comply with NFPA 13.

Automatic foam-water systems and automatic aqueous film-forming foam (AFFF) water sprinkler systems shall not be used except when *approved*.

Protection criteria developed from fire modeling or full-scale fire testing conducted at an *approved* testing laboratory are allowed in lieu of the protection as shown in Tables N5704.3.6.3(2) through N5704.3.6.3(7) and Table N5704.3.7.5.1 when *approved*.

N5704.3.8 Liquid storage warehouses. Buildings used for storage of flammable or *combustible liquids* in quantities exceeding those set forth in Section N5704.3.4 for *control areas* and Section N5704.3.7 for liquid storage rooms shall comply with Sections N5704.3.8.1 through N5704.3.8.5 and shall be constructed and separated as required by this code.

N5704.3.8.1 Quantities and storage arrangement. The total quantities of liquids in a liquid storage warehouse shall not be limited. The arrangement of storage shall be in accordance with Table N5704.3.6.3(2) or N5704.3.6.3(3)

N5704.3.8.1.1 Mixed storage. Mixed storage shall be in accordance with Section N5704.3.7.2.1.

N5704.3.8.1.2 Separation and aisles. Separation and *aisles* shall be in accordance with Section N5704.3.7.2.2.

N5704.3.8.2 Spill control and secondary containment. Liquid storage warehouses shall be provided with spill control and secondary containment as set forth in Section N5004.2.

N5704.3.8.3 Ventilation. Liquid storage warehouses storing containers greater than 5 gallons (19 L) in capacity shall be ventilated at a rate of not less than 0.25 cfm per square foot (0.075 m³/s · m²) of floor area over the storage area.

N5704.3.8.4 Fire-extinguishing systems. Liquid storage warehouses shall be protected by automatic sprinkler systems installed in accordance with Chapter 9 of this code and Tables N5704.3.6.3(4) through N5704.3.6.3(7) and Table N5704.3.7.5.1, or Sections 16.4.1 through 16.4.3, 16.5.1 through 16.5.2.12, and Tables 16.5.2.1 through 16.5.2.12 and Figures 16.4.1(a) through 16.4.1(c) of NFPA 30. In-rack sprinklers shall also comply with NFPA 13.

Automatic foam-water systems and automatic AFFF water sprinkler systems shall not be used except where *approved*

Protection criteria developed from fire modeling or full-scale fire testing conducted at an *approved* testing laboratory are allowed in lieu of the protection as shown in Tables N5704.3.6.3(2) through N5704.3.6.3(7) and Table N5704.3.7.5.1 where *approved*.

N5704.3.8.5 Warehouse hose lines. In liquid storage warehouses, either 1½-inch (38 mm) lined or 1-inch (25 mm) hard rubber hand hose lines shall be provided in sufficient number to reach all liquid storage areas and shall be in accordance with Section 903 or Section 905 of this code.

TABLE N5704.3.6.3(4)
 AUTOMATIC SPRINKLER PROTECTION FOR SOLID-PILE AND PALLETIZED STORAGE OF LIQUIDS IN METAL CONTAINERS AND PORTABLE TANKS^a

Class liquid	STORAGE CONDITIONS	CEILING SPRINKLER DESIGN AND DEMAND					MINIMUM HOSE STREAM DEMAND (gpm)	MINIMUM DURATION SPRINKLERS AND HOSE STREAMS (hours)
		Density (gpm/ft ²)	Area (square feet)		Maximum spacing (square feet)			
			High temperature sprinklers	Ordinary temperature sprinklers				
IA	5 gallons or less, with or without cartons, palletized or solid pile ^b	0.30	3,000	5,000	100	750	2	
	Containers greater than 5 gallons, on end or side, palletized or solid pile	0.60	5,000	8,000	80	750		
IB, IC and II	5 gallons or less, with or without cartons, palletized or solid pile ^b	0.30	3,000	5,000	100	500	2	
	Containers greater than 5 gallons on pallets or solid pile, one high	0.25	5,000	8,000	100			
II	Containers greater than 5 gallons on pallets or solid pile, more than one high, on end or side	0.60	5,000	8,000	80	750	2	
IB, IC and II	Portable tanks, one high	0.30	3,000	5,000	100	500	2	
	Portable tanks, two high	0.60	5,000	8,000	80	750	2	
III	5 gallons or less, with or without cartons, palletized or solid pile	0.25	3,000	5,000	120	500	1	
	Containers greater than 5 gallons on pallets or solid pile, on end or sides, up to three high	0.25	3,000	5,000	120	500	1	
	Containers greater than 5 gallons, on pallets or solid pile, on end or sides, up to 18 feet high	0.35	3,000	5,000	100	750	2	
	Portable tanks, one high	0.25	3,000	5,000	120	500	1	
	Portable tanks, two high	0.50	3,000	5,000	80	750	2	

For SI: 1 foot = 304.8 mm, 1 gallon = 3.785 L, 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/m, 1 gallon per minute per square foot = 40.75 L/min/m².

- a. The design area contemplates the use of Class II standpipe systems. Where Class I standpipe systems are used, the area of application shall be increased by 30 percent without revising density.
- b. For storage heights above 4 feet or ceiling heights greater than 18 feet, an approved engineering design shall be provided in accordance with Section 104.7.2 of this code.

TABLE N5704.3.6.3(6)
 AUTOMATIC SPRINKLER PROTECTION REQUIREMENTS FOR RACK STORAGE OF LIQUIDS IN METAL CONTAINERS OF 5-GALLON CAPACITY OR LESS WITH OR WITHOUT CARTONS ON CONVENTIONAL WOOD PALLETS^a

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND		IN-RACK SPRINKLER ARRANGEMENT AND DEMAND				MINIMUM HOSE STREAM DEMAND (gpm)	MINIMUM DURATION SPRINKLER AND HOSE STREAM (hours)	
	Density (gpm/ft ²)	Area (square feet)	Maximum spacing	Racks up to 9 feet deep	Racks more than 9 feet to 12 feet deep	Number of sprinklers operating			
I (maximum 25-foot height) Option 1	0.40	High-temperature sprinklers	80 ft ² /head	1. Ordinary temperature, quick-response sprinklers, maximum 8 feet 3 inches horizontal spacing 2. One line sprinklers above each level of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	1. Ordinary temperature, quick-response sprinklers, maximum 8 feet 3 inches horizontal spacing 2. One line sprinklers above each level of storage 3. Locate in transverse flue spaces, staggered vertical and within 20 inches of aisle 4. Shields required where multilevel	30 psi (standard office) 14 psi (large office)	1. Eight sprinklers if only one level 2. Six sprinklers each on two levels if only two levels 3. Six sprinklers each on top three levels, if three or more levels 4. Hydraulically most remote	750	2
		Ordinary temperature sprinklers							
I (maximum 25-foot height) Option 2	0.55	2,000b	100 ft ² /head	1. Ordinary temperature, quick-response sprinklers, maximum 8 feet 3 inches horizontal spacing 2. See 2 above 3. See 3 above 4. See 4 above	1. Ordinary temperature, quick-response sprinklers, maximum 8 feet 3 inches horizontal spacing 2. See 2 above 3. See 3 above 4. See 4 above	14 psi (0.53-inch office)	1 through 4 above	500	2
		Not Applicable							
I and II (maximum 14-foot storage height) (maximum three tiers)	0.55c	2,000d	100 ft ² /head	Not Applicable None for maximum 6-foot-deep racks	Not Applicable	Not Applicable	Not Applicable	500	2
		Not Applicable							
II (maximum 25-foot height)	0.30	3,000	100 ft ² /head	1. Ordinary temperature sprinklers 8 feet apart horizontally 2. One line sprinklers between levels at nearest 10-foot vertical intervals 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	1. Ordinary temperature sprinklers 8 feet apart horizontally 2. Two lines between levels at nearest 10-foot vertical intervals 3. Locate in transverse flue spaces, staggered vertical and within 20 inches of aisle 4. Shields required where multilevel	30 psi	Hydraulically most remote—six sprinklers at each level, up to a maximum of three levels	750	2
		5,000							
III (40-foot height)	0.25	3,000	120 ft ² /head	Same as for Class II liquids	Same as for Class II liquids	30 psi	Same as for Class II liquids	500	2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per square inch = 6.895 kPa, 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 gallon per minute per square foot = 40.75 L/min/m².

a. The design area contemplates the use of Class II standpipe systems. Where Class I standpipe systems are used, the area of application shall be increased by 30 percent without revising density.

b. Using listed or approved extra-large orifices, high-temperature quick-response or standard element sprinklers under a maximum 30-foot ceiling with minimum 7.5-foot aisles.

c. For friction lid cans and other metal containers equipped with plastic nozzles or caps, the density shall be increased to 0.65 gpm per square foot using listed or approved extra-large orifice, high-temperature quick-response sprinklers.

d. Using listed or approved extra-large orifice, high-temperature quick-response or standard element sprinklers under a maximum 18-foot ceiling with minimum 7.5-foot aisles and metal containers.

TABLE N5704.3.6.3(6)
 AUTOMATIC SPRINKLER PROTECTION REQUIREMENTS OR RACK STORAGE OF LIQUIDS IN METAL CONTAINERS GREATER THAN 5-GALLON CAPACITY^a

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND			IN-RACK SPRINKLER ARRANGEMENT AND DEMAND					MINIMUM HOSE STREAM DEMAND (gpm)	MINIMUM DURATION SPRINKLER AND HOSE STREAM (hours)
	Density (gpm/ ft ²)	Area (square feet)		Maximum spacing	On-side storage racks up to 9-foot-deep racks	On-storage racks (on pallets) up to 9-foot-deep racks	Minimum nozzle pressure	Number of sprinklers operating		
		High-temperature sprinklers	Ordinary temperature sprinklers							
IA (maximum 25-foot height)	0.60	3,000	5,000	80 ft ² /head	1. Ordinary temperature sprinklers 8 feet apart horizontally 2. One line sprinklers above each tier of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	1. Ordinary temperature sprinklers 8 feet apart horizontally 2. One line sprinklers above each tier of storage 3. Locate in longitudinal flue space, staggered vertical 4. Shields required where multilevel	30 psi	Hydraulically most remote—six sprinklers at each level	1,000	2
IB, IC and II (maximum 25-foot height)	0.60	3,000	5,000	100 ft ² /head	1. See 1 above 2. One line sprinklers every three tiers of storage 3. See 3 above 4. See 4 above	1. See 1 above 2. See 2 above 3. See 3 above 4. See 4 above	30 psi	Hydraulically most remote—six sprinklers at each level	750	2
II (maximum 40-foot height)	0.25	3,000	5,000	120 ft ² /head	1. See 1 above 2. One line sprinklers every sixth level (maximum) 3. See 3 above 4. See 4 above	1. See 1 above 2. One line sprinklers every third level (maximum) 3. See 3 above 4. See 4 above	15 psi	Hydraulically most remote—six sprinklers at each level	500	1

For SI: 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per square inch = 6.895 kPa, 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 gallon per minute per square foot = 40.75 L/min/m².

a. The design assumes the use of Class II standpipe systems. Where a Class I standpipe system is used, the area of application shall be increased by 30 percent without revising density.

TABLE N5704.3.6.3(7)
AUTOMATIC AFFWATERPROTECTION REQUIREMENTS FOR RACK STORAGE OF LIQUIDS IN METAL CONTAINERS GREATER THAN 5-GALLON CAPACITY^{a,b}

CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND			IN-RACK SPRINKLER ARRANGEMENT AND DEMAND				DURATION AFF SUPPLY (minimum)	DURATION WATER SUPPLY (hours)
	Density (gpm/ft ²)	Area (square feet)		On-end storage of drums on pallets, up to 25 feet	Minimum nozzle pressure (psi)	Number of sprinklers operating	Hose stream demand (gpm)	15	2
		High-temperature sprinklers	Ordinary temperature sprinklers						
IA, IB, IC and II	0.30	1,500	2,500	<ol style="list-style-type: none"> Ordinary temperature sprinkler up to 10 feet apart horizontally One line sprinklers above each level of storage Locate in longitudinal flue space, staggered vertically Shields required for multilevel 	30	Three sprinklers per level	500	15	2

- For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per square inch = 6.895 kPa, 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 gallon per minute per square foot = 40.75 L/m/m².
- System shall be a closed-head wet system with approved devices for proportioning aqueous film-forming foam.
 - Except as modified herein, in-rack sprinklers shall be installed in accordance with NFPA 13.
 - The height of storage shall not exceed 25 feet.
 - Hose stream demand includes 1½-inch inside hand hose, when required.

TABLE N5704.3.6.3(8)
AUTOMATIC SPRINKLER PROTECTION REQUIREMENTS FOR CLASS I LIQUID STORAGE IN METAL CONTAINERS OF 1-GALLON CAPACITY OR LESS WITH UNCARTONED OR CASE CUT SHELF DISPLAY UP TO 6.5 FEET, AND PALLETIZED STORAGE ABOVE IN A DOUBLE-ROW RACK ARRAY^a

STORAGE HEIGHT	CEILING SPRINKLER DESIGN AND DEMAND			IN-RACK SPRINKLER ARRANGEMENT AND DEMAND				MINIMUM HOSE STREAM DEMAND (gpm)	MINIMUM DURATION SPRINKLERS AND HOSE STREAM (hours)
	Density (gpm/ft ²)	Area (square feet)		Racks up to 9 feet deep	Racks 9 to 12 feet	Minimum nozzle pressure	Number of sprinklers operating	500	2
		High temperature	Ordinary temperature						
Maximum 20-foot storage height	0.60	2,000 ^b	Not Applicable	<ol style="list-style-type: none"> Ordinary temperature, quick-response sprinklers, maximum 8 feet 3 inches horizontal spacing. One line of sprinklers at the 6-foot level and the 11.5-foot level of storage. Locate in longitudinal flue space, staggered vertical. Shields required where multilevel. 	Not Applicable	30 psi (standard orifice) or 14 psi (large orifice)	<ol style="list-style-type: none"> Six sprinklers each on two levels Hydraulically most remote 12 sprinklers 	500	2

- For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 pound per square inch = 6.895 kPa, 1 gallon = 3.785 L, 1 gallon per minute = 3.785 L/m, 1 gallon per minute per square foot = 40.75 L/m/m².
- This table shall not apply to racks with solid shelves.
 - Using extra-large orifice sprinklers under a ceiling 3.0 feet or less in height. Minimum aisle width is 7.5 feet.

**TABLE N5704.3.7.5.1
AUTOMATIC AFFF-WATER PROTECTION REQUIREMENTS FOR SOLID-PILE AND PALLETIZED STORAGE OF LIQUIDS IN METAL CONTAINERS OF 5-GALLON CAPACITY OR LESS^{a, b}**

PACKAGE TYPE	CLASS LIQUID	CEILING SPRINKLER DESIGN AND DEMAND					STORAGE HEIGHT (feet)	HOSE DEMAND (gpm) ^c	DURATION AFFF SUPPLY (minimum)	DURATION WATER SUPPLY (hours)
		Density (gpm/ ft ²)	Area (square feet)	Temperature rating	Maximum spacing	Orifice size (inch)				
Cartoned	IB, IC, II and III	0.40	2,000	286°F	100 ft ² / head	0.531	11	500	15	2
Uncartoned	IB, IC, II and III	0.30	2,000	286°F	100 ft ² / head	0.5 or 0.531	12	500	15	2

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 square foot = 0.0929 m², 1 gallon per minute = 3.785 L/m, 1 gallon per minute per square foot = 40.75 L/min/ m², °C. = [(°F)-32]/1.8.

- a. System shall be a closed-head wet system with approved devices for proportioning aqueous film-forming foam.
- b. Maximum ceiling height of 30 feet.
- c. Hose stream demand includes 1½ -inch inside hand hose, when required.

**SECTION N5705
DISPENSING, USE, MIXING AND HANDLING OF
FLAMMABLE AND COMBUSTIBLE LIQUIDS**

N5705.1 – N5705.2 Reserved.

N5705.3 Use, dispensing and mixing inside of buildings. Indoor use, dispensing and mixing of flammable and *combustible liquids* shall be in accordance with Sections N5705.3.1 through N5705.3.5.3.

N5705.3.1 Closure of mixing or blending vessels. Vessels used for mixing or blending of Class I liquids and Class II or III liquids heated up to or above their *flash points* shall be provided with self-closing, tight-fitting, noncombustible lids that will control a fire within such vessel.

Exception: Where such devices are impractical, *approved* automatic or manually controlled fire-extinguishing devices shall be provided.

N5705.3.2 Reserved.

N5705.3.3 Heating, lighting and cooking appliances. Heating, lighting and cooking appliances which utilize Class I liquids shall not be operated within a building or structure.

Exception: Operation in single-family *dwelling*s.

N5705.3.4 Location of processing vessels. Processing vessels shall be located with respect to distances to *lot lines* of adjoining property which can be built on, in accordance with Tables N5705.3.4(1) and N5705.3.4(2)

Exception: Where the exterior wall facing the adjoining *lot line* is a blank wall having a *fire-resistance rating* of not less than 4 hours, the *building official* is authorized to modify the distances. The distance shall not be less than that set forth elsewhere in this code, and when Class IA or unstable liquids are involved, explosion control shall be provided in accordance with Section N901.

N5705.3.5 Quantity limits for use. Liquid use quantity limitations shall comply with Sections N5705.3.5.1 through N5705.3.5.3

N5705.3.5.1 Maximum allowable quantity per control area. Indoor use, dispensing and mixing of flammable and *combustible liquids* shall not exceed the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code and shall not exceed the additional limitations set forth in Section N5705.3.5.

Use of hazardous production material flammable and *combustible liquids* in Group H-5 occupancies shall be in accordance with Sections N2701 through N2705.

**TABLE N5705.3.4(1)
SEPARATION OF PROCESSING VESSELS FROM LOT LINES**

PROCESSING VESSELS WITH EMERGENCY RELIEF VENTING	LOCATION ^a	
	Stable liquids	Unstable liquids
Not in excess of 2.5 psig	Table N5705.3.4(2)	2.5 times Table N5705.3.4(2)
Over 2.5 psig	1.5 times Table N5705.3.4(2)	4 times Table N5705.3.4(2)

For SI: 1 pound per square inch gauge = 6.895 kPa.

- a. Where protection of exposures by a public fire department or private fire brigade capable of providing cooling water streams on structures is not provided, distances shall be doubled.

**TABLE N5705.3.4(2)
REFERENCE TABLE FOR USE WITH TABLE 5705.3.4(1)**

TANK CAPACITY (gallons)	MINIMUM DISTANCE FROM LOT LINE OF A LOT WHICH IS OR CAN BE BUILT UPON, INCLUDING THE OPPOSITE SIDE OF A PUBLIC WAY (feet)	MINIMUM DISTANCE FROM NEAREST SIDE OF ANY PUBLIC WAY OR FROM NEAREST IMPORTANT BUILDING ON THE SAME PROPERTY (feet)
275 or less	5	5
276 to 750	10	5
751 to 12,000	15	5
12,001 to 30,000	20	5
30,001 to 50,000	30	10
50,001 to 100,000	50	15
100,001 to 500,000	80	25
500,001 to 1,000,000	100	35
1,000,001 to 2,000,000	135	45
2,000,001 to 3,000,000	165	55
3,000,001 or more	175	60

For SI: 1 foot = 304.8 mm, 1 gallon = 3.785 L.

N5705.3.5.2 Occupancy quantity limits. The following limits for quantities of flammable and *combustible liquids* used, dispensed or mixed based on occupancy classification shall not be exceeded:

1. Group A occupancies: Quantities in Group A occupancies shall not exceed that necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
2. Group B occupancies: Quantities in drinking, dining, office and school uses within Group B occupancies shall not exceed that necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
3. Group E occupancies: Quantities in Group E occupancies shall not exceed that necessary for demonstration, treatment, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 307.1(1) of this code.
4. Group F occupancies: Quantities in dining, office and school uses within Group F occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
5. Group I occupancies: Quantities in Group I occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
6. Group M occupancies: Quantities in dining, office and school uses within Group M occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.

7. Group R occupancies: Quantities in Group R occupancies shall not exceed that necessary for maintenance purposes and operation of equipment, and shall not exceed quantities set forth in Table 307.1(1) of this code.
8. Group S occupancies: Quantities in dining and office uses within Group S occupancies shall not exceed that necessary for demonstration, laboratory work, maintenance purposes and operation of equipment and shall not exceed quantities set forth in Table 307.1(1) of this code.

N5705.3.5.3 Quantities exceeding limits for control areas. Quantities exceeding the *maximum allowable quantity per control area* indicated in Sections N5705.3.5.1 and N5705.3.5.2 shall be in accordance with the following:

1. For *open systems*, indoor use, dispensing and mixing of flammable and *combustible liquids* shall be within a room or building complying with this code and Sections N5705.3.7.1 through N5705.3.7.5.
2. For *closed systems*, indoor use, dispensing and mixing of flammable and *combustible liquids* shall be within a room or building complying with this code and Sections N5705.3.7 through N5705.3.7.4 and Section N5705.3.7.6.

N5705.3.6 Location for ventilation.

[M]N5705.3.6.1 [5705.3.6.2.6] Ventilation. Machines shall be located in areas adequately ventilated to prevent accumulation of vapors.

N5705.3.7 Rooms or buildings for quantities exceeding the maximum allowable quantity per control area. Where required by Section N5705.3.5.3, rooms or buildings used for the use, dispensing or mixing of flammable and *combustible liquids* in quantities exceeding the maximum allowable quantity per *control area* shall be in accordance with Sections N5705.3.7.1 through N5705.3.7.6.3.

N5705.3.7.1 Construction, location and fire protection. Rooms or buildings classified in accordance this code as Group H-2 or H-3 occupancies based on use, dispensing or mixing of flammable or *combustible liquids* shall be constructed in accordance with this code.

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N5705.3.7.2 Basements. In rooms or buildings classified in accordance with this code as Group H-2 or H-3, dispensing or mixing of flammable or *combustible liquids* shall not be conducted in *basements*.

N5705.3.7.3 Fire protection. Rooms or buildings classified in accordance with this code as Group H-2 or H-3 occupancies shall be equipped with an *approved* automatic fire-extinguishing system in accordance with Chapter 9 of this code.

N5705.3.7.4 Doors. Interior doors to rooms or portions of such buildings shall be self-closing fire doors in accordance with this code.

N5705.3.7.5 Open systems. Use, dispensing and mixing of flammable and *combustible liquids* in *open systems* shall be in accordance with Sections N5705.3.7.5.1 through N5705.3.7.5.3.

[M]N5705.3.7.5.1 Ventilation. Continuous mechanical ventilation shall be provided at a rate of not less than 1 cfm per square foot [$0.00508 \text{ m}^3/(\text{s} \cdot \text{m}^2)$] of floor area over the design area. Provisions shall be made for introduction of makeup air in such a manner to include all floor areas or pits where vapors can collect. Local or spot ventilation shall be provided when needed to prevent the accumulation of hazardous vapors. Ventilation system design shall comply with this code and the *Mechanical Code*.

Exception: Where natural ventilation can be shown to be effective for the materials used, dispensed or mixed.

N5705.3.7.5.2 Explosion control. Explosion control shall be provided in accordance with Section N901.

N5705.3.7.5.3 Spill control and secondary containment. Spill control shall be provided in accordance with Section N5703.4 where Class I, II or IIIA liquids are dispensed into containers exceeding a 1.3-gallon (5 L) capacity or mixed or used in open containers or systems exceeding a 5.3-gallon (20 L) capacity. Spill control and secondary containment shall be provided in accordance with Section N5703.4 when the capacity of an individual container exceeds 55 gallons (208 L) or the aggregate capacity of multiple containers or tanks exceeds 100 gallons (378.5 L).

N5705.3.7.6 Closed systems. Use or mixing of flammable or *combustible liquids* in *closed systems* shall be in accordance with Sections N5705.3.7.6.1 through N5705.3.7.6.3.

N5705.3.7.6.1 Ventilation. *Closed systems* designed to be opened as part of normal operations shall be provided with ventilation in accordance with Section N5705.3.7.5.1.

N5705.3.7.6.2 Explosion control. Explosion control shall be provided when an explosive environment can occur as a result of the mixing or use process. Explosion control shall be designed in accordance with Section N901.

Exception: When process vessels are designed to contain fully the worst-case explosion anticipated

within the vessel under process conditions considering the most likely failure.

N5705.3.7.6.3 Spill control and secondary containment. Spill control shall be provided in accordance with Section N5703.4 when flammable or *combustible liquids* are dispensed into containers exceeding a 1.3-gallon (5 L) capacity or mixed or used in open containers or systems exceeding a 5.3-gallon (20 L) capacity. Spill control and secondary containment shall be provided in accordance with Section N5703.4 when the capacity of an individual container exceeds 55 gallons (208 L) or the aggregate capacity of multiple containers or tanks exceeds 1,000 gallons (3785 L).

SECTION N5706 FLAMMABLE AND COMBUSTIBLE LIQUIDS SPECIAL OPERATIONS

N5706.1-N5706.3 Reserved.

N5706.4 Bulk plants or terminals. Portions of properties where flammable and *combustible liquids* are received by tank vessels, pipelines, tank cars or tank vehicles and which are stored or blended in bulk for the purpose of distributing such liquids by tank vessels, pipelines, tanks cars, tank vehicles or containers shall be in accordance with Sections N5706.4.1 through N5704.4.10.2.

N5706.4.1 Building construction. Buildings shall be constructed in accordance with this code.

N5706.4.2 Means of egress. Rooms in which liquids are stored, used or transferred by pumps shall have *means of egress* arranged to prevent occupants from being trapped in the event of fire.

N5706.4.3 Heating. Rooms in which Class I liquids are stored or used shall be heated only by means not constituting a source of ignition, such as steam or hot water. Rooms containing heating appliances involving sources of ignition shall be located and arranged to prevent entry of flammable vapors.

[M]N5706.4.4 Ventilation. Ventilation shall be provided for rooms, buildings and enclosures in which Class I liquids are pumped, used or transferred. Design of ventilation systems shall consider the relatively high specific gravity of the vapors. When natural ventilation is used, adequate openings in outside walls at floor level, unobstructed except by louvers or coarse screens, shall be provided. When natural ventilation is inadequate, mechanical ventilation shall be provided in accordance with the *Mechanical Code*.

[M]N5706.4.4.1 Basements and pits. Class I liquids shall not be stored or used within a building having a *basement* or pit into which flammable vapors can travel, unless such area is provided with ventilation designed to prevent the accumulation of flammable vapors therein.

[M]N5706.4.4.2 Dispensing of Class I liquids. Containers of Class I liquids shall not be drawn from or filled within buildings unless a provision is made to prevent the accumulation of flammable vapors in hazardous

concentrations. Where mechanical ventilation is required, it shall be kept in operation while flammable vapors could be present.

N5706.4.5 Storage. Storage of Class I, II and IIIA liquids in bulk plants shall be in accordance with the applicable provisions of Section N5704.

N5706.4.6 Reserved.

N5706.4.7 Wharves. This section shall apply to wharves and piers as defined in Section N202, over or contiguous to navigable water having a primary function of transferring liquid cargo in bulk between shore installations and tank vessels, ships, barges, lighter boats or other mobile floating craft.

Exception: Marine motor fuel-dispensing facilities.

N5706.4.7.2 Transferring location. Wharves at which liquid cargoes are to be transferred in bulk quantities to or from tank vessels shall be at least 100 feet (30 480 mm) from any bridge over a navigable waterway; or from an entrance to, or superstructure of, any vehicular or railroad tunnel under a waterway. The termination of the fixed piping used for loading or unloading at a wharf shall be at least 200 feet (60 960 mm) from a bridge or from an entrance to, or superstructures of, a tunnel.

N5706.4.7.3 Superstructure and decking material. Superstructure and decking shall be designed for the intended use. Decking shall be constructed of materials that will afford the desired combination of flexibility, resistance to shock, durability, strength and *fire resistance*.

N5706.4.7.4 Tanks allowed. Tanks used exclusively for ballast water or Class II or III liquids are allowed to be installed on suitably designed wharves.

N5706.4.8-N5706.4.9 Reserved.

N5706.4.10 Fire protection. Fire protection shall be in accordance with Chapter 9 of this code and Section N5706.4.10.1 and N5706.4.10.2

N5706.4.10.2 Fire hoses. Where piped water is available, ready-connected fire hose in a size appropriate for the water supply shall be provided in accordance with Section 905 so that manifolds where connections are made and broken can be reached by at least one hose stream.

N5706.5 Bulk transfer and process transfer operations. Bulk transfer and process transfer operations shall be *approved* and be in accordance with Sections N5706.5.1.2 through N5706.5.1.12.

N5706.5.1 [5706.5.1.2] Weather protection canopies. Where weather protection canopies are provided, they shall be constructed in accordance with Section N5004.13. Weather protection canopies shall not be located within 15 feet (4572 mm) of a building or combustible material or within 25 feet (7620 mm) of building openings, *lot lines*, public streets, public alleys or *public ways*.

N5706.5.2 [5706.5.1.3] Ventilation. Ventilation shall be provided to prevent accumulation of vapors in accordance with Section N5705.3.7.5.1.

N5706.5.3 [5706.5.1.6] Fire protection. Fire protection shall be in accordance with Section N5703.2.

N5706.5.4 [5706.5.1.12] Loading racks. Where provided, loading racks, stairs or platforms shall be constructed of noncombustible materials. Buildings for pumps or for shelter of loading personnel are allowed to be part of the loading rack. Wiring and electrical equipment located within 25 feet (7620 mm) of any portion of the loading rack shall be in accordance with Section N5703.1.1.

N5706.6 Reserved.

N5706.7 Refineries. Plants and portions of plants in which flammable liquids are produced on a scale from crude petroleum, natural gasoline or other hydrocarbon sources shall be in accordance with Sections N5706.7.1.

N5706.7.1 Corrosion protection. Above-ground tanks and piping systems shall be protected against corrosion in accordance with API 651.

CHAPTER N58 FLAMMABLE GASES AND FLAMMABLE CRYOGENIC FLUIDS

SECTION N5801 GENERAL

N5801.1 Scope. The storage and use of flammable gases and flammable cryogenic fluids shall be in accordance with Sections N5801 through N5805 and NFPA 55. Compressed gases shall also comply with Sections N5301 through N5307 and cryogenic fluids shall also comply with Sections N5501 through N5505. Flammable cryogenic fluids shall comply with Section N5806.

Exceptions:

1. Gases used as refrigerants in refrigeration systems (see Section N606).
2. Liquefied petroleum gases and natural gases
3. Fuel-gas systems and appliances regulated under the *Mechanical Code* other than gaseous hydrogen systems and appliances.
4. Pyrophoric gases in accordance with Sections N6401 through N6404.

SECTION N5802 DEFINITIONS

N5802.1 Definitions. The following terms are defined in Section N202:

METAL HYDRIDE.

METAL HYDRIDE STORAGE SYSTEM.

SECTION N5803 GENERAL REQUIREMENTS

N5803.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of flammable gases in amounts not exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003, N5801 and N5803

N5803.1.1 Special limitations for indoor storage and use. Flammable gases shall not be stored or used in Group A, E, I or R occupancies or in offices in Group B occupancies.

Exceptions: Cylinders of nonliquefied *compressed gases* not exceeding a capacity of 250 cubic feet (7.08 m³) or liquefied gases not exceeding a capacity of 40 pounds (18 kg) each at *normal temperature and pressure (NTP)* used for maintenance purposes, patient care or operation of equipment.

N5803.1.1.1 Medical gases. Medical gas system supply cylinders shall be located in medical gas storage rooms or gas cabinets as set forth in Section N5306.

N5803.1.2 [5803.1.5] Electrical. Electrical wiring and equipment shall be installed in accordance with *the Electrical Code*.

N5803.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of flammable gases in amounts exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N5801 through N5805.

SECTION N5804 STORAGE OF FLAMMABLE GASES AND FLAMMABLE CRYOGENIC FLUIDS

N5804.1 Indoor storage. Indoor storage of flammable gases in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code, shall be in accordance with Sections N5001, N5003 and N5004, and Sections N5801 through N5805.

N5804.1.1 Explosion control. Buildings or portions thereof containing flammable gases shall be provided with explosion control in accordance with Section N901.

SECTION N5806 FLAMMABLE CRYOGENIC FLUIDS

N5806.1 General. The storage and use of flammable *cryogenic fluids* shall be in accordance with Sections N5806.2 through N5806.4.8.3 and this code.

N5806.2 Reserved.

N5806.3 Above-ground tanks for liquid hydrogen. Aboveground tanks for the storage of liquid hydrogen shall be in accordance with Sections N5806.3 through N5806.3.2.1.

N5806.3.1 Construction of the inner vessel. The inner vessel of storage tanks in liquid hydrogen service shall be

designed and constructed in accordance with Section VIII, Division 1, of the *ASME Boiler and Pressure Vessel Code* and shall be vacuum jacketed in accordance with Section N5806.3.2.

N5806.3.2 Construction of the vacuum jacket (outer vessel). The vacuum jacket used as an outer vessel for storage tanks in liquid hydrogen service shall be of welded steel construction designed to withstand the maximum internal and external pressure to which it will be subjected under operating conditions to include conditions of emergency pressure relief of the annular space between the inner and outer vessel. The jacket shall be designed to withstand a minimum collapsing pressure differential of 30 psi (207 kPa).

N5806.3.2.1 Vacuum-level monitoring. A connection shall be provided on the exterior of the vacuum jacket to allow measurement of the pressure within the annular space between the inner and outer vessel. The connection shall be fitted with a bellows-sealed or diaphragm-type valve equipped with a vacuum gauge tube that is shielded to protect against damage from impact.

SECTION N5807 METAL HYDRIDE STORAGE SYSTEMS

N5807.1 [5807.1.10] Electrical. Electrical components for metal hydride storage systems shall be designed, constructed and installed in accordance with *the Electrical Code*.

CHAPTER N59 FLAMMABLE SOLIDS

SECTION N5901 GENERAL

N5901.1 Scope. The storage and use of flammable solids shall be in accordance with this Sections N5901 through N5906.

SECTION N5902 DEFINITIONS

5902.1 Definitions. The following terms are defined in Section N202:

MAGNESIUM.

SECTION N5903 FLAMMABLE SOLIDS GENERAL REQUIREMENTS

N5903.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of flammable solids in amounts not exceeding the *maximum allowable quantity per control area* as indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003 and N5901.

N5903.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of flammable solids exceeding the *maximum allowable quantity per control area* as indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N5903 through N5906.

SECTION N5904 STORAGE OF FLAMMABLE SOLIDS

N5904.1 Indoor storage. Indoor storage of flammable solids in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code shall be in accordance with Sections N5001, N5003, N5004 and Sections N5901 through N5906.

N5904.1.1 [5904.1.3] Basement storage. Flammable solids shall not be stored in *basement*.

SECTION N5905 RESERVED

SECTION N5906 MAGNESIUM

N5906.1 Reserved.

N5906.2 [5906.2.2] Storage of greater than 1,000 cubic feet. Magnesium storage in quantities greater than 1,000 cubic feet (28 m³) shall be separated into piles not larger than 1,000 cubic feet (28 m³) each. Piles shall be separated by aisles with a minimum width of not less than the pile height. Such storage shall not be located in nonsprinklered buildings of Type III, IV or V construction. .

N5906.3 Storage of pigs, ingots and billets. The storage of magnesium pigs, ingots and billets shall comply with Sections N5906.3.1.

N5906.3.1 Indoor storage. Indoor storage of pigs, ingots and billets shall only be on floors of noncombustible construction.

Piles shall not be larger than 500,000 pounds (226.8 metric tons) each.

N5906.4 Storage of fine magnesium scrap.

N5906.4.1 [5906.4.2] Storage of 50 to 1,000 cubic feet. Storage of fine magnesium scrap in quantities greater than 50 cubic feet (1.4 m³) [six 55-gallon (208 L) steel drums] shall be separated from other occupancies by an open space of at least 50 feet (15 240 mm) or by a *fire barrier* constructed in accordance with Section 707 of this code.

N5906.5 Use of magnesium. The use of magnesium shall comply with Sections N5906.5.1 through N5906.5.5.

N5906.5.1 Melting pots. Floors under and around melting pots shall be of noncombustible construction.

N5906.5.2 Reserved.

N5906.5.3 Dust collection. Magnesium grinding, buffing and wire-brushing operations, other than rough finishing of castings, shall be provided with *approved* hoods or enclosures for dust collection which are connected to a liquid-precipitation type of separator that converts dust to sludge without contact (in a dry state) with any high-speed moving parts.

N5906.5.3.1 Duct construction. Connecting ducts or suction tubes shall be , as short as possible, and without bends. Ducts shall be fabricated and assembled with a

smooth interior, with internal lap joints pointing in the direction of airflow and without unused capped side outlets, pockets or other dead-end spaces which allow an accumulation of dust.

N5906.5.3.2 Independent dust separators. Each machine shall be equipped with an individual dust-separating unit.

Exceptions:

1. One separator is allowed to serve two dust producing units on multiunit machines.
2. One separator is allowed to serve not more than four portable dust-producing units in a single enclosure or stand.

N5906.5.4 Power supply interlock. Power supply to machines shall be interlocked with exhaust airflow, and liquid pressure level or flow. The interlock shall be designed to shut down the machine it serves when the dust removal or separator system is not operating properly.

N5906.5.5 Electrical equipment. Electric wiring, fixtures and equipment in the immediate vicinity of and attached to dust-producing machines, including those used in connection with separator equipment, shall be of *approved* types and shall be *approved* for use in Class II, Division 1 hazardous locations in accordance with *the Electrical Code*.

CHAPTER N60 HIGHLY TOXIC AND TOXIC MATERIALS

SECTION N6001 GENERAL

N6001.1 Scope. The storage of highly toxic and toxic materials shall comply with Sections N6001 through N6005. *Compressed gases* shall also comply with Sections N5301 through N5307.

Exceptions: Display and storage in Group M and storage in Group S occupancies complying with Section N5003.11.

SECTION N6002 DEFINITIONS

N6002.1 Definitions. The following terms are defined in Section N202:

OZONE-GAS GENERATOR.

SECTION N6003 HIGHLY TOXIC AND TOXIC SOLIDS AND LIQUIDS

N6003.1 Indoor storage and use. The indoor storage and use of highly toxic and toxic materials shall comply with Sections N6003.1.1 through N6003.1.5.3.

N6003.1.1 Quantities not exceeding the maximum allowable quantity per control area. The indoor storage or use of highly toxic and toxic solids or liquids in amounts not exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(2) of this code shall be in accordance with Sections N5001, N5003 and N6001.

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N6003.1.2 Quantities exceeding the maximum allowable quantity per control area. The indoor storage or use of highly toxic and toxic solids or liquids in amounts exceeding the *maximum allowable quantity per control area* set forth in Table 307.1(2) of this code shall be in accordance with Section N6001, Sections N6003.1.3 through N6003.1.5.3 and Sections N5001 through N5005.

N6003.1.3 Treatment system—highly toxic liquids. Exhaust scrubbers or other systems for processing vapors of highly toxic liquids shall be provided where a spill or accidental release of such liquids can be expected to release highly toxic vapors at *normal temperature and pressure*. Treatment systems and other processing systems shall be installed in accordance with the *Mechanical Code*.

N6003.1.4 Indoor storage. Indoor storage of highly toxic and toxic solids and liquids shall comply with Sections N6003.1.4.1 and N6003.1.4.2.

N6003.1.4.1 Floors. In addition to the requirements set forth in Section N5004.12, floors of storage areas shall be of liquid-tight construction.

N6003.1.4.2 Separation—highly toxic solids and liquids. In addition to the requirements set forth in Section N5003.9.2, highly toxic solids and liquids in storage shall be located in *approved* hazardous material storage cabinets or isolated from other hazardous material storage by construction in accordance with this code.

N6003.1.5 Indoor use. Indoor use of highly toxic and toxic solids and liquids shall comply with Sections N6003.1.5.1 and N6003.1.5.3

[M]N6003.1.5.1 [6003.1.5.2] Exhaust ventilation for open systems. Mechanical exhaust ventilation shall be provided for highly toxic and toxic liquids used in *open systems* in accordance with Section N5005.2.1.1.

Exception: Liquids or solids that do not generate highly toxic or toxic fumes, mists or vapors

[M]N6003.1.5.2 [6003.1.5.3] Exhaust ventilation for closed systems. Mechanical exhaust ventilation shall be provided for highly toxic and toxic liquids used in *closed systems* in accordance with Section N5005.2.2.1.

Exception: Liquids or solids that do not generate highly toxic or toxic fumes, mists or vapors.

N6003.2 Outdoor storage.

N6003.2.1 [6003.2.3] General outdoor requirements. The general requirements applicable to the outdoor storage of highly toxic or toxic solids and liquids shall be in accordance with Sections N6003.2.3.1 and N6003.2.3.2.

N6003.2.1.1 [6003.2.3.1] Location. Outdoor storage or use of highly toxic or toxic solids and liquids shall not be located within 20 feet (6096 mm) of *lot lines*, public streets, public alleys, *public ways*, *exit discharges* or *exterior wall* openings. A 2-hour *fire barrier* without openings or penetrations extending not less than 30 inches (762 mm) above and to the sides of the storage is allowed in lieu of such distance. The wall shall either be an

independent structure, or the exterior wall of the building adjacent to the storage area.

[M]N6003.2.1.2 [6003.2.3.2] Treatment system—highly toxic liquids. Exhaust scrubbers or other systems for processing vapors of highly toxic liquid shall be provided where a spill or accidental release of such liquids can be expected to release highly toxic vapors at *normal temperature and pressure (NTP)*. Treatment systems and other processing systems shall be installed in accordance with the *Mechanical Code*.

N6003.2.2 [6003.2.5] Weather protection for highly toxic liquids and solids—outdoor storage or use. Where overhead weather protection is provided for outdoor storage or use of highly toxic liquids or solids, and the weather protection is attached to a building, the storage or use area shall either be equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code, or storage or use vessels shall be fire resistive. Weather protection shall be provided in accordance with Section N5004.13 for storage and Section N5005.3.1 for use.

SECTION N6004

HIGHLY TOXIC AND TOXIC COMPRESSED GASES

N6004.1 General. The storage and use of highly toxic and toxic *compressed gases* shall comply with this section.

N6004.1.1 Special limitations for indoor storage and use by occupancy. The indoor storage and use of highly toxic and toxic *compressed gases* in certain occupancies shall be subject to the limitations contained in Sections N6004.1.1.1 through N6004.1.1.3.

N6004.1.1.1 Group A, E, I or U occupancies. Toxic and highly toxic *compressed gases* shall not be stored or used within Group A, E, I or U occupancies.

Exception: Cylinders not exceeding 20 cubic feet (0.566 m³) at *normal temperature and pressure (NTP)* are allowed within gas cabinets or fume hoods.

N6004.1.1.2 Group R occupancies. Toxic and highly toxic *compressed gases* shall not be stored or used in Group R occupancies.

N6004.1.1.3 Offices, retail sales and classrooms. Toxic and highly toxic *compressed gases* shall not be stored or used in offices, retail sales or classroom portions of Group B, F, M or S occupancies.

Exception: In classrooms of Group B occupancies, cylinders with a capacity not exceeding 20 cubic feet (0.566 m³) at *NTP* are allowed in gas cabinets or fume hoods.

[M]N6004.1.2 Gas cabinets. Gas cabinets containing highly toxic or toxic *compressed gases* shall comply with Section N5003.8.6 and the following requirements:

1. The average ventilation velocity at the face of gas cabinet access ports or windows shall not be less than 200 feet per minute (1.02 m/s) with a minimum of 150

feet per minute (0.76 m/s) at any point of the access port or window.

2. Gas cabinets shall be connected to an exhaust system.
3. Gas cabinets shall not be used as the sole means of exhaust for any room or area.
4. The maximum number of cylinders located in a single gas cabinet shall not exceed three, except that cabinets containing cylinders not exceeding 1 pound (0.454 kg) net contents are allowed to contain up to 100 cylinders.
5. Gas cabinets required by Section N6004. shall be equipped with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code. Alternative fire-extinguishing systems shall not be used.

[M]N6004.1.3 Exhausted enclosures. Exhausted enclosures containing highly toxic or toxic *compressed gases* shall comply with Section N5003.8.5 and the following requirements:

1. The average ventilation velocity at the face of the enclosure shall not be less than 200 feet per minute (1.02 m/s) with a minimum of 150 feet per minute (0.76 m/s).
2. Exhausted enclosures shall be connected to an exhaust system.
3. Exhausted enclosures shall not be used as the sole means of exhaust for any room or area.
4. Exhausted enclosures required by Section N6004.2 shall be equipped with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code. Alternative fire-extinguishing systems shall not be used.

N6004.2 Indoor storage and use. The indoor storage and use of highly toxic or toxic *compressed gases* shall be in accordance with Sections N6004.2.1 through N6004.2.2.10.3.

N6004.2.1 Applicability. The applicability of regulations governing the indoor storage and use of highly toxic and toxic *compressed gases* shall be as set forth in Sections N6004.2.1.1 and N6004.2.1.2.

N6004.2.1.1 Quantities not exceeding the maximum allowable quantity per control area. The indoor storage or use of highly toxic and toxic gases in amounts not exceeding the *maximum allowable quantity per control area* set forth in Table 307.1(2) of this code shall be in accordance with Sections N5001, N5003, N6001 and N6004.1.

N6004.2.1.2 Quantities exceeding the maximum allowable quantity per control area. The indoor storage or use of highly toxic and toxic gases in amounts exceeding the *maximum allowable quantity per control area* set forth in Table 307.1(2) of this code shall be in accordance with Sections N6001, N6004.1, N6004.2 and Sections 5001 through 5005.

N6004.2.2 General indoor requirements. The general requirements applicable to the indoor storage and use of highly toxic and toxic *compressed gases* shall be in

accordance with Sections N6004.2.2.1 through N6004.2.2.10.3.

N6004.2.2.1 Cylinder and tank location. Cylinders shall be located within gas cabinets, exhausted enclosures or gas rooms. Portable and stationary tanks shall be located within gas rooms or exhausted enclosures.

[M]N6004.2.2.2 Ventilated areas. The room or area in which gas cabinets or exhausted enclosures are located shall be provided with exhaust ventilation. Gas cabinets or exhausted enclosures shall not be used as the sole means of exhaust for any room or area.

N6004.2.2.3 Leaking cylinders and tanks. One or more gas cabinets or exhausted enclosures shall be provided to handle leaking cylinders, containers or tanks.

Exceptions:

1. Where cylinders, containers or tanks are located within gas cabinets or exhausted enclosures.
2. Where *approved* containment vessels or containment systems are provided in accordance with all of the following:
 - 2.1. Containment vessels or containment systems shall be capable of fully containing or terminating a release.
 - 2.3. Containment vessels or containment systems shall be capable of being transported to the leaking cylinder, container or tank.

N6004.2.2.3.1 Location. Gas cabinets and exhausted enclosures shall be located in gas rooms and connected to an exhaust system.

[M]N6004.2.2.4 Local exhaust for portable tanks. A means of local exhaust shall be provided to capture leaks from portable tanks. The local exhaust shall consist of portable ducts or collection systems designed to be applied to the site of a leak in a valve or fitting on the tank. The local exhaust system shall be located in a gas room. Exhaust shall be directed to a treatment system in accordance with Section N6004.2.2.7.

N6004.2.2.5 Piping and controls—stationary tanks. stationary tanks shall comply with the following requirements:

1. Pressure relief devices shall be vented to a treatment system designed in accordance with Section N6004.2.2.7.

Exception: Pressure relief devices on outdoor tanks provided exclusively for relieving pressure due to fire exposure are not required to be vented to a treatment system provided that:

1. The material in the tank is not flammable.
2. The tank is not located in a diked area with other tanks containing combustible materials.
3. The tank is located not less than 30 feet (9144 mm) from combustible materials or structures or is

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shielded by a *fire barrier* complying with Section N6004.3.2.1.1

2. Filling or dispensing connections shall be provided with a means of local exhaust. Such exhaust shall be designed to capture fumes and vapors. The exhaust shall be directed to a treatment system in accordance with Section N6004.2.2.7.

N6004.2.2.6 Gas rooms. Gas rooms shall comply with Section N5003.8.4 and both of the following requirements:

1. The exhaust ventilation from gas rooms shall be directed to an exhaust system.
2. Gas rooms shall be equipped with an *approved automatic sprinkler system*. Alternative fire extinguishing systems shall not be used.

N6004.2.2.7 Treatment systems. The exhaust ventilation from gas cabinets, exhausted enclosures and gas rooms, and local exhaust systems required in Sections N6004.2.2.4 and N6004.2.2.5 shall be directed to a treatment system. The treatment system shall be utilized to handle the accidental release of gas and to process exhaust ventilation. The treatment system shall be designed in accordance with Sections N6004.2.2.7.1 through N6004.2.2.7.3 and Section 510 of the *Mechanical Code*.

Exceptions:

1. Highly toxic and toxic gases—storage. A treatment system is not required for cylinders, containers and tanks in storage when all of the following controls are provided:
 - 1.1. Valve outlets are equipped with gastight outlet plugs or caps.
 - 1.2. Handwheel-operated valves have handles secured to prevent movement.
 - 1.3. *Approved* containment vessels or containment systems are provided in accordance with Section N6004.2.2.3.
2. Toxic gases—use. Treatment systems are not required for toxic gases supplied by cylinders or portable tanks not exceeding 1,700 pounds (772 kg) water capacity when the following are provided:
 - 2.1. A *listed* or *approved* gas detection system with a sensing interval not exceeding 5 minutes.
 - 2.2. A *listed* or *approved* automatic-closing fail-safe valve located immediately adjacent to cylinder valves. The failsafe valve shall close when gas is detected at the permissible exposure limit (PEL) by a gas detection system monitoring the exhaust system at the point of discharge from the gas cabinet, exhausted enclosure, ventilated enclosure or gas room. The gas detection system shall comply with Section N6004.2.2.10.

N6004.2.2.7.1 Design. Treatment systems shall be capable of diluting, adsorbing, absorbing, containing, neutralizing, burning or otherwise processing the contents of the largest single vessel of compressed gas. Where a total containment system is used, the system shall be designed to handle the maximum anticipated pressure of release to the system when it reaches equilibrium.

N6004.2.2.7.2 Performance. Treatment systems shall be designed to reduce the maximum allowable discharge concentrations of the gas to one-half immediate by dangerous to life and health (IDLH) at the point of discharge to the atmosphere. Where more than one gas is emitted to the treatment system, the treatment system shall be designed to handle the worst-case release based on the release rate, the quantity and the IDLH for all *compressed gases* stored or used.

N6004.2.2.7.3 Sizing. Treatment systems shall be sized to process the maximum worst-case release of gas based on the maximum flow rate of release from the largest vessel utilized. The entire contents of the largest *compressed gas* vessel shall be considered.

N6004.2.2.8 Emergency power. Emergency power in accordance with the Chapter 27 of this code, Section N604 and the *Electrical Code* shall be provided in lieu of standby power where any of the following systems are required:

1. Exhaust ventilation system.
2. Treatment system.
3. Gas detection system.
4. Smoke detection system.
5. Temperature control system.
6. Fire alarm system.
7. Emergency alarm system.

Exception: Emergency power is not required for mechanical exhaust ventilation, treatment systems and temperature control systems where *approved* fail-safe engineered systems are installed.

N6004.2.2.9 Automatic fire detection system—highly toxic compressed gases. An *approved* automatic fire detection system shall be installed in rooms or areas where highly toxic *compressed gases* are stored or used. Activation of the detection system shall sound a local alarm. The fire detection system shall comply with Section 907 of this code.

N6004.2.2.10 Gas detection system. A gas detection system shall be provided to detect the presence of gas at or below the PEL or ceiling limit of the gas for which detection is provided. The system shall be capable of monitoring the discharge from the treatment system at or below one-half the IDLH limit.

Exception: A gas detection system is not required for toxic gases when the physiological warning threshold level for the gas is at a level below the accepted PEL for the gas.

N6004.2.2.10.1 Gas detection system components. Gas detection system control units shall be *listed* and *labeled* in accordance with UL 864 or UL 2017, or approved. Gas detectors shall be *listed* and *labeled* in accordance with UL 2075 for use with the gases and vapors being detected, or *approved*.

N6004.2.2.10.2 Alarms. The gas detection system shall initiate a local alarm and transmit a signal to a constantly attended control station when a short-term hazard condition is detected. The alarm shall be both visual and audible and shall provide warning both inside and outside the area where gas is detected. The audible alarm shall be distinct from all other alarms.

Exception: Signal transmission to a constantly attended control station is not required where not more than one cylinder of highly toxic or toxic gas is stored.

N6004.2.2.10.3 Shut off of gas supply. The gas detection system shall automatically close the shutoff valve at the source on gas supply piping and tubing related to the system being monitored for whichever gas is detected.

Exception: Automatic shutdown is not required for reactors utilized for the production of highly toxic or toxic *compressed gases* where such reactors are:

1. Operated at pressures less than 15 pounds per square inch gauge (psig) (103.4 kPa).
2. Constantly attended.
3. Provided with readily accessible emergency shutoff valves.

N6004.2.2.10.4 Valve closure. Automatic closure of shutoff valves shall be in accordance with the following:

1. When the gas-detection sampling point initiating the gas detection system alarm is within a gas cabinet or exhausted enclosure, the shutoff valve in the gas cabinet or exhausted enclosure for the specific gas detected shall automatically close.
2. Where the gas-detection sampling point initiating the gas detection system alarm is within a gas room and *compressed gas* containers are not in gas cabinets or exhausted enclosures, the shutoff valves on all gas lines for the specific gas detected shall automatically close.
3. Where the gas-detection sampling point initiating the gas detection system alarm is within a piping distribution manifold enclosure, the shutoff valve for the compressed container of specific gas detected supplying the manifold shall automatically close.

Exception: When the gas-detection sampling point initiating the gas-detection system alarm is at a use location or within a gas valve enclosure of a branch line downstream of a piping distribution manifold, the shutoff valve in the gas valve enclosure for the branch line located in the piping distribution manifold enclosure shall automatically close.

N6004.3 Outdoor storage.

N6004.3.1 Reserved.

N6004.3.2 General outdoor requirements. The general requirements applicable to the outdoor storage and use of highly toxic and toxic *compressed gases* shall be in accordance with Sections N6004.3.2.1 through N6004.3.2.3.

N6004.3.2.1 Location. Outdoor storage or use of highly toxic or toxic *compressed gases* shall be located in accordance with Sections N6004.3.2.1.1 through N6004.3.2.1.3.

Exception: *Compressed gases* located in gas cabinets complying with Sections N5003.8.6 and N6004.1.2 and located 5 feet (1524 mm) or more from buildings and 25 feet (7620 mm) or more from an *exit discharge*.

N6004.3.2.1.1 Distance limitation to exposures. Outdoor storage or use of highly toxic or toxic *compressed gases* shall not be located within 75 feet (22 860 mm) of a *lot line*, public street, public alley, *public way*, *exit discharge* or building not associated with the manufacture or distribution of such gases, unless all of the following conditions are met:

1. Storage is shielded by a 2-hour *fire barrier* which interrupts the line of sight between the storage and the exposure.
2. The 2-hour *fire barrier* shall be located at least 5 feet (1524 mm) from any exposure.
3. The 2-hour *fire barrier* shall not have more than two sides at approximately 90-degree (1.57 rad) directions, or three sides with connecting angles of approximately 135 degrees (2.36 rad).

N6004.3.2.1.2 Openings in exposed buildings. Where the storage or use area is located closer than 75 feet (22 860 mm) to a building not associated with the manufacture or distribution of highly toxic or toxic *compressed gases*, openings into a building other than for piping are not allowed above the height of the top of the 2-hour *fire barrier* or within 50 feet (15 240 mm) horizontally from the storage area whether or not shielded by a *fire barrier*.

N6004.3.2.1.3 Air intakes. The storage or use area shall not be located within 75 feet (22 860 mm) of air intakes.

N6004.3.2.2 Leaking cylinders and tanks. The requirements of Section N6004.2.2.3 shall apply to outdoor cylinders and tanks. Gas cabinets and exhausted enclosures shall be located within or immediately adjacent to outdoor storage or use areas.

N6004.3.2.3 Local exhaust for portable tanks. Local exhaust for outdoor portable tanks shall be provided in accordance with the requirements set forth in Section N6004.2.2.4.

N6004.3.3 Outdoor storage weather protection for portable tanks and cylinders. Weather protection in accordance with Section N5004.13 shall be provided for portable tanks and cylinders located outdoors and not within gas cabinets or exhausted enclosures. The storage area shall be equipped with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code.

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Exception: An *automatic sprinkler system* is not required when:

1. All materials under the weather protection structure, including hazardous materials and the containers in which they are stored, are noncombustible.
2. The weather protection structure is located not less than 30 feet (9144 mm) from combustible materials or structures or is separated from such materials or structures using a *fire barrier* complying with Section N6004.3.2.1.1.

N6004.3.4 Outdoor use of cylinders, containers and portable tanks. Cylinders, containers and portable tanks in outdoor use shall be located in gas cabinets or exhausted enclosures and shall comply with Sections N6004.3.4.1 through N6004.3.4.3.

N6004.3.4.1 Treatment systems. The treatment system requirements set forth in Section N6004.2.2.7 shall apply to highly toxic or toxic gases located outdoors.

N6004.3.4.2 Emergency power. The requirements for emergency power set forth in Section N6004.2.2.8 shall apply to highly toxic or toxic gases located outdoors.

N6004.3.4.3 Gas detection system. The gas detection system requirements set forth in Section N6004.2.2.10 shall apply to highly toxic or toxic gases located outdoors.

SECTION N6005 OZONE GAS GENERATORS

N6005.1 Location.

N6005.1.1 [6005.3.2] Ozone gas generator rooms. Ozone gas generator rooms shall be mechanically ventilated in accordance with the *Mechanical Code* with a minimum of six air changes per hour. Ozone gas generator rooms shall be equipped with a continuous gas detection system that will shut off the generator and sound a local alarm when concentrations above the permissible exposure limit occur. Ozone gas generator rooms shall not be normally occupied, and such rooms shall be kept free of combustible and hazardous material storage. Room access doors shall display an *approved* sign stating: OZONE GAS GENERATOR—HIGHLY TOXIC—OXIDIZER.

CHAPTER N62 ORGANIC PEROXIDES

SECTION N6201 GENERAL

N6201.1 Scope. The storage and use of organic peroxides shall be in accordance with this section and Sections N5001 through N5005.

SECTION N6202 DEFINITION

N6202.1 Definition. The following term is defined in Section N202:

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UNCLASSIFIED DETONABLE.

SECTION N6203 ORGANIC PEROXIDES GENERAL REQUIREMENTS

N6203.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of organic peroxides in amounts not exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003, N6201 and N6203.

N6203.1.1 Special limitations for indoor storage and use by occupancy. The indoor storage and use of organic peroxides shall be in accordance with Sections N6203.1.1.1 through N6203.1.1.4.

N6203.1.1.1 Group A, E, I or U occupancies. In Group A, E, I or U occupancies, any amount of unclassified detonable and Class I organic peroxides shall be stored in accordance with the following:

1. Unclassified detonable and Class I organic peroxides shall be stored in hazardous materials storage cabinets complying with Section N5003.8.7.
2. The hazardous materials storage cabinets shall not contain other storage.

N6203.1.1.2 Group R occupancies. Unclassified detonable and Class I organic peroxides shall not be stored or used within Group R occupancies.

N6203.1.1.3 Group B, F, M or S occupancies. Unclassified detonable and Class I organic peroxides shall not be stored or used in offices, or retail sales areas of Group B, F, M or S occupancies.

N6203.1.1.4 Classrooms. In classrooms in Group B, F or M occupancies, any amount of unclassified detonable and Class I organic peroxides shall be stored in accordance with the following:

1. Unclassified detonable and Class I organic peroxides shall be stored in hazardous materials storage cabinets complying with Section N5003.8.7.
2. The hazardous materials storage cabinets shall not contain other storage.

N6203.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of organic peroxides in amounts exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N6201 through N6204.

SECTION N6204 ORGANIC PEROXIDES STORAGE

N6204.1 Indoor storage. Indoor storage of organic peroxides in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code shall be in accordance with Sections N5001, N5003, N5004 and Sections N6201 through N6204.

N6204.1.1 Detached storage. Storage of organic peroxides shall be in detached buildings when required by Section N5003.8.2.

N6204.1.2 Distance from detached buildings to exposures. In addition to the requirements elsewhere in this code, detached storage buildings for Class I, II, III, IV and V organic peroxides shall be located in accordance with Table N6204.1.2. Detached buildings containing quantities of unclassified detonable organic peroxides in excess of those set forth in Table 415.5.2 of this code shall be located in accordance with Table N5604.5.2(1).

N6204.1.3 Liquid-tight floor. In addition to the requirements of Section N5004.12, floors of storage areas shall be of liquid-tight construction.

N6204.1.4 Electrical wiring and equipment. Electrical wiring and equipment in storage areas for Class I or II organic peroxides shall comply with the requirements for electrical Class I, Division 2 locations.

N6204.1.5 Smoke detection. An *approved* supervised smoke detection system in accordance with Section 907 of this code shall be provided in rooms or areas where Class I, II or III organic peroxides are stored. Activation of the smoke detection system shall sound a local alarm.

Exception: A smoke detection system shall not be required in detached storage buildings equipped throughout with an *approved* automatic fire-extinguishing system complying with Chapter 9 of this code.

N6204.1.6 Maximum quantities. Maximum allowable quantities per building in a mixed occupancy building shall

not exceed the amounts set forth in Table 415.5.2 of this code. Maximum allowable quantities per building in a detached storage building shall not exceed the amounts specified in Table N6204.1.2.

N6204.1.7 Reserved.

N6204.1.8 Location in building. The storage of Class I or II organic peroxides shall be on the ground floor. Class III organic peroxides shall not be stored in basements.

N6204.1.9 Contamination. Organic peroxides shall be stored in their original DOTn shipping containers. Organic peroxides shall be stored in a manner to prevent contamination.

N6204.1.10 Explosion control. Indoor storage rooms, areas and buildings containing unclassified detonable and Class I organic peroxides shall be provided with explosion control in accordance with Section N901.

N6204.1.11 Standby power. Standby power in accordance with Section N604 shall be provided for storage areas of Class I and unclassified detonable organic peroxide.

N6204.2 Outdoor storage.

N6204.2.1 [6204.2.2] Electrical wiring and equipment. Electrical wiring and equipment in outdoor storage areas containing unclassified detonable, Class I or II organic peroxides shall comply with the requirements for electrical Class I, Division 2 locations.

TABLE N6204.1.2
ORGANIC PEROXIDES—DISTANCE TO EXPOSURES FROM DETACHED STORAGE BUILDINGS OR OUTDOOR STORAGE AREAS

ORGANIC PEROXIDE CLASS	MAXIMUM STORAGE QUANTITY (POUNDS) AT MINIMUM SEPARATION DISTANCE					
	Distance to buildings, lot lines, public streets, public alleys, public ways or means of egress			Distance between individual detached storage buildings or individual outdoor storage areas		
	50 feet	100 feet	150 feet	20 feet	75 feet	100 feet
I	2,000	20,000	175,000	2,000	20,000	175,000
II	100,000	200,000	No Limit	100,000 ^a	No Limit	No Limit
III	200,000	No Limit	No Limit	200,000 ^a	No Limit	No Limit
IV	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit
V	No Limit	No Limit	No Limit	No Limit	No Limit	No Limit

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg.

a. When the amount of organic peroxide stored exceeds this amount, the minimum separation shall be 50 feet.

**CHAPTER N63
OXIDIZERS, OXIDIZING GASES AND OXIDIZING
CRYOGENIC FLUIDS**

**SECTION N6301
GENERAL**

N6301.1 Scope. The storage and use of oxidizing materials shall be in accordance with Sections N6301 through N6304 and Sections N5001 through N5005. Oxidizing gases shall also comply with Sections N5301 through N5307. Oxidizing *cryogenic fluids* shall also comply with Sections N5501 through N5505.

Exceptions:

1. Display and storage in Group M and storage in Group S occupancies complying with Section N5003.11.
2. Bulk oxygen systems at industrial and institutional consumer sites shall be in accordance with NFPA 55.

**SECTION N6302
DEFINITIONS**

N6302.1 Definitions. The following terms are defined in Section N202:

**BULK OXYGEN SYSTEM.
OXIDIZING CRYOGENIC FLUID.**

**SECTION N6303
OXIDIZERS, OXIDIZING GASES AND OXIDIZING
CRYOGENIC FLUIDS - GENERAL REQUIREMENTS**

N6303.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of oxidizing materials in amounts not exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003, N6301 and N6303. Oxidizing gases shall also comply with Sections N5301 through N5307.

N6303.1.1 Special limitations for indoor storage and use by occupancy. The indoor storage and use of oxidizing materials shall be in accordance with Sections N6303.1.1.1 through N6303.1.1.3.

N6303.1.1.1 Class 4 liquid and solid oxidizers. The storage and use of Class 4 liquid and solid oxidizers shall comply with Sections N6303.1.1.1.1 through N6303.1.1.1.4.

N6303.1.1.1.1 Group A, E, I or U occupancies. In Group A, E, I or U occupancies, any amount of Class 4 liquid and solid oxidizers shall be stored in accordance with the following:

1. Class 4 liquid and solid oxidizers shall be stored in hazardous materials storage cabinets complying with Section N5003.8.7.
2. The hazardous materials storage cabinets shall not contain other storage.

N6303.1.1.1.2 Group R occupancies. Class 4 liquid and solid oxidizers shall not be stored or used within Group R occupancies.

N6303.1.1.1.3 Offices and retail sales areas. Class 4 liquid and solid oxidizers shall not be stored or used in offices or retail sales areas of Group B, F, M or S occupancies.

N6303.1.1.1.4 Classrooms. In classrooms of Group B, F or M occupancies, any amount of Class 4 liquid and solid oxidizers shall be stored in accordance with the following:

1. Class 4 liquid and solid oxidizers shall be stored in hazardous materials storage cabinets complying with Section N5003.8.7.
2. Hazardous materials storage cabinets shall not contain other storage.

N6303.1.1.2 Class 3 liquid and solid oxidizers. A maximum of 200 pounds (91 kg) of solid or 20 gallons (76 L) of liquid Class 3 oxidizer is allowed in Group I occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in *approved* containers and in an *approved* manner.

N6303.1.1.3 Oxidizing gases. Except for cylinders of nonliquefied *compressed gases* not exceeding a capacity of 250 cubic feet (7 m³) or liquefied *compressed gases* not exceeding a capacity of 46 pounds (21 kg) each used for

maintenance purposes, patient care or operation of equipment, oxidizing gases shall not be stored or used in Group A, E, I or R occupancies or in offices in Group B occupancies.

The aggregate quantities of gases used for maintenance purposes and operation of equipment shall not exceed the *maximum allowable quantity per control area* listed in Table 307.1(1) of this code.

Medical gas systems and medical gas supply cylinders shall also be in accordance with Section N5306.

N6303.1.2 Emergency shutoff. *Compressed gas* systems conveying oxidizing gases shall be provided with *approved* manual or automatic emergency shutoff valves that can be activated at each point of use and at each source.

N6303.1.2.1 Shutoff at source. A manual or automatic fail-safe emergency shutoff valve shall be installed on supply piping at the cylinder or bulk source. Manual or automatic cylinder valves are allowed to be used as the required emergency shutoff valve when the source of supply is limited to unmanifolded cylinder sources.

N6303.1.2.2 Shutoff at point of use. A manual or automatic emergency shutoff valve shall be installed on the supply piping at the point of use or at a point where the equipment using the gas is connected to the supply system.

N6303.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of oxidizing materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N6001 through N6004.

**SECTION N6304
STORAGE OF OXIDIZERS, OXIDIZING GASES AND
OXIDIZING CRYOGENIC FLUIDS**

N6304.1 Indoor storage. Indoor storage of oxidizing materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code shall be in accordance with Sections N5001, N5003 and N5004 and Sections N6301 through N6304.

N6304.1.1 Detached storage. Storage of liquid and solid oxidizers shall be in detached buildings when required by Section N5003.8.2.

N6304.1.2 Distance from detached storage buildings to exposures. In addition to the requirements of elsewhere in this code, detached storage buildings shall be located in accordance with Table N6304.1.2.

N6304.1.3 Explosion control. Indoor storage rooms, areas and buildings containing Class 4 liquid or solid oxidizers shall be provided with explosion control in accordance with Section N901.

N6304.1.4 Automatic sprinkler system. The *automatic sprinkler system* shall be designed in accordance with NFPA 400.

N6304.1.5 Liquid-tight floor. In addition to Section N5004.12, floors of storage areas for liquid and solid oxidizers shall be of liquid-tight construction.

**TABLE N6304.1.2
OXIDIZER LIQUIDS AND SOLIDS—DISTANCE FROM DETACHED BUILDINGS AND OUTDOOR STORAGE AREAS TO EXPOSURES**

OXIDIZER CLASS	WEIGHT (pounds)	MINIMUM DISTANCE TO BUILDINGS, LOT LINES, PUBLIC STREETS, PUBLIC ALLEYS, PUBLIC WAYS OR MEANS OF EGRESS (feet)
1	Note a	Not Required
2	Note a	35
3	Note a	50
4	Over 10 to 100	75
	101 to 500	100
	501 to 1,000	125
	1,001 to 3,000	200
	3,001 to 5,000	300
	5,001 to 10,000	400
	Over 10,000	As required by the fire code official

For SI: 1 foot = 304.8 mm, 1 pound = 0.454 kg.

- a. Any quantity over the amount required for detached storage in accordance with Section N5003.8.2, or over the outdoor maximum allowable quantity for outdoor control areas.

N6304.1.6 Smoke detection. An *approved* supervised smoke detection system in accordance with Section 907 of this code shall be installed in liquid and solid oxidizer storage areas. Activation of the smoke detection system shall sound a local alarm.

Exception: Detached storage buildings protected by an *approved* automatic fire-extinguishing system.

N6304.1.7 Storage conditions. The maximum quantity of oxidizers per building in detached storage buildings shall not exceed those quantities set forth in Tables N6304.1.7(1) through N6304.1.7(4).

The storage configuration for liquid and solid oxidizers shall be as set forth in Tables N6304.1.7(1) through N6304.1.7(4).

Class 2 oxidizers shall not be stored in *basements* except when such storage is in stationary tanks.

Class 3 and 4 oxidizers in amounts exceeding the *maximum allowable quantity per control area* set forth in Section N5003.1 shall be stored on the ground floor only.

N6304.1.8 Separation of Class 4 oxidizers from other materials. In addition to the requirements in Section N5003.9.2, Class 4 oxidizer liquids and solids shall be separated from other hazardous materials by not less than a 1-hour *fire barrier* or stored in hazardous materials storage cabinets.

Detached storage buildings for Class 4 oxidizer liquids and solids shall be located a minimum of 50 feet (15 240 mm) from other hazardous materials storage.

N6304.1.9 Contamination. Liquid and solid oxidizers shall not be stored on or against combustible surfaces. Liquid and solid oxidizers shall be stored in a manner to prevent contamination.

**TABLE N6304.1.7(1)
STORAGE OF CLASS 1 OXIDIZER LIQUIDS AND SOLIDS IN COMBUSTIBLE CONTAINERS**

STORAGE CONFIGURATION	LIMITS (feet)
Piles	
Maximum length	No Limit
Maximum width	50
Maximum height	20
Minimum distance to next pile	3
Minimum distance to walls	2
Maximum quantity per pile	No Limit
Maximum quantity per building	No Limit

For SI: 1 foot = 304.8 mm.

- a. Storage in noncombustible containers or in bulk in detached storage buildings is not limited as to quantity or arrangement.

**TABLE N6304.1.7(2)
STORAGE OF CLASS 2 OXIDIZER LIQUIDS AND SOLIDS^{a, b}**

STORAGE CONFIGURATION	LIMITS		
	Segregated storage	Cutoff storage rooms ^c	Detached building
Piles			
Maximum width	16 feet	25 feet	25 feet
Maximum height	10 feet	12 feet	12 feet
Minimum distance to next pile	Note d	Note d	Note d
Minimum distance to walls	2 feet	2 feet	2 feet
Maximum quantity per pile	20 tons	50 tons	200 tons
Maximum quantity per building	200 tons	500 tons	No Limit

For SI: 1 foot = 304.8 mm, 1 ton = 0.907185 metric ton.

- a. Storage in noncombustible containers is not limited as to quantity or arrangement, except that piles shall be at least 2 feet from walls in sprinklered buildings and 4 feet from walls in nonsprinklered buildings; the distance between piles shall not be less than the pile height.
- b. Quantity limits shall be reduced by 50 percent in buildings or portions of buildings used for retail sales.
- c. Cutoff storage rooms shall be separated from the remainder of the building by 2-hour fire barriers.
- d. Aisle width shall not be less than the pile height.

**TABLE N6304.1.7(3)
STORAGE OF CLASS 3 OXIDIZER LIQUIDS AND SOLIDS^{a, b}**

STORAGE CONFIGURATION	LIMITS		
	Segregated storage	Cutoff storage rooms ^c	Detached building
Piles			
Maximum width	12 feet	16 feet	20 feet
Maximum height	8 feet	10 feet	10 feet
Minimum distance to next pile	Note d	Note d	Note d
Minimum distance to walls	4 feet	4 feet	4 feet
Maximum quantity per pile	20 tons	30 tons	150 tons
Maximum quantity per building	100 tons	500 tons	No Limit

For SI: 1 foot = 304.8 mm, 1 ton = 0.907185 metric ton.

- a. Storage in noncombustible containers is not limited as to quantity or arrangement, except that piles shall be at least 2 feet from walls in sprinklered buildings and 4 feet from walls in nonsprinklered buildings; the distance between piles shall not be less than the pile height.
- b. Quantity limits shall be reduced by 50 percent in buildings or portions of buildings used for retail sales.
- c. Cutoff storage rooms shall be separated from the remainder of the building by 2-hour fire barriers.

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d. Aisle width shall not be less than the pile height.

**CHAPTER N64
PYROPHORIC MATERIALS**

**SECTION N6401
GENERAL**

N6401.1 Scope. The storage and use of pyrophoric materials shall be in accordance with this code. *Compressed gases* shall also comply with Sections N5301 through N5307.

**SECTION N6402
DEFINITION**

N6402.1 Definition. The following term is defined in Section N202:

PYROPHORIC.

**SECTION N6403
GENERAL REQUIREMENTS**

N6403.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of pyrophoric materials in amounts not exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003, N6401 and N6403.

N6403.1.1 Emergency shutoff. *Compressed gas* systems conveying pyrophoric gases shall be provided with *approved* manual or automatic emergency shutoff valves that can be activated at each point of use and at each source.

N6403.1.1.1 Shutoff at source. An automatic emergency shutoff valve shall be installed on supply piping at the cylinder or bulk source. The shutoff valve shall be operated by a remotely located manually activated shutdown control located not less than 15 feet (4572 mm) from the source of supply. Manual or automatic cylinder valves are allowed to be used as the required emergency shutoff valve when the source of supply is limited to unmanifolded cylinder sources.

N6403.1.1.2 Shutoff at point of use. A manual or automatic emergency shutoff valve shall be installed on the supply piping at the point of use or at a point where the equipment using the gas is connected to the supply system.

N6403.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of pyrophoric materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N6401 through N6404.

**SECTION N6404
STORAGE**

N6404.1 Indoor storage. Indoor storage of pyrophoric materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code, shall be in accordance with Sections N5001, N5003 and N5004 and Sections N6401 through N6404.

The storage of silane gas, and gas mixtures with a silane concentration of 1.37 percent or more by volume, shall be in accordance with CGA G-13.

N6404.1.1 Liquid-tight floor. In addition to the requirements of Section N5004.12, floors of storage areas containing pyrophoric liquids shall be of liquid-tight construction.

N6404.1.2 Pyrophoric solids and liquids. Storage of pyrophoric solids and liquids shall be limited to a maximum area of 100 square feet (9.3 m²) per pile. Storage shall not exceed 5 feet (1524 mm) in height. Individual containers shall not be stacked. Aisles between storage piles shall be a minimum of 10 feet (3048 mm) in width. Individual tanks or containers shall not exceed 500 gallons (1893 L) in capacity.

N6404.1.3 Pyrophoric gases. Storage of pyrophoric gases shall be in detached buildings where required by Section N5003.8.2.

N6404.1.4 Separation from incompatible materials. In addition to the requirements of Section N5003.9.1, indoor storage of pyrophoric materials shall be isolated from incompatible hazardous materials by 1-hour *fire barriers* with openings protected in accordance with this code.

Exception: Storage in *approved* hazardous materials storage cabinets constructed in accordance with Section N5003.8.7.

N6404.2.2 Weather protection. When overhead construction is provided for sheltering outdoor storage areas of pyrophoric materials, the storage areas shall be provided with *approved* automatic fire-extinguishing system protection.

**TABLE N6404.2.1
PYROPHORIC GASES—DISTANCE FROM STORAGE TO EXPOSURES^a**

MAXIMUM AMOUNT PER STORAGE AREA (cubic feet)	MINIMUM DISTANCE BETWEEN STORAGE AREAS (feet)	MINIMUM DISTANCE TO LOT LINES OF PROPERTY THAT CAN BE BUILT UPON (feet)	MINIMUM DISTANCE TO PUBLIC STREETS, PUBLIC ALLEYS OR PUBLIC WAYS (feet)	MINIMUM DISTANCE TO BUILDINGS ON THE SAME PROPERTY		
				Nonrated construction or openings within 25 feet	Two-hour construction and no openings within 25 feet	Four-hour construction and no openings within 25 feet
250	5	25	5	5	0	0
2,500	10	50	10	10	5	0
7,500	20	100	20	20	10	0

For SI: 1 foot = 304.8 mm, 1 cubic foot = 0.02832 m³.

a. The minimum required distances shall be reduced to 5 feet when protective structures having a minimum fire resistance of 2 hours interrupt the line of sight between the container and the exposure. The protective structure shall be at least 5 feet from the exposure. The configuration of the protective structure shall allow natural ventilation to prevent the accumulation of hazardous gas concentrations.

CHAPTER N65 PYROXYLIN (CELLULOSE NITRATE) PLASTICS

SECTION N6501 [6504] STORAGE

N6501.1 [6504.2] Fire protection. The manufacture or storage of articles of cellulose nitrate (pyroxylin) plastic in quantities exceeding 100 pounds (45 kg) shall be located in a building or portion thereof equipped throughout with an *approved automatic sprinkler system* in accordance with Section 903.3.1.1 of this code.

N6501.2 [6504.4] Heating. Rooms in which cellulose nitrate (pyroxylin) plastic is handled or stored shall be heated by low-pressure steam or hot water radiators.

SECTION N6601 UNSTABLE (REACTIVE) MATERIALS GENERAL

N6601.1 Scope. The storage and use of unstable (reactive) materials shall be in accordance with Sections N6601 through N6604. *Compressed gases* shall also comply with Sections N5301 through N5307.

Exceptions: Display and storage in Group M and storage in Group S occupancies complying with Section N5003.11.

SECTION N6602 RESERVED

SECTION N6603 UNSTABLE (REACTIVE) MATERIALS GENERAL REQUIREMENTS

N6603.1 Quantities not exceeding the maximum allowable quantity per control area. Quantities of unstable (reactive) materials not exceeding the *maximum allowable quantity per control area* shall be in accordance with Sections N6603.1.1 through N6603.1.2.5.

N6603.1.1 General. The storage and use of unstable (reactive) materials in amounts not exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003, N6601 and N6603.

N6603.1.2 Limitations for indoor storage and use by occupancy. The indoor storage of unstable (reactive) materials shall be in accordance with Sections N6603.1.2.1 through N6603.1.2.5.

N6603.1.2.1 Group A, E, I or U occupancies. In Group A, E, I or U occupancies, any amount of Class 3 and 4 unstable (reactive) materials shall be stored in accordance with the following:

1. Class 3 and 4 unstable (reactive) materials shall be stored in hazardous material storage cabinets complying with Section N5003.8.7.
2. The hazardous material storage cabinets shall not contain other storage.

N6603.1.2.2 Group R occupancies. Class 3 and 4 unstable (reactive) materials shall not be stored or used within Group R occupancies.

N6603.1.2.3 Group M occupancies. Class 4 unstable (reactive) materials shall not be stored or used in retail sales portions of Group M occupancies.

N6603.1.2.4 Offices. Class 3 and 4 unstable (reactive) materials shall not be stored or used in offices of Group B, F, M or S occupancies.

N6603.1.2.5 Classrooms. In classrooms in Group B, F or M occupancies, any amount of Class 3 and 4 unstable (reactive) materials shall be stored in accordance with the following:

1. Class 3 and 4 unstable (reactive) materials shall be stored in hazardous material storage cabinets complying with Section N5003.8.7.
2. The hazardous material storage cabinets shall not contain other storage.

N6603.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of unstable (reactive) materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N6601 through N6604.

SECTION N6604 STORAGE OF UNSTABLE (REACTIVE) MATERIALS

N6604.1 Indoor storage. Indoor storage of unstable (reactive) materials in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code shall be in accordance with Sections N5001, N5003, N5004 and Sections N6601 through N6604. In addition, Class 3 and 4 unstable (reactive) detonable materials shall be stored in accordance with the requirements for *explosives*.

N6604.1.1 Detached storage. Storage of unstable (reactive) materials shall be in detached buildings when required in Section N5003.8.2.

N6604.1.2 Explosion control. Indoor storage rooms, areas and buildings containing Class 3 or 4 unstable (reactive) materials shall be provided with explosion control in accordance with Section N901.

N6604.1.3 Liquid-tight floor. In addition to Section N5004.12, floors of storage areas for liquids and solids shall be of liquid-tight construction.

N6604.1.4 Storage configuration. Unstable (reactive) materials stored in quantities greater than 500 cubic feet (14 m³) shall be separated into piles, each not larger than 500 cubic feet (14 m³). Aisle width shall not be less than the height of the piles or 4 feet (1219 mm), whichever is greater.

Exception: Materials stored in tanks.

N6604.1.5 Location in building. Unstable (reactive) materials shall not be stored in *basements*.

N6604.2 Outdoor Storage.

APPENDIX N

N6604.2.1 [6604.2.3] Distance from storage to exposures Class 2 and 1 materials. Outdoor storage of Class 2 or 1 unstable (reactive) materials shall not be located within 20 feet (6096 mm) of buildings not associated with the manufacture or distribution of such materials, *lot lines*, public streets, public alleys, *public ways* or *means of egress*. The minimum required distance shall not apply when *fire barriers* without openings or penetrations having a minimum fire-resistance rating of 2 hours interrupt the line of sight between the storage and the exposure. The *fire barrier* shall either be an independent structure or the exterior wall of the building adjacent to the storage area.

CHAPTER N67 WATER-REACTIVE SOLIDS AND LIQUIDS

SECTION N6701 GENERAL

N6701.1 Scope. The storage and use of water-reactive solids and liquids shall be in accordance with this code.

Exceptions: Display and storage in Group M and storage in Group S occupancies complying with Section N5003.11.

SECTION N6702 RESERVED

SECTION N6703 GENERAL REQUIREMENTS

N6703.1 Quantities not exceeding the maximum allowable quantity per control area. The storage and use of water-reactive solids and liquids in amounts not exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001, N5003, N6701 and N6703.

N6703.2 Quantities exceeding the maximum allowable quantity per control area. The storage and use of water-reactive solids and liquids in amounts exceeding the *maximum allowable quantity per control area* indicated in Section N5003.1 shall be in accordance with Sections N5001 through N5005 and Sections N6701 through N6704.

SECTION N6704 STORAGE OF WATER-REACTIVE SOLIDS AND LIQUIDS

N6704.1 Indoor storage. Indoor storage of water-reactive solids and liquids in amounts exceeding the *maximum allowable quantity per control area* indicated in Table 307.1(1) of this code shall be in accordance with Sections N5001, N5003, N5004 and Sections N6701 through N6704.

N6704.1.1 Detached storage. Storage of water-reactive solids and liquids shall be in detached buildings when required by Section N5003.8.2.

N6704.1.2 Liquid-tight floor. In addition to the provisions of Section N5004.12, floors in storage areas for water-

reactive solids and liquids shall be of liquid-tight construction.

N6704.1.3 Waterproof room. Rooms or areas used for the storage of water-reactive solids and liquids shall be constructed in a manner which resists the penetration of water through the use of waterproof materials. Piping carrying water for other than *approved automatic sprinkler systems* shall not be within such rooms or areas.

N6704.1.4 Water-tight containers. When Class 3 water-reactive solids and liquids are stored in areas equipped with an *automatic sprinkler system*, the materials shall be stored in closed water-tight containers.

N6704.1.5 Storage configuration. Water-reactive solids and liquids stored in quantities greater than 500 cubic feet (14 m³) shall be separated into piles, each not larger than 500 cubic feet (14 m³). Aisle widths between piles shall not be less than the height of the pile or 4 feet (1219 mm), whichever is greater.

Exception: Water-reactive solids and liquids stored in tanks.

Class 2 water-reactive solids and liquids shall not be stored in *basements* unless such materials are stored in closed water-tight containers or tanks.

Class 3 water-reactive solids and liquids shall not be stored in *basements*.

Class 2 or 3 water-reactive solids and liquids shall not be stored with flammable liquids.

N6704.1.6 Explosion control. Indoor storage rooms, areas and buildings containing Class 2 or 3 water-reactive solids and liquids shall be provided with explosion control in accordance with Section N901.

N6704.2 Outdoor storage.

N6704.2.1 [6704.2.3] Class 2 distance to exposures. Outdoor storage of Class 2 water-reactive solids and liquids shall not be within 20 feet (6096 mm) of buildings, *lot lines*, public streets, public alleys, *public ways* or *means of egress*. A 2-hour *fire barrier* without openings or penetrations, and extending not less than 30 inches (762 mm) above and to the sides of the storage area, is allowed in lieu of such distance. The wall shall either be an independent structure, or the exterior wall of the building adjacent to the storage area.

CHAPTER N70 REFERENCED STANDARDS

SECTION N7001 REFERENCED STANDARDS

These standards are referenced in various sections of this appendix and are not provided in Chapter 35 of this code. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.7 of this code.

ASTM ASTM International
100 Barr Harbor Drive
West Conshohocken, PA 19428-2959

Standard reference number	Title	Referenced in code section number
D92—05a	Test Method for Flash and Fire Points by Cleveland Open Cup	N2401.2, N5701.2
E1529—06	Test Method for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies	N5704.2.9.1

CGA Compressed Gas Association
4221 Walney Road,
16th Floor
Arlington, VA 20151-2923

Standard reference number	Title	Referenced in code section number
G-13—(2006)	Storage and Handling of Silane and Silane Mixtures (an American National Standard)	N6404.1
ANSI/P-18—(2006)	Standard for Bulk Inert Gas Systems at Consumer Sites (an American National Standard)	N5501.1
S-1.1—(2005)	Relief Device Standards—Part 1—Cylinders for Compressed Gases	N5503.2
S-1.2—(2005)	Pressure Relief Device Standards—Part 2—Cargo and Portable Tanks for Compressed Gases	N5503.2
S-1.3—(2005)	Pressure Relief Device Standards—Part 3—Stationary Storage Containers for Compressed Gases	N5503.2

CPSC Consumer Product Safety Commission
4330 East West Highway
Bethesda, MD 20814

Standard reference number	Title	Referenced in code section number
16 CFR Part 1500.41—2009	Method for Testing Primary Irritant Substances	202
16 CFR Part 1500.42—2009	Test for Eye Irritants	202

DOTy U.S. Department of Treasury
c/o Superintendent of Documents
U.S. Government Printing Office
Washington, DC 20402-9325

Standard reference number	Title	Referenced in code section number
27 CFR Part 55—1998	Commerce in Explosives, as amended through April 1, 1998	N202

NFPA National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

Standard reference number	Title	Referenced in code section number
15—12	Water Spray Fixed Systems for Fire Protection	N5704.2.9.1
30B—11	Manufacture and Storage of Aerosol Products	N5101.1, N5103.1, N5104.1, Table N5104.3.1, Table N5104.3.2, Table N5104.3.2.2, N5104.4.1, N5104.5.2, N5104.6, N5106.3.1, N5106.5, N5106.5.3, N5107.1
33—11	Spray Application Using Flammable or Combustible Materials	N2404.3.2
34—11	Dipping and Coating Processes Using Flammable or Combustible Liquids	N2405.3, N2405.4.1.1
35—11	Manufacture of Organic Coatings	N2905.4
52—13	Vehicular Fuel System Code	N5301.1
55—13	Standard for the Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationery Containers	N5501.1, N5801.1, N6301.1
69—08	Explosion Prevention Systems	N901.1, N901.3, Table N2204.1
86—11	Ovens and Furnaces	N3001.1
140—13	Motion Picture and Television Production Studio Soundstages and Approved Production Facilities	N302.2
318—12	Standard for the Protection of Semiconductor Fabrication Facilities	N2703.16
400—13	Storage of Hazardous Material	N6304.1.4
495—13	Explosive Materials Code	N202, N901.2, N901.4, N5605.2

UL Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, IL 60062

Standard reference number	Title	Referenced in code section number
30—95	Metal Safety Cans—with Revisions through July 2009	N5003.9.4
900—04	Air Filter Units—with revisions through November 2009	N2404.7.8
1275—05	Flammable Liquid Storage Cabinets—with Revisions through May 2006	N5003.8.7.1
1313—93	Standard for Nonmetallic Safety Cans for Petroleum Products—with Revisions through August 2007	N5003.9.10
2075—04	Standard for Gas and Vapor Detectors and Sensors—with Revisions through September 2007	N6004.2.2.10.1
2085—97	Protected Above-ground Tanks for Flammable and Combustible Liquids—with Revisions through December 1999	N202, N5704.2.9.1
2245—06	Below-grade Vaults for Flammable Liquid Storage Tanks	N5704.2.8.1
2335—01	Fire Tests of Storage Pallets—with Revisions through March 2010	N3208.2.1
2360—00	Test Methods for Determining the Combustibility Characteristics of Plastics Used in Semi-Conductor Tool Construction—with Revisions through June, 2008	N2703.10.1.2