505

NFPA 505 Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation 1996 Edition

National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101
An International Codes and Standards Organization

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Policy Adopted by NFPA Board of Directors on December 3, 1982

The Board of Directors reaffirms that the National Fire Protection Association recognizes that the toxicity of the products of combustion is an important factor in the loss of life from fire. NFPA has dealt with that subject in its technical committee documents for many years.

There is a concern that the growing use of synthetic materials may produce more or additional toxic products of combustion in a fire environment. The Board has, therefore, asked all NFPA technical committees to review the documents for which they are responsible to be sure that the documents respond to this current concern. To assist the committees in meeting this request, the Board has appointed an advisory committee to provide specific guidance to the technical committees on questions relating to assessing the hazards of the products of combustion.

Statement on NFPA Procedures

This material has been developed under the published procedures of the National Fire Protection Association, which are designed to assure the appointment of technically competent Committees having balanced representation. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accept any liability resulting from compliance or noncompliance with the provisions given herein, for any restrictions imposed on materials or processes, or for the completeness of the text.

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Errata

NFPA 505

Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation

1996 Edition

Reference: Table 1-6
Errata No.: 505-96-1

The Committee on Industrial Trucks notes the following error in the 1996 edition of NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation.*

1. In Table 1-6, add the symbol K under columns DS and ES for Division 2, Groups B and C. Add the symbol J under the same columns for Division 2, Group D. The corrected Table 1-6 reads as follows:

Table 1-6 Summary Table on Use of Powered Industrial Trucks as Described in Chapter 1

Locations	CNG-Powered		Diesel-Powered				Electrically-Powered				Gasoline-Powered		LP-Gas-Powered		Dual-Fuel-Powered				Text Reference
	CN	CNS	D	DS	DY	DX	E	ES	EE	EX	G	GS	LP	LPS	G/CN	GS/CNS	G/LP	GS/LPS	
Class I Division 1																			
Group A																			1-6.1
Group B																			1-6.1
Group C																			1-6.1
Group D						A				A									1-6.2
Class 1 Division 2																			
Group A					K	K			K	K									1-6.10
Group B		K		K	K	K		K	K	K		K		K		K		K	1-6.10
Group C		K		K	K	K		K	K	K		K		K		K		K	1-6.10
Group D		J		J	A	A		J	A	A		J		J		J		J	1-6.3
Class II Division 1																			
Group E						J				J									1-6.4
Group F						A†				A†									1-6.5
Group G						A				A									1-6.6
Class II Division 2																			
Group F[1]		J		J	A	A		J	A	A		J		J		J		J	1-6.7
Group G		J		J	A	A		J	A	A		J		J		J		J	1-6.7
Class III Division 1		J		J	A	A		J	A	A		J		J		J		J	1-6.8
Class III Division 2		A		A	A	A	J	A	A	A		A		A		A		A	1-6.9

Key to Table Symbols

A = Type truck authorized for location described.

J = Type truck authorized for location described with approval of the authority having jurisdiction.

† = Where dust has resistivity of 10^5 ohm-cm, use J.

[1] = Where dust has resistivity of 10^5 ohm-cm or greater.

K = Type truck authorized to be determined by the authority having jurisdiction.

Type truck not authorized in location described.

Issue Date: April 2, 1998

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Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation

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This edition of NFPA 505, *Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation,* was prepared by the Technical Committee on Industrial Trucks and acted on by the National Fire Protection Association, Inc., at its Annual Meeting held May 20–23, 1996, in Boston, MA. It was issued by the Standards Council on July 18, 1996, with an effective date of August 9, 1996, and supersedes all previous editions.

Changes other than editorial are indicated by a vertical rule in the margin of the pages on which they appear. These lines are included as an aid to the user in identifying changes from the previous edition.

This edition of NFPA 505 was approved as an American National Standard on July 26, 1996.

Origin and Development of NFPA 505

Chapter 1 (formerly Part A) of this standard was originally designated as NFPA 505A and was first adopted by the Association in 1951. Chapters 4 and 5 (formerly Parts A and B), "Maintenance of Industrial Trucks" and "Operation of Industrial Trucks," were originally adopted in 1952 and published by the NFPA under the designation NFPA No. 505B, C, *Standards for the Maintenance and Safe Operation of Industrial Trucks.* The combining of the three texts into one document, NFPA 505, was accomplished in 1955. Revisions were made in 1955, 1957, 1963, 1965, 1966, 1967, 1968, 1969, 1971, 1972, 1973, 1975, 1978, 1982, and 1987. The 1971 edition was the first edition to be approved by ANSI.

In the 1992 edition, Group F was added to the list of classified locations to correlate with the *National Electrical Code®*.

In the 1996 edition, changes were made to the types of trucks listed for operation in Class I, Division 2, locations, and a new DX type designation was added. Also, a new section on compressed natural gas (CNG) was added and related changes to the chapters on dual-fuel trucks and converted trucks were made.

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This list represents the membership at the time the Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred.

NOTE: Membership on a Committee shall not in and of itself constitute an endorsement of the Association or any document developed by the Committee on which the member serves.

Committee Scope: This Committee shall have primary responsibility for documents on the safe use, maintenance, and operation of industrial trucks and other material-handling equipment to minimize fire hazards.

Contents

Chapter 1 Type Designations and Areas of Use **505– 4**
1-1 Scope **505– 4**
1-2 General **505– 4**
1-3 Equivalency **505– 4**
1-4 Definitions **505– 4**
1-5 Hazard Classification **505– 5**
1-6 Specific Areas of Use **505– 5**

Chapter 2 Dual-Fuel Trucks **505– 9**
2-1 General **505– 9**
2-2 Requirements **505– 9**
2-3 Nameplate Visibility **505–10**

Chapter 3 Converted Trucks **505–10**
3-1 Conversion of Trucks **505–10**
3-2 Conversion Requirements **505–10**

Chapter 4 Maintenance of Industrial Trucks . . . **505–10**
4-1 General **505–10**
4-2 Precautions **505–10**
4-3 Replacement Parts **505–10**
4-4 Mufflers **505–10**
4-5 Operating Temperature **505–11**
4-6 Fire Prevention **505–11**
4-7 Antifreeze **505–11**
4-8 Nameplate Visibility **505–11**

Chapter 5 Fuel Recharging, Marking, and Operation of Industrial Trucks **505–11**
5-1 Fuel Handling and Storage **505–11**
5-2 Dual Fuel **505–12**
5-3 Changing and Charging Storage Batteries **505–12**
5-4 Use of Trucks in Classified Areas **505–13**
5-5 Safe Operating Rules **505–13**
5-6 Operating Procedures and Training **505–13**

Chapter 6 Referenced Publications **505–14**

Appendix A Explanatory Material **505–15**

Appendix B Referenced Publications **505–16**

Index **505–16**

NFPA 505

Fire Safety Standard for

Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation

1996 Edition

NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates explanatory material on that paragraph in Appendix A.

Information on referenced publications can be found in Chapter 6 and Appendix B.

Chapter 1 Type Designations and Areas of Use

1-1 Scope. This standard shall apply to fork trucks, tractors, platform lift trucks, motorized hand trucks, and other specialized industrial trucks powered by electric motors or internal combustion engines. This standard shall not apply to compressed air-operated or nonflammable compressed gas-operated industrial trucks, farm vehicles, or automotive vehicles for highway use.

1-2 General.

1-2.1 The design and installation of the compressed natural gas (CNG) fuel systems on CNG- and dual-fuel- (gasoline and CNG) powered industrial trucks shall be in accordance with the applicable provisions of NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems.*

1-2.2 The design and installation of the LP-Gas fuel systems on LP-Gas- and dual-fuel- (gasoline and LP-Gas) powered industrial trucks shall be in accordance with the applicable provisions of NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases.*

1-2.3 Approved powered industrial trucks, as referred to in this standard, are those trucks listed by a testing laboratory for the use intended. Trucks shall be tested and labeled in accordance with UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered,* or UL 583, *Standard for Safety Electric-Battery-Powered Industrial Trucks.*

1-3 Equivalency. Nothing in this standard is intended to prevent the use of new methods or devices, provided that sufficient technical data is submitted to the authority having jurisdiction to demonstrate that the proposed method or device is equivalent in quality, strength, fire endurance, effectiveness, durability, and safety to those prescribed by this standard.

1-4* Definitions.

Approved.* Acceptable to the authority having jurisdiction.

Authority Having Jurisdiction.* The organization, office, or individual responsible for approving equipment, an installation, or a procedure.

Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

Listed.* Equipment, materials, or services included in a list published by an organization acceptable to the authority having jurisdiction and concerned with evaluation of products or services that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services and whose listing states either that the equipment, material, or service meets identified standards or has been tested and found suitable for a specified purpose.

Shall. Indicates a mandatory requirement.

Should. Indicates a recommendation or that which is advised but not required.

Type Designation.* A system for identifying types of powered industrial trucks for operation in nonclassified and classified areas. [*See (a) through (r), which follow.*]

(a) *Type CN* units are compressed natural gas-powered units having minimum acceptable safeguards against inherent fire hazards.

(b) *Type CNS* units are compressed natural gas-powered units that, in addition to meeting the requirements for Type CN units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

(c) *Type D* units are diesel-powered units having minimum acceptable safeguards against inherent fire hazards.

(d) *Type DS* units are diesel-powered units that, in addition to meeting all the requirements for Type D units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

(e) *Type DY* units are diesel-powered units having all the safeguards of Type DS units and, in addition, any electrical equipment is completely enclosed. They are equipped with temperature limitation features.

(f) *Type DX* units are diesel-powered units that differ from Type DS and DY units in that the diesel engine and the electrical fittings and equipment are so designed, constructed, and assembled that the units can be used in atmospheres containing specifically named flammable vapors, dusts, and, under certain conditions, fibers. Type DX units are specifically tested and classified for use in Class I, Group D locations or for Class II, Group F or G locations as defined in NFPA 70, *National Electrical Code®.*

(g) *Type E* units are electrically powered units having minimum acceptable safeguards against inherent fire and electrical shock hazards.

(h) *Type ES* units are electrically powered units that, in addition to meeting all the requirements for Type E units, are provided with additional safeguards to the electrical system to prevent the emission of hazardous sparks and to limit surface temperatures.

(i) *Type EE* units are electrically powered units that, in addition to meeting all the requirements for Types E and ES units, have their electric motors and all other electrical equipment completely enclosed.

(j) *Type EX* units are electrically powered units that differ from a Type E, ES, or EE unit in that the electrical fittings and equipment are so designed, constructed, and assembled that the units can be used in atmospheres containing specifically named flammable vapors, dusts, and, under certain

conditions, fibers. Type EX units are specifically tested and classified for use in Class I, Group D locations or for Class II, Group F or G locations as defined in NFPA 70, *National Electrical Code*.

(k) *Type G* units are gasoline-powered units having minimum acceptable safeguards against inherent fire hazards.

(l) *Type GS* units are gasoline-powered units that, in addition to meeting all the requirements for Type G units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

(m) *Type LP* units are liquefied petroleum gas-powered units having minimum acceptable safeguards against inherent fire hazards.

(n) *Type LPS* units are liquefied petroleum gas-powered units that, in addition to meeting the requirements for Type LP units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

(o) *Type G/CN* units operate on either gasoline or compressed natural gas having minimum acceptable safeguards against inherent fire hazards.

(p) *Type GS/CNS* units operate on either gasoline or compressed natural gas and, in addition to meeting all the requirements for Type G/CN units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

(q) *Type G/LP* units operate on either gasoline or liquefied petroleum gas having minimum acceptable safeguards against inherent fire hazards.

(r) *Type GS/LPS* units operate on either gasoline or liquefied petroleum gas and, in addition to meeting all the requirements for the Type G/LP units, are provided with additional safeguards to the exhaust, fuel, and electrical systems.

1-5 Hazard Classification.

1-5.1 The authority having jurisdiction shall determine the hazard classification of any specific location. The location shall have been classified prior to the consideration of the use of industrial trucks therein, and the type of industrial truck required shall be as provided in Section 1-6 for that location.

1-5.2 Several areas of any single plant or building could have different hazard classifications. The authority having jurisdiction shall limit the use of industrial trucks in classified areas in a plant or building in accordance with the hazard classification of such areas. The responsibility for the enforcement of restricted use in such areas shall be that of the management.

1-5.3 The industrial trucks specified in Section 1-6 are the minimum types required. Industrial trucks having greater safeguards shall be permitted to be used.

1-6 Specific Areas of Use. Table 1-6 provides a summary of industrial truck types for specific areas of use and was developed from information contained in this section.

The references to class/group/division contained in parentheses in the subsection headings of this section correspond to classifications in accordance with NFPA 70, *National Electrical Code*, and are provided for the convenience of the user.

Table 1-6 Summary Table on Use of Powered Industrial Trucks as Described in Chapter 1

Locations	CNG-Powered		Diesel-Powered				Electrically-Powered				Gasoline-Powered		LP-Gas-Powered		Dual-Fuel-Powered				Text Reference
	CN	CNS	D	DS	DY	DX	E	ES	EE	EX	G	GS	LP	LPS	G/CN	GS/CNS	G/LP	GS/LPS	
Class I Division 1																			
Group A																			1-6.1
Group B																			1-6.1
Group C																			1-6.1
Group D						A				A									1-6.2
Class I Division 2																			
Group A					K	K			K	K									1-6.10
Group B		K			K	K			K	K		K		K		K		K	1-6.10
Group C		K			K	K			K	K		K		K		K		K	1-6.10
Group D		J			A	A			A	A		J		J		J		J	1-6.3
Class II Division 1																			
Group E						J				J									1-6.4
Group F						A†				A†									1-6.5
Group G						A				A									1-6.6
Class II Division 2																			
Group F[1]		J		J	A	A		J	A	A		J		J		J		J	1-6.7
Group G		J		J	A	A		J	A	A		J		J		J		J	1-6.7
Class III Division 1		J		J	A	A		J	A	A		J		J		J		J	1-6.8
Class III Division 2		A		A	A	A	J	A	A	A		A		A		A		A	1-6.9

Key to Table Symbols
A = Type truck authorized for location described.
J = Type truck authorized for location described with approval of the authority having jurisdiction.
† = Where dust has resistivity of 10^5 ohm-cm, use J.
[1] = Where dust has resistivity of 10^5 ohm-cm or greater.
K = Type truck authorized to be determined by the authority having jurisdiction.
Type truck not authorized in location described.

1-6.1* Areas Containing Certain Flammable Gases or Vapors Where Power-Operated Industrial Trucks Shall Not Be Used (Class I, Groups A, B, and C, Division 1). Power-operated industrial trucks shall not be used in these locations.

For examples of those chemicals for which mixtures of their vapors in air are classified as Class I, Group A, B, or C, see Section 500-3 of NFPA 70, *National Electrical Code*, and A-1-6.1 of this standard.

1-6.2 Areas Where Vapors of Flammable Liquids and Some Gases Exist under Normal Operating Conditions (Class I, Group D, Division 1).

1-6.2.1* Approved power-operated industrial trucks designated as Type DX or EX and classified for Class I, Group D chemicals shall be used in such locations containing gases or vapors.

1-6.2.2 Class I, Group D, Division 1 areas include locations where volatile flammable liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity of spraying and painting operations where volatile flammable solvents are used; locations containing open tanks or vats of volatile flammable liquids; drying rooms or compartments for the evaporation of flammable solvents; locations containing fat and oil extraction apparatus using volatile flammable solvents; portions of cleaning and dyeing plants where hazardous liquids are used; gas generator rooms and other portions of gas manufacturing plants where flammable gas could escape; inadequately ventilated pump rooms for flammable gas or for volatile flammable liquids; the interiors of refrigerators and freezers in which volatile flammable materials are stored in open, lightly stoppered, or easily ruptured containers; and all other locations where hazardous concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

1-6.3 Areas Where Volatile Flammable Liquids and Their Vapors or Flammable Gases Are Normally Confined (Class I, Group D, Division 2).

1-6.3.1 Approved power-operated industrial trucks designated as Type DX, DY, EE, or EX (classified for Class I, Group D locations) shall be used in locations where volatile flammable liquids or flammable gases are handled, processed, or used, but in which these liquids, vapors, or gases normally are confined within closed containers or closed systems from which they can escape only in the event of accidental rupture or breakdown of such containers or systems, or in the event of abnormal operation of equipment; in locations in which ignitible concentrations of gases or vapors are normally prevented by positive mechanical ventilation but that might become hazardous through failure or abnormal operation of the ventilating equipment; or in locations adjacent to Class I, Division 1 locations and to which ignitible concentrations of gases or vapors might occasionally be communicated, unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided.

1-6.3.2 Class I, Group D, Division 2 areas include locations where volatile flammable liquids or flammable gases or vapors are used, but that, in the judgment of the authority having jurisdiction, would become hazardous only in the event of an accident or some unusual operating condition. The quantity of flammable material that might escape during an accident, the adequacy of ventilating equipment, the total area involved, and the record of the industry or business with respect to explosions or fires are all factors that should receive consideration in determining whether or not a particular type of truck possesses sufficient safeguards for the location.

1-6.4 Areas Containing Combustible Metal Dusts and Other Combustible Dusts Having Resistivity of Less than 10^2 ohm-cm (Class II, Groups E and F, Division 1).

1-6.4.1 Power-operated industrial trucks shall not be used in locations containing hazardous concentrations of metal dust, including aluminum and magnesium and their commercial alloys or other dusts of similarly hazardous characteristics having resistivity of less than 10^2 ohm-cm.

Exception: Approved power-operated industrial trucks designated as Type DX or EX shall be permitted to be used in such locations, subject to special investigation of both the truck and the specific area of use by the authority having jurisdiction.

1-6.4.2 In atmospheres where the dust of magnesium, aluminum, or aluminum bronze might be present, truck fuses, switches, motor controllers, and circuit breakers shall have enclosures specifically approved for such locations.

1-6.5 Areas Containing Combustible Dusts in Suspension Having Resistivity of 10^2 ohm-cm or Greater and Less than 10^8 ohm-cm (Class II, Group F, Division 1).

1-6.5.1 Power-operated industrial trucks shall not be used in locations containing hazardous concentrations of electrically conductive Group F dusts having a resistivity less than 10^5 ohm-cm.

Exception: Approved power-operated industrial trucks designated as Type DX or EX shall be permitted to be used in such locations, subject to special investigation of both the truck and the specific area of use by the authority having jurisdiction.

1-6.5.2 Approved power-operated industrial trucks designated as Type DX or EX (classified for Class II, Group F locations) shall be used in locations in which electrically nonconductive Group F dust having a resistivity of 10^5 ohm-cm or greater but less than 10^8 ohm-cm is or could be in suspension under normal operating conditions in quantities sufficient to produce explosive or ignitible mixtures or where mechanical failure or abnormal operation of machinery or equipment might cause such mixtures to be produced.

1-6.5.3* Class II, Group F, Division 1 areas include locations containing carbon black, charcoal, coal, and coke dusts that have more than 8 percent total volatile material (coal and coke dust in accordance with ASTM D 3175, *Standard Test Method for Volatile Matter in the Analysis Sample of Coal and Coke*) or atmospheres containing those dusts sensitized by other materials so that they present an explosion hazard.

1-6.6 Areas Containing Combustible Dusts in Suspension Having Resistivity of 10^8 ohm-cm or Greater (Class II, Group G, Division 1).

1-6.6.1 Approved power-operated industrial trucks designated as Type DX or EX (classified for Class II, Group G locations) shall be used in locations in which combustible dust having resistivity of 10^8 ohm-cm or greater is or could be in suspension under normal operating conditions in

quantities sufficient to produce explosive or ignitible mixtures, or where mechanical failure or abnormal operation of machinery or equipment might cause such mixtures to be produced.

1-6.6.2 Class II, Group G, Division 1 areas include locations such as the working areas of grain-handling and storage plants; rooms containing grinders or pulverizers, cleaners, graders, scalpers, open conveyors or spouts, open bins or hoppers, mixers or blenders, automatic or hopper scales, packing machinery, elevator heads and boots, stock distributors, and dust and stock collectors (except all-metal collectors vented to the outside); and all similar dust-producing machinery and equipment in grain-processing plants, starch plants, sugar-pulverizing plants, malting plants, wood flour plants, hay-grinding plants, and other occupancies of similar nature where combustible dust having resistivity of 10^8 ohm-cm or greater might, under normal operating conditions, be present in the air in quantities sufficient to produce explosive or ignitible mixtures.

1-6.7 Areas Where Combustible Dusts Having Resistivity of 10^5 ohm-cm or Greater are Present but Not Normally in Suspension in the Atmosphere (Class II, Groups F and G, Division 2).

1-6.7.1 Approved power-operated industrial trucks designated as Type DX, DY, EE, or EX (classified for Class II, Group F or G locations, as appropriate) shall be used in locations in which combustible dust having resistivity of 10^5 ohm-cm or greater is not normally in suspension in the air or is not likely to be thrown into suspension by the normal operation of equipment or apparatus in quantities sufficient to produce explosive or ignitible mixtures but where deposits or accumulations of such dust might be ignited by arcs or sparks originating in the truck.

1-6.7.2 In locations where dangerous concentrations of suspended dust having resistivity of 10^5 ohm-cm or greater would not be likely, approved power-operated industrial trucks designated as Type CNS, DS, ES, GS, LPS, GS/CNS, or GS/LPS shall be permitted to be used if approved for such location by the authority having jurisdiction. These locations include rooms and areas containing only closed spouting and conveyors, closed bins or hoppers, or machines and equipment from which appreciable quantities of dust could escape only under abnormal operating conditions; rooms or areas into which explosive or ignitible concentrations of suspended dust might be communicated only under abnormal operating conditions; rooms or areas where the formation of explosive or ignitible concentrations of suspended dust is prevented by the operation of effective dust control equipment; warehouses and shipping rooms where dust-producing materials are stored or handled only in bags or containers; and other similar locations.

1-6.8 Areas Where Easily Ignitible Fibers or Materials Producing Combustible Flyings Are Handled, Manufactured, or Used (Class III, Division 1).

1-6.8.1* Approved power-operated industrial trucks designated as Type DX, DY, EE, or EX shall be used in locations that are classified because of the presence of easily ignitible fibers or materials producing combustible flyings but in which such fibers or flyings are not likely to be in suspension in the air in quantities sufficient to produce ignitible mixtures.

1-6.8.2 Locations where easily ignitible fibers or flyings are found usually include some portions of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cottonseed mills; flax-processing plants; clothing-manufacturing plants; woodworking plants (except wood flour plants); and establishments and industries involving similar processes or conditions.

A wood flour plant shall be considered to be a Class II, Group G, Division 1 location as defined in 1-6.6.2.

Easily ignitible fibers and flyings include rayon, cotton (including cotton linters and cotton waste), sisal or henequen, istle, jute, hemp, tow, cocoa fiber, oakum, baled waste kapok, Spanish moss, excelsior, sawdust, wood chips, and other materials of similar nature.

1-6.9 Areas Where Easily Ignitible Fibers Are Stored or Handled (Class III, Division 2).

Exception: In process of manufacture.

1-6.9.1 Approved power-operated industrial trucks designated as Type CNS, DS, DX, DY, ES, EE, EX, GS, LPS, GS/CNS, or GS/LPS shall be used in locations where easily ignitible fibers are stored or handled, including outside storage, but are not being processed or manufactured. Industrial trucks designated as Type E that have been used previously in these locations shall be permitted to be continued in use with the approval of the authority having jurisdiction.

1-6.10 Hazardous Areas Not Otherwise Classified. The authority having jurisdiction shall determine which types of approved power-operated industrial trucks, if any, shall be used following an engineering survey of the property and an evaluation of the fire and explosion hazards.

1-6.11 Piers and Wharves.

1-6.11.1 Where it is determined that the location on piers and wharves for handling general cargo is not hazardous, any approved power-operated industrial truck designated as Type CN, D, E, G, LP, G/CN, or G/LP shall be permitted to be used, or trucks that conform to the requirements for these types shall be permitted to be used.

1-6.11.2 Where an area of a pier or wharf is determined to be hazardous, only approved power-operated industrial trucks specified for such locations in the preceding subsections shall be permitted to be used.

1-6.12 General Inside and Outside Storage.

1-6.12.1 Where it is determined that the location for general storage in warehouses or general outside storage is not hazardous, any approved power-operated industrial truck designated as Type CN, D, E, G, LP, G/CN, or G/LP shall be permitted to be used, or trucks that conform to the requirements for these types shall be permitted to be used.

1-6.12.2 Where the location for general storage in warehouses or general outside storage is determined to be hazardous, only approved power-operated industrial trucks specified for such a location in the preceding subsections shall be permitted to be used.

1-6.13 General Industrial or Commercial Properties.

1-6.13.1 Where it is determined that the location on a general industrial or commercial property for handling or processing materials (with storage being incidental to handling and processing), or both, is not hazardous, any approved

power-operated industrial truck designated as Type CN, D, E, G, LP, G/CN, or G/LP shall be permitted to be used, or trucks that conform to the requirements for these types shall be permitted to be used.

1-6.13.2 Where the location on a general industrial or commercial property for handling or processing materials, or both, is determined to be hazardous, only approved power-operated industrial trucks specified for such a location in the preceding subsections shall be permitted to be used.

1-6.14 Converted Industrial Trucks.

1-6.14.1 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G for the use of gasoline for fuel, where converted to the use of liquefied petroleum gas fuel in accordance with Chapter 3, shall be permitted to be used in those locations where a Type G or LP truck has been specified in the preceding subsections.

1-6.14.2 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G for the use of gasoline for fuel, where converted to the use of dual fuels (gasoline and LPG) in accordance with Chapter 3, shall be permitted to be used in those locations where a Type G or LP truck has been specified in the preceding subsections.

1-6.14.3 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type LP for the use of liquefied petroleum gas for fuel, where converted to the use of dual fuels (gasoline and LPG) in accordance with Chapter 3, shall be permitted to be used in those locations where a Type G or LP truck has been specified in the preceding subsections.

1-6.14.4 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type LP for the use of liquefied petroleum gas for fuel, where converted to the use of gasoline for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where Type G trucks have been specified in the preceding subsections.

1-6.14.5 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G/LP for the use of dual fuels, where converted to the sole use of gasoline for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where Type G trucks have been specified in the preceding subsections.

1-6.14.6 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G/LP for the use of dual fuels, where converted to the sole use of liquefied petroleum gas for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where Type LP trucks have been specified in the preceding subsections.

1-6.14.7 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G for the use of gasoline for fuel, where converted to the use of compressed natural gas fuel in accordance with Chapter 3, shall be permitted to be used in those locations where a Type G or CN truck has been specified in the preceding subsections.

1-6.14.8 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G for the use of gasoline for fuel, where converted to the use of dual fuels (gasoline and CNG) in accordance with Chapter 3, shall be permitted to be used in those locations where a Type G or CN truck has been specified in the preceding subsections.

1-6.14.9 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type CN for the use of compressed natural gas for fuel, where converted to the use of gasoline for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where a Type G or CN truck has been specified in the preceding subsections.

1-6.14.10 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type CN for the use of compressed natural gas for fuel, where converted to the use of gasoline for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where Type G trucks have been specified in the preceding subsections.

1-6.14.11 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G/CN for the use of dual fuels, where converted to the sole use of gasoline for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where Type G trucks have been specified in the preceding subsections.

1-6.14.12 Power-operated industrial trucks that previously have been approved for or that conform to the requirements for Type G/CN for the use of dual fuels, where converted to the sole use of compressed natural gas for fuel in accordance with Chapter 3, shall be permitted to be used in those locations where Type CN trucks have been specified in the preceding subsections.

1-6.14.13 Power-operated industrial trucks previously designated Type CNS, GS, LPS, GS/CNS, or GS/LPS shall not be converted to the use of other fuels.

1-6.14.14 Power-operated industrial trucks previously approved for or that conform to the requirements for Type CN, G, LP, G/CN, or G/LP shall not be converted to Type CNS, GS, LPS, GS/CNS, or GS/LPS.

Chapter 2 Dual-Fuel Trucks

2-1 General. A dual-fuel truck shall be defined as a truck equipped to be operated on either gasoline or LPG or to be operated on either gasoline or CNG without further modification.

2-2 Requirements.

2-2.1 Those parts of the fuel system that come into contact with gasoline shall meet the requirements for liquid fuel in accordance with UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered.*

2-2.2 Those parts of the fuel system that come into contact with CNG fuel shall meet the requirements for CNG fuel in accordance with NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems.*

2-2.3 Those parts of the fuel system that come into contact with LPG fuel shall meet the requirements for LPG fuel in accordance with UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered.*

2-2.4 Those parts of the fuel system that come into contact with both gasoline and LPG fuel or with both gasoline and CNG fuel shall be compatible with both fuels.

2-2.5* Fuel Changeover. Where switching from CNG or LPG to liquid fuel, care shall be taken to ensure that there is no spillage of liquid fuel.

2-3 Nameplate Visibility. The truck type designation (*see definitions in Section 1-4*) as shown on the nameplate and the type marker (*see 5-4.2*) shall not be covered over with paint so that their information is obscured.

Chapter 3 Converted Trucks

3-1* Conversion of Trucks. Industrial trucks previously approved and classified by type designation (*see 1-6.14*) shall be permitted to be converted to another type, provided that the conversion results in a truck that embodies the features specified for the particular fuel to be used in accordance with Table 3-1.

Table 3-1 Permissible Truck Fuel Conversions

Original Approval and Classification	New Approval and Classification
Gasoline	LP-Gas
Gasoline or LP-Gas	Dual fuels
LP-Gas or Dual fuels	Gasoline
Dual fuels	LP-Gas
Gasoline	CNG
G/CNG	Dual fuels
CNG or Dual fuels	Gasoline
Dual fuels	CNG
LP-Gas	CNG
CNG	LP-Gas

3-2 Conversion Requirements.

3-2.1 A truck designated as Type G, LP, or G/LP that is converted to another of these designations shall conform to the requirements for the new designation selected in accordance with UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered.*

3-2.2 Conversion kits for use on trucks designated as Type G, LP, or G/LP shall conform to the requirements for the type designation selected in accordance with UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered,* and can be approved by a testing laboratory.

3-2.3 Conversion kits for use on trucks designated as Type CN, G, LP, G/CN, or G/LP shall include the items specified in 3-2.4. The installation of the kit shall be in accordance with 3-2.4. Where a listed conversion kit is used, a copy of the report shall be supplied to the authority having jurisdiction upon request.

3-2.4 Kits for conversion of CN, G, LP, G/CN, and G/LP trucks shall include:

(a) Step-by-step installation instructions with pictorial illustration (if necessary) for clarity.

(b) All parts required to complete the installation, including:

1. Functional components;
2. Mounting brackets and hardware;
3. Connecting wires, hoses, and fittings; and
4. Sealants, if required.

(c) A durable, corrosion-resistant plate, indicating the converted type designation of the truck, for permanent mounting adjacent to the manufacturer's name plate on the truck.

(d) A metal nameplate attached to the LPG-tank mounting identifying the fuel container assembly to be used where the conversion is to LPG and a removable fuel tank is to be used.

(e) A gasoline fuel tank, along with necessary mounting and connection hardware and installation instructions, where the conversion is from CNG or LPG to gasoline or dual fuels.

(f) Instructions for removal or deactivation of the present components, including the gasoline tank(s), where the conversion is from gasoline or dual fuels to CNG or LPG.

(g) A tank or tanks, as appropriate, along with the necessary mounting and connection hardware and installation instructions where the conversion is from LPG to CNG or dual fuels, or where from gasoline to CNG or dual fuels and the truck is not equipped with a CNG or gasoline fuel tank, or both.

(h) Instructions covering checks and tests to be performed after the conversion and prior to putting the truck into service.

3-2.5 When a conversion kit is installed, all original identification of approval or listing and type designation shall be removed, and the plate specified in 3-2.4(c) shall be installed in lieu thereof.

Chapter 4 Maintenance of Industrial Trucks

4-1 General. The fire safety built into power-operated industrial trucks shall be maintained in accordance with the instructional and training material provided by the manufacturer. Any power-operated industrial truck not in safe operating condition shall be removed from service.

4-2 Precautions.

4-2.1 Repairs shall not be made in Class I, Class II, and Class III locations.

4-2.2 Repairs to the fuel and ignition systems of industrial trucks that involve fire hazards shall be conducted only in locations designated for such repairs.

4-2.3 Repairs to the electrical system of battery-powered industrial trucks shall be performed only after the battery has been disconnected.

4-3 Replacement Parts. All parts of any industrial truck, particularly trucks approved for use in classified hazardous locations, needing replacement shall be replaced only with parts providing the same degree of fire safety as those used in the original design.

4-4 Mufflers. Water mufflers shall be filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 percent of the filled capacity. Vehicles with

mufflers having screens or other parts that might become clogged shall not be operated while such screens or parts are clogged. Any vehicle that emits hazardous sparks or flames from the exhaust system shall be removed from service immediately and shall not be returned to service until the cause for the emission of such sparks and flames has been eliminated.

4-5 Operating Temperature. Where the temperature of any part of any truck is found to be in excess of its normal operating temperature and creates a hazardous condition, the vehicle shall be removed from service and shall not be returned to service until the cause for such overheating has been eliminated.

4-6 Fire Prevention. Industrial trucks shall be kept in a clean condition and reasonably free of lint, excess oil, and grease. Noncombustible agents are preferred for cleaning trucks. Flammable liquids [those having flash points below 100°F (37.8°C)] shall not be used. Combustible liquids [those having flash points at or above 100°F (37.8°C)] shall be permitted to be used. Precautions regarding toxicity, ventilation, and fire hazard shall be appropriate for the agent or solvent used.

4-7 Antifreeze. Where antifreeze is used in the engine cooling system, only glycol-based material shall be used.

4-8 Nameplate Visibility. The truck type designations (*see definitions in Section 1-4*) as shown on the nameplate and the type markers (*see 5-4.2*) shall not be covered over with paint so that their identification information is obscured.

Chapter 5 Fuel Recharging, Marking, and Operation of Industrial Trucks

5-1 Fuel Handling and Storage.

5-1.1 Liquid Fuels (e.g., Gasoline and Diesel Fuel).

5-1.1.1 The storage and handling of liquid fuels shall be in accordance with NFPA 30, *Flammable and Combustible Liquids Code*, or NFPA 30A, *Automotive and Marine Service Station Code*, as applicable.

5-1.1.2* Trucks using liquid fuels shall be refueled only at locations designated for that purpose and from approved dispensing pumps.

5-1.1.3 Engines shall be stopped and the operator shall not be on or inside the truck during refueling.

5-1.1.4 Emergency refueling shall be from approved safety cans. Safety cans shall be inspected regularly for leaks and for damage to closures; faulty cans shall be replaced.

5-1.1.5 Spillage of fuel or overfilling of the vehicle fuel tank shall be avoided.

5-1.1.6 Smoking or open flames shall be prohibited in the refueling area.

5-1.2 Liquefied Petroleum Gas Fuel.

5-1.2.1 The storage and handling of liquefied petroleum gas (LP-Gas) shall be in accordance with NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

5-1.2.2 Filling of fuel containers that are permanently mounted on trucks and filling of removable DOT-type LP-Gas containers shall be done at locations designated for that purpose and in accordance with NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*.

5-1.2.3 LP-Gas containers shall not be dropped, thrown, rolled, or dragged.

5-1.2.4 LP-Gas containers shall not be overfilled.

5-1.2.5 The engine shall be stopped and the operator shall not be on or inside the truck during refueling.

5-1.2.6 Trained and designated personnel shall refill or exchange LP-Gas containers.

5-1.2.7 A soap solution shall be used to check for leaks. A match or open flame shall not be used.

5-1.2.8 Removable LP-Gas containers shall not be exchanged near, and LP-Gas-powered vehicles shall not be parked near, sources of heat, open flames, or similar sources of ignition or near open pits, underground entrances, elevator shafts, or other similar areas.

Exception: Open pits, underground entrances, elevator shafts, or similar areas that are adequately ventilated to prevent accumulations of LP-Gas.

5-1.2.9 Trucks equipped with permanently mounted LP-Gas containers shall be refueled outdoors.

5-1.2.10* Means shall be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. This shall be accomplished by:

(a) Closing the valve on the LP-Gas container; and

(b) Using an approved automatic quick-closing coupling (a type that closes in both directions when uncoupled) in the fuel line. Where such an automatic quick-closing coupling is not used, the fuel line shall be emptied by allowing the engine to run until the fuel in the line is consumed.

5-1.2.11 Removable LP-Gas containers shall be mounted securely to prevent them from jarring loose, slipping, or rotating and shall be positioned so that the safety pressure relief valve opening is always in contact with the vapor space (top) of the container. This shall be accomplished by means of a substantial positioning pin engaging the cylinder, or an equivalent means, and a container clamp(s) that, where the container is properly installed, positions the container. A container and its fittings shall not extend beyond the platform of the industrial truck.

5-1.2.12 All reserve LP-Gas containers shall be stored and transported with the service valve closed. Safety relief valves shall have direct communication with the vapor space of the container at all times.

5-1.2.13 All LP-Gas containers shall be examined before refilling for the following defects or damage:

(a) Dents, scrapes, and gouges of the pressure vessel;

(b) Damage to the various valves and liquid level gauge;

(c) Debris in the relief valve;

(d) Damage to or loss of the relief valve cap;

(e) Indications of leakage at the valves or threaded connections; and

(f) Deterioration, damage, or loss of flexible seals in the filling or servicing connections.

Where examination reveals physical damage such as dents, scrapes, or gouges [*see 5-1.2.13(a)*] that materially

weaken the structure of the LP-Gas container and render it unsafe for use, it shall be removed from service.

Where examination reveals damages specified above other than physical damage [*see 5-1.2.13(b) through (f)*] to the container, appropriate repairs shall be made before the container is refilled.

5-1.2.14 Smoking shall be prohibited in the container refilling area for either portable or permanently mounted containers and in the exchange area during the exchange of LP-Gas containers.

5-1.2.15 The service valve of the fuel container shall be closed whenever vehicles are parked overnight or stored indoors for a protracted time.

5-1.3 Compressed Natural Gas Fuel.

5-1.3.1 The compression, storage, handling and dispensing of CNG shall be located and conducted in accordance with NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems*.

5-1.3.2 The engine shall be stopped and the operator shall not be on or inside the truck during refueling.

5-1.3.3 Smoking and open flames shall be prohibited in the refueling area.

5-1.3.4 Each fuel supply container shall be mounted in a location to minimize damage from collision. A container and its fittings shall not extend beyond the platform of the industrial truck. Containers, valves, and hoses and fittings shall be protected from physical damage using the vehicle structure, valve protectors, or suitable guards in accordance with NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems*.

5-1.3.5 The refueling receptacle on a truck shall be supported firmly and shall incorporate a means to prevent the entry of dust, water, and other foreign material. Where the means used is capable of sealing the system pressure, it shall be capable of being depressurized before removal.

5-1.3.6 A CNG cylinder shall not be charged in excess of its maximum allowable working pressure at the normal temperature for that cylinder.

5-1.3.7 The transfer of CNG into the fuel supply container of a truck shall be performed by a person who is qualified by virtue of having performed the transfer operation for at least three full cycles under supervision and who has competence in initiating emergency procedures. This person shall be responsible for verifying the working pressure and for ensuring that the container is retested according to the required schedule.

5-1.3.8 A match or open flame shall not be used to check for leaks in CNG fuel systems.

5-1.3.9 Containers.

5-1.3.9.1 Containers and their appurtenances, piping systems, compression equipment, controls, devices, and pressure relief valves shall be maintained in proper operating condition.

5-1.3.9.2 To keep pressure relief devices in reliable operating condition, care shall be take in the handling and storing of compressed natural gas containers to avoid damage. Care also shall be exercised to avoid plugging caused by paint or other dirt accumulation in pressure relief device channels or other parts that could interfere with the functioning of the device. Only qualified personnel shall be permitted to service pressure relief devices.

5-1.3.9.3 Only assemblies or original manufacturer's parts shall be used in the repair of pressure relief devices.

Exception: Assemblies or parts that have been proved by suitable testing.

5-1.3.10 CNG-powered vehicles shall not be parked near sources of heat, open flames, or similar sources of ignition.

5-1.3.11 The service valve of the fuel container shall be closed whenever vehicles are parked overnight or stored indoors for a protracted time.

5-2 Dual Fuel.

5-2.1* Where operating a dual-fuel truck on CNG or LP-Gas, the gasoline level in the liquid fuel tank shall be checked daily. The truck shall not be operated unless the gasoline fuel tank is at least 1/4 full.

5-2.2 Where operating a dual-fuel truck on CNG fuel, the provisions of 5-1.3 shall apply.

5-2.3 Where operating a dual-fuel truck on LP-Gas, the provisions of 5-1.2 shall apply.

5-2.4 Where operating a dual-fuel truck on liquid fuel, the provisions of 5-1.1 shall apply.

5-3 Changing and Charging Storage Batteries.

5-3.1 This section shall apply to batteries used on electric trucks. The two types of batteries commonly used are lead and nickel-iron. They contain corrosive chemical solutions, either acid or alkali, and, therefore, present a chemical hazard. While being charged, they give off hydrogen and oxygen, which, in certain concentrations, are explosive.

5-3.2 Battery-charging installations shall be located in areas designated for that purpose; such areas shall be kept free of extraneous combustible materials. Facilities shall be provided for the following:

(a) Flushing spilled electrolyte;

(b) Fire protection;

(c) Protecting charging apparatus from damage by trucks; and

(d) Adequate ventilation for dispersal of fumes from gassing batteries.

Where on-board chargers are used, charging shall be accomplished at locations designated for that purpose, taking into account the electrical requirements of the charger and facilities for fire protection.

Exception: Flushing facilities shall not be required if charging is accomplished without removing the battery from the vehicle.

5-3.3 Where handling acid concentrates greater than 50 percent acid (above 1.400 specific gravity), an eye-wash fountain shall be provided.

5-3.4 A conveyor, overhead hoist, or equivalent material-handling equipment shall be provided for handling batteries.

5-3.5 Chain hoists shall be equipped with load-chain containers. Where a hand hoist is used, uncovered batteries

shall be covered with a sheet of plywood or other nonconducting material to prevent the hand chain from shorting on cell connectors or terminals. A properly insulated spreader bar shall be used with any overhead hoist.

5-3.6 Reinstalled or new batteries shall meet or exceed the battery type marked on the truck. Reinstalled batteries shall be positioned properly and secured in the truck.

5-3.7 A carboy tilter or siphon shall be provided where acid in carboys is used. Where diluting concentrated sulfuric acid to make up electrolyte, the acid ALWAYS shall be added to the water — not the reverse. Battery maintenance personnel shall wear protective clothing such as eye protection, long sleeves, and gloves.

Exception: Removal and replacement of batteries shall not require the use of protective clothing.

5-3.8 Electrical installations shall be in accordance with NFPA 70, *National Electrical Code*, and any local ordinances.

5-3.9 Trained and authorized personnel shall change or charge batteries.

5-3.10 Trucks shall be positioned properly and brakes shall be applied before attempting to change or charge batteries.

5-3.11 Where charging batteries, the vent caps shall be kept in place to avoid electrolyte spray. Care shall be taken to ensure that vent caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat and gas.

5-3.12 Smoking shall be prohibited in the charging area.

5-3.13 Precautions shall be taken to prevent open flames, sparks, or electric arcs in battery-charging areas.

5-3.14 Tools and other metallic objects shall be kept away from the tops of uncovered batteries.

5-4 Use of Trucks in Classified Areas.

5-4.1 Industrial trucks shall not be used in classified areas.

Exception: Where specified in Chapter 1.

5-4.2 Markings of Types CNS, DS, DY, DX, ES, EE, EX, GS, LPS, GS/CNS, and GS/LPS Industrial Trucks and Their Areas of Use.

5-4.2.1 Proper equipment shall be used in classified areas for the safety and protection of employees and property. Approved trucks, listed by a testing laboratory for use in such areas, shall be clearly identified. To facilitate identification by operators and supervisory personnel, a uniform system of marking has been developed and is described in 5-4.2.2 and 5-4.2.3.

5-4.2.2 Durable markers indicating the designation of the type of truck for use in classified areas shall be applied to each side of the vehicle in a visible but protected location. These markers shall be distinctive in shape as shown in Figure

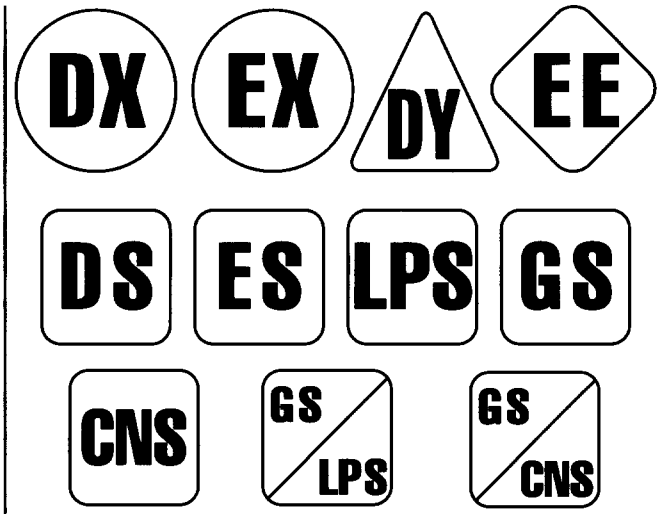

Figure 5-4.2.2. Markers used to identify type of industrial truck.

5-4.2.2. The markers for LPS, GS, DS, ES, CNS, GS/LPS, and GS/CNS shall measure 4 in. (102 mm) square markers. The width of the other markers shall be 5 in. (127 mm). The signs shall have black borders and lettering on a yellow background.

5-4.2.3 Entrances to classified areas where industrial trucks are to be used shall be posted with durable markers as shown in Figure 5-4.2.3. The minimum width of the sign shall be 11 in. (279 mm); the minimum height of the sign shall be 16 in. (406 mm). The sign shall have the word "caution" in yellow letters on a black background. The body of the sign shall have black letters on a yellow background. A marker(s) identical to that used on the side of the truck shall be installed on the sign as indicated. (*See Figure 5-4.2.2.*)

5-5 Safe Operating Rules. Powered industrial truck operation shall be in accordance with ANSI B56.1, *Safety Standard for Low Lift and High Lift Trucks.*

5-6 Operating Procedures and Training.

5-6.1 There shall be a written operating procedure plan and operator training.

5-6.2 The procedure shall include, as a minimum, (a) through (e) as follows:

(a) Operation limited to trained personnel;
(b) Cautions where checking or filling tank;
(c) Action for suspected leak;
(d) Refueling instructions;
(e) Emergency items:
  1. Shut off fuel valve;
  2. Ensure battery correct type and position.

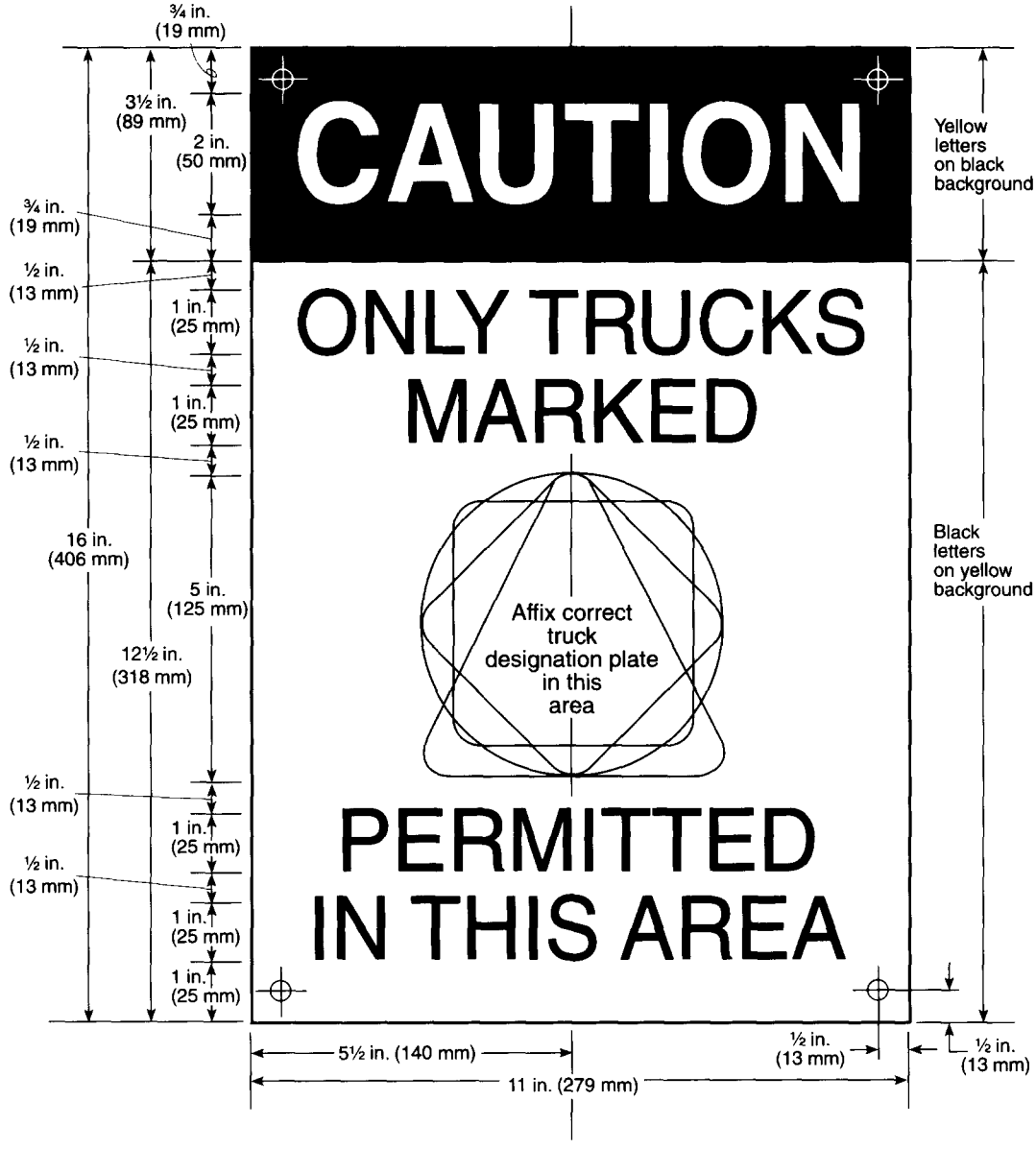

Figure 5-4.2.3. Building signs for posting at entrance to hazardous areas.

Chapter 6 Referenced Publications

6-1 The following documents or portions thereof are referenced within this standard and shall be considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

6-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 30, *Flammable and Combustible Liquids Code*, 1996 edition.

NFPA 30A, *Automotive and Marine Service Station Code*, 1996 edition.

NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems*, 1995 edition.

NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, 1995 edition.

NFPA 70, *National Electrical Code*, 1996 edition.

6-1.2 Other Publications.

6-1.2.1 ASME Publication. American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

ANSI/ASME B56.1, *Safety Standard for Low Lift and High Lift Trucks*, 1993.

6-1.2.2 ASTM Publication. American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D 3175, *Standard Test Method for Volatile Matter in the Analysis Sample of Coal and Coke*, 1989.

6-1.2.3 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered*, 1991.

UL 583, *Standard for Safety Electric-Battery-Powered Industrial Trucks*, 1991.

Appendix A Explanatory Material

This Appendix is not a part of the requirements of this NFPA document but is included for informational purposes only.

A-1-4 Approved. The National Fire Protection Association does not approve, inspect, or certify any installations, procedures, equipment, or materials; nor does it approve or evaluate testing laboratories. In determining the acceptability of installations, procedures, equipment, or materials, the authority having jurisdiction may base acceptance on compliance with NFPA or other appropriate standards. In the absence of such standards, said authority may require evidence of proper installation, procedure, or use. The authority having jurisdiction may also refer to the listings or labeling practices of an organization concerned with product evaluations that is in a position to determine compliance with appropriate standards for the current production of listed items.

A-1-4 Authority Having Jurisdiction. The phrase "authority having jurisdiction" is used in NFPA documents in a broad manner, since jurisdictions and approval agencies vary, as do their responsibilities. Where public safety is primary, the authority having jurisdiction may be a federal, state, local, or other regional department or individual such as a fire chief; fire marshal; chief of a fire prevention bureau, labor department, or health department; building official; electrical inspector; or others having statutory authority. For insurance purposes, an insurance inspection department, rating bureau, or other insurance company representative may be the authority having jurisdiction. In many circumstances, the property owner or his or her designated agent assumes the role of the authority having jurisdiction; at government installations, the commanding officer or departmental official may be the authority having jurisdiction.

A-1-4 Listed. The means for identifying listed equipment may vary for each organization concerned with product evaluation, some of which do not recognize equipment as listed unless it is also labeled. The authority having jurisdiction should utilize the system employed by the listing organization to identify a listed product.

A-1-4 Type Designation. Specific standards covering the types of industrial trucks detailed in Section 1-4 have been published by Underwriters Laboratories Inc., and are identified as UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered*, and UL 583, *Standard for Safety Electric-Battery-Powered Industrial Trucks*. UL 558 covers Types D, DS, DY, G, GS, LP, LPS, G/LP and GS/LPS; UL 583 covers Types E, EE, ES, and EX.

Standards for Types CN, CNS, G/CN, and GS/CNS trucks are not in published form; however, information is available from Underwriters Laboratories Inc. regarding their requirements for these type designations.

The Underwriters Laboratories Inc. examination of powered industrial trucks relates to fire hazards only for Types D, DS, DY, G, GS, LP, LPS, G/LP, and GS/LPS internal-combustion-engine-powered industrial trucks; to fire and explosion hazard for Type DX trucks; to fire and electrical shock hazard only for Types E, ES, and EE battery-powered industrial trucks; and to the fire, electric shock, and explosion hazard for Type EX trucks suitable either for use in Class I, Group D, or Class II, Group G, hazardous locations. Trucks that have been examined and classified as meeting the respective Underwriters Laboratories standards for the particular area of use are found in the UL *Automotive Burglary Protection Mechanical Equipment Directory*, except for Type EX trucks, which can be found in the UL *Hazardous Locations Equipment Directory*.

A-1-6.1 For examples of those chemicals for which mixtures of their vapors in air are classified as Class I, Group A, B, or C, see Section 500-3 of NFPA 70, *National Electrical Code*. The following are some examples of Class I, Groups A, B, and C chemicals:

acetaldehyde
acetylene
acrolein (inhibited)
allyl alcohol
arsine
butadiene
n-butyraldehyde
carbon monoxide
crotonaldehyde
cyclopropane
diethyl ether
diethylamine
epichlorohydrin
ethyl mercaptan
ethyl sulfide
ethylene
ethylene oxide
ethylenimine
hydrogen
hydrogen cyanide
hydrogen sulfide
manufactured gases containing more than 30% hydrogen (by volume)
morpholine
2-nitropropane
propylene oxide
propylnitrate
tetrahydrofuran
unsymmetrical dimethyl hydrazine (UDMH 1, 1-dimethyl hydrazine)

A-1-6.2.1 For examples of those chemicals for which mixtures of their vapors in air are classified as Class I, Group D, see Section 500-3 of NFPA 70, *National Electrical Code*. The following are some examples of Class I, Group D chemicals:

acetic acid (glacial)
acetone
acrylonitrile
ammonia
benzene
butane
1-butanol
2-butanol (secondary utyl alcohol)
n-butyl acetate
isobutyl acetate
sec-butyl alcohol
di-isobutylene
ethane
methane (natural gas)
methanol (methyl alcohol)
3-methyl-1-butanol (isoamyl alcohol)
methyl ethyl ketone
methyl isobutyl ketone
2-methyl-1-propanol (isobutyl alcohol)
2-methyl-2-propanol (tertiary butyl alcohol)
petroleum naphtha
pyridine
octanes
ethanol (ethyl alcohol)
ethyl acetate
ethyl acrylate
ethylene diamine (anhydrous)
ethylene dichloride
ethylene glycol monomethyl ether
gasoline
heptanes
hexanes
isoprene
isopropyl ether
mesityl oxide
pentanes
1-pentanol (amyl alcohol)
propane
1-propanol (propyl alcohol)
2-propanol (isopropyl alcohol)
propylene
styrene
toluene
vinyl acetate
vinyl chloride
xylenes

A-1-6.5.3 Most Group F dusts are electrically nonconductive and have resistivities in the range of 10^5 ohm-cm to

10^8 ohm-cm. However, some western (e.g., Wyoming) coals can have resistivities less than 10^5 ohm-cm.

A-1-6.8.1 Where these materials are either in enclosed systems or where flyings in air are minimized through use of ventilation controls, the use of Types CNS, DS, ES, GS, LPS, GS/CNS, or GS/LPS trucks may be considered.

A-2-2.5 The purpose of this requirement is to ensure the carburetor float system is functioning properly after a period of disuse.

A-3-1 Section 3-1 provides that acceptance of an industrial truck that has been converted rests entirely with the inspection authority having jurisdiction. The responsibility of determining whether or not a truck has been properly converted is placed with the authority having jurisdiction because it is impractical to ship each converted truck back to the testing laboratory to be reexamined or retested, and it is also impractical for the laboratory to send a representative into the field to examine or test every converted truck.

It is recognized that the various authorities having jurisdiction may not be expert in determining what constitutes a proper conversion. Installation directions furnished with conversion equipment, "Listed by Report," specify in detail how the conversion is to be made so that it will be in accordance with NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*. These detailed instructions supply the authority having jurisdiction with all the necessary information to determine whether or not a truck has been properly converted.

A-5-1.1.2 Safe outdoor locations are preferable to those indoors. NFPA 30, *Flammable and Combustible Liquids Code*, includes requirements for arranging indoor fueling facilities. NFPA 30A, *Automotive and Marine Service Station Code*, includes requirements for arranging outdoor fueling facilities.

A-5-1.2.10 The exchange of removable LP-Gas containers is preferably done outdoors, but may be done indoors.

A-5-2.1 The purpose in requiring that the liquid fuel tank always be filled with gasoline to at least the 1/4-full level is to provide a sufficient amount of liquid fuel to maintain a vapor saturation in the tank above the normally explosive level. The amount of fuel in the tank can be determined using the fuel gauge provided on the vehicle.

Appendix B Referenced Publications

B-1 The following documents or portions thereof are referenced within this standard for informational purposes only and thus are not considered part of the requirements of this document. The edition indicated for each reference is the current edition as of the date of the NFPA issuance of this document.

B-1.1 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.

NFPA 30, *Flammable and Combustible Liquids Code*, 1996 edition.

NFPA 30A, *Automotive and Marine Service Station Code*, 1996 edition.

NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems*, 1995 edition.

NFPA 58, *Standard for the Storage and Handling of Liquefied Petroleum Gases*, 1995 edition.

NFPA 70, *National Electrical Code*, 1996 edition.

B-1.2 Other Publications.

B-1.2.1 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062.

UL 558, *Standard for Safety Industrial Trucks, Internal Combustion Engine-Powered*, 1991.

UL 583, *Standard for Safety Electric-Battery-Powered Industrial Trucks*, 1991.

Automotive Burglary Protection Mechanical Equipment Directory, 1994.

Hazardous Locations Equipment Directory, 1995.

Index

-A-

Antifreeze 4-7
Approved (definition) 1-4, A-1-4
Areas of use, specific ..... 1-6, Table 1-6, A-1-6
Authority having jurisdiction (definition) 1-4, A-1-4

-B-

Batteries, storage, changing and charging 5-3
Buildings, classified areas in 1-5.2

-C-

Chemicals, Class I 1-6.1, 1-6.2.1, A-1-6.1, A-1-6.2.1
Class I trucks, locations for use ..... Table 1-6, 1-6.1 to 1-6.3, 4-2.1, A-1-6.1
Class II trucks, locations for use ... Table 1-6, 1-6.5 to 1-6.7, 4-2.1
Class III trucks, locations for use ..... Table 1-6, 1-6.8 to 1-6.9, 4-2.1
Classified areas ..... *see* Hazard areas
Cleaning, of trucks 4-6
Combustible dusts, areas with ..... 1-6.4 to 1-6.7, A-1-6.5.3
Combustible flyings, areas with 1-6.8, A-1-6.8.1
Combustible liquids, for cleaning 4-6
Commercial properties, general 1-6.13
Compressed natural gas (CNG) fuel 5-1.3
Compressed natural gas (CNG) trucks
Conversion ..... 1-6.14.7 to 1-6.14.14, Table 3-1, 3-2.3 to 3-2.4
Fuel systems 1-2.1
Markings 5-4.2.2
Type designations ..... 1-4(a) to (b), 1-4(o) to (p), A-1-4
Containers
Compressed natural gas (CNG) ..... 5-1.3.4 to 5-1.3.7, 5-1.3.9
LP-Gas 5-1.2, A-5-1.2.10

Conversion kits ..... 3-2.2 to 3-2.5
Converted trucks ..... 1-6.14, Chap. 3, A-3-1
Permissible conversions 3-1, A-3-1
Requirements 3-2

-D-

Definitions 1-4, A-1-4
Diesel fuel 5-1.1, 5-2.4, A-5-1.1.2
Diesel-powered units ..... 1-4(c) to (f), A-1-4
Dual fuel 5-2, A-5-2.1
Dual-fuel trucks ..... Chap. 2
Compressed natural gas (CNG) ... 1-2.1, 1-6.14.11 to 1-6.14.14, 2-2.2, 2-2.4, 5-2.1 to 5-2.2, A-5-2.1
Conversion ..... Table 3-1, 3-2
Fuel changeover 2-2.5, A-2-2.5
Gasoline ..... 1-2.1 to 1-2.2, 1-6.14.5 to 1-6.14.6, 1-6.14.11 to 1-6.14.14, 2-2.1, 2-2.4, 5-2.1, 5-2.4, A-5-2.1
LP-Gas ..... 1-2.2, 1-6.14.5 to 1-6.14.6, 1-6.14.13 to 1-6.14.14, 2-2.3 to 2-2.4, 5-2.1, 5-2.3, A-5-2.1
Markings 5-4.2.2
Nameplate visibility 2-3
Requirements 2-2
Type designations ..... 1-4(o) to (r), A-1-4
Dusts, combustible, areas with ..... 1-6.4 to 1-6.7, A-1-6.5.3

-E-

Electrical systems, repairs to 4-2.3
Electrically-powered trucks ..... 1-4(g) to (j), A-1-4
Equivalency to standard 1-3

-F-

Fibers, ignitible, areas with ..... 1-6.8 to 1-6.9, A-1-6.8.1
Fire prevention 4-6
Flammable gases, areas with ..... 1-6.1 to 1-6.3, A-1-6.1, A-1-6.2.1
Flammable liquids
Areas with ..... 1-6.2 to 1-6.3, A-1-6.2.1
For cleaning 4-6
Flammable vapors, areas with .... 1-6.1 to 1-6.3, A-1-6.1, A-1-6.2.1
Flyings, combustible, areas with 1-6.8, A-1-6.8.1
Fuel changeover, dual-fuel trucks 2-2.5, A-2-2.5
Fuel systems
Design and installation ..... 1-2.1 to 1-2.2
Repairs to 4-2.2
Fuels
Dual 5-2, A-5-2.1
Handling and storage 5-1, A-5-1.1.2
Liquid ..... 5-1.1, 5-2.4; *see also* Gasoline trucks
LP-Gas 5-1.2

-G-

Gases, flammable, areas with ..... 1-6.1 to 1-6.3, A-1-6.1, A-1-6.2.1
Gasoline
As dual fuel ..... *see* Dual-fuel trucks
Handling and storage 5-1.1, A-5-1.1.2
Gasoline trucks
Conversion ..... 1-6.14, Table 3-1, 3-2
Markings 5-4.2.2
Type designations ..... 1-4(k) to 1-4(l), (o) to (r), A-1-4

-H-

Hazard areas 1-6, 5-4, A-1-6
Dusts, combustible, areas with ..... 1-6.4 to 1-6.7, A-1-6.5.3
Fibers, ignitible, areas with ..... 1-6.8 to 1-6.9, A-1-6.8.1
Flyings, combustible, areas with 1-6.8, A-1-6.8.1
Gases and vapors, flammable, areas with ..... 1-6.1 to 1-6.3, A-1-6.1, A-1-6.2.1
Industrial or commercial properties 1-6.13.2
Liquids, flammable, areas with ..... 1-6.2 to 1-6.3, A-1-6.2.1
Not otherwise classified 1-6.10
Piers and wharves 1-6.11.2
Repairs at 4-2.1
Storage, inside and outside 1-6.12.2
Hazard classification 1-5

-I-

Ignitible fibers, areas with ..... 1-6.8 to 1-6.9, A-1-6.8.1
Ignition systems, repairs to 4-2.2
Industrial properties, general 1-6.13
Inside storage 1-6.12

-L-

Labeled 1-2.3
Definition 1-4
Liquids, flammable ..... *see* Flammable liquids
Listed (definition) 1-4, A-1-4
LP-Gas
As dual fuel ..... *see* Dual-fuel trucks
Handling and storage 5-1.2, A-5-1.2.10
LP-Gas trucks
Conversion ..... 1-6.14.1 to 1-6.14.6, 1-6.14.13 to 1-6.14.14, Table 3-1, 3-2
Fuel systems 1-2.2
Markings 5-4.2.2
Type designations ..... 1-4(m) to (n), 1-4(q) to (r), A-1-4

-M-

Maintenance ..... Chap. 4
Markings ..... 3-2.4(c), 5-4.2, Fig. 5-4.2.2, Fig. 5-4.2.3; *see also* Nameplates
Metal dusts, areas with 1-6.4
Mufflers 4-4

-N-

Nameplates
Converted trucks ..... 3-2.4(d), 3-2.5
Visibility 2-3, 4-8

-O-

Operating procedures and training 5-6
Operating rules, safe 5-5
Outside storage 1-6.12

-P-

Piers 1-6.11
Plants, classified areas in 1-5.2

-R-

Referenced publications ..... Chap. 6, App. B
Repairs ..... 4-2 to 4-3
Replacement parts 4-3

-S-

Safety rules 5-5
Scope of standard 1-1
Shall (definition) 1-4
Should (definition) 1-4
Smoking prohibition 5-1.1.6, 5-1.2.14, 5-1.3.3, 5-3.12
Storage
Fibers, ignitible 1-6.9
Fuel 5-1, A-5-1.1.2
General inside and outside 1-6.12
Storage batteries, changing and charging 5-3

-T-

Temperature, operating 4-5
Testing 1-2.3
Training, operator 5-6
Type designations 1-4, A-1-4

-V-

Vapors, flammable, areas with ... 1-6.1 to 1-6.3, A-1-6.1, A-1-6.2.1

-W-

Wharves 1-6.11

The NFPA Codes and Standards Development Process

Since 1896, one of the primary purposes of the NFPA has been to develop and update the standards covering all areas of fire safety.

Calls for Proposals
The code adoption process takes place twice each year and begins with a call for proposals from the public to amend existing codes and standards or to develop the content of new fire safety documents.

Report on Proposals
Upon receipt of public proposals, the technical committee members meet to review, consider, and act on the proposals. The public proposals – together with the committee action on each proposal and committee-generated proposals – are published in the NFPA's Report on Proposals (ROP). The ROP is then subject to public review and comment.

Report on Comments
These public comments are considered and acted upon by the appropriate technical committees. All public comments – together with the committee action on each comment – are published as the Committee's supplementary report in the NFPA's Report on Comments (ROC).

The committee's report and supplementary report are then presented for adoption and open debate at either of NFPA's semi-annual meetings held throughout the United States and Canada.

Association Action
The Association meeting may, subject to review and issuance by the NFPA Standards Council, (a) adopt a report as published, (b) adopt a report as amended, contingent upon subsequent approval by the committee, (c) return a report to committee for further study, and (d) return a portion of a report to committee.

Standards Council Action
The Standards Council will make a judgement on whether or not to issue an NFPA document based upon the entire record before the Council, including the vote taken at the Association meeting on the technical committee's report.

Voting Procedures
Voting at an NFPA Annual or Fall Meeting is restricted to members of record for 180 days prior to the opening of the first general session of the meeting, except that individuals who join the Association at an Annual or Fall Meeting are entitled to vote at the next Fall or Annual Meeting.

"Members" are defined by Article 3.2 of the Bylaws as individuals, firms, corporations, trade or professional associations, institutes, fire departments, fire brigades, and other public or private agencies desiring to advance the purposes of the Association. Each member shall have one vote in the affairs of the Association. Under Article 4.5 of the Bylaws, the vote of such a member shall be cast by that member individually or by an employee designated in writing by the member of record who has registered for the meeting. Such a designated person shall not be eligible to represent more than one voting privilege on each issue, nor cast more than one vote on each issue.

Any member who wishes to designate an employee to cast that member's vote at an Association meeting in place of that member must provide that employee with written authorization to represent the member at the meeting. The authorization must be on company letterhead signed by the member of record, with the membership number indicated, and the authorization must be recorded with the President of NFPA or his designee before the start of the opening general session of the Meeting. That employee, irrespective of his or her own personal membership status, shall be privileged to cast only one vote on each issue before the Association.