NFPA No.

505

TYPE DESIGNATIONS, AREAS OF USE, MAINTENANCE, & OPERATION OF POWERED INDUSTRIAL TRUCKS 1972

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NATIONAL FIRE PROTECTION ASSOCIATION
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Official NFPA Definitions

Adopted Jan. 23, 1964: Revised Dec. 9, 1969. Where variances to these definitions are found, efforts to eliminate such conflicts are in process.

SHALL is intended to indicate requirements.

SHOULD is intended to indicate recommendations or that which is advised but not required.

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*Among the laboratories nationally recognized by the authorities having jurisdiction in the United States and Canada are the Underwriters' Laboratories, Inc., the Factory Mutual Research Corp., the American Gas Association Laboratories, the Underwriters' Laboratories of Canada, the Canadian Standards Association Testing Laboratories, and the Canadian Gas Association Approvals Division.

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Statement on NFPA Procedures

This material has been developed in the interest of safety to life and property under the published procedures of the National Fire Protection Association. These procedures are designed to assure the appointment of technically competent Committees having balanced representation from those vitally interested and active in the areas with which the Committees are concerned. These procedures provide that all Committee recommendations shall be published prior to action on them by the Association itself and that following this publication these recommendations shall be presented for adoption to the Annual Meeting of the Association where anyone in attendance, member or not, may present his views. While these procedures assure the highest degree of care, neither the National Fire Protection Association, its members, nor those participating in its activities accepts 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.

Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks

NFPA No. 505 — 1972

1972 Edition of No. 505

This Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks is published in accordance with action taken at the 1972 Annual Meeting of the National Fire Protection Association, held May 15-19 in Philadelphia, Pa. This text replaces the last previous edition of this Standard adopted in 1971. The 1972 edition includes the addition of new notes to Paragraphs 101, 103, 207.a., and 208.a., and revisions in Paragraphs 103.d., 103.g., 201.a., 203.a., 204.a., 205.a., 206.a., 602.1., and editorial changes in Table. 1.

The 1971 edition of this Standard was approved by the American National Standards Institute under date of September 10, 1971 and designated ANSI B56.2. The 1972 edition is being submitted for similar approval. The ANSI designation and date of approval will be printed on the front cover of copies of this edition printed after approval has been received.

Origin and Development of No. 505

Part A of this Standard was originally designated as NFPA No. 505A and was first adopted by the Association in 1951. Parts B and C covering "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 and 505C, respectively. Revisions were made in 1955, 1957, 1963, 1965, 1966, 1967, 1968, 1969, and 1971. 1971 was the first edition to be approved by ANSI.

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Scope: To develop recommendations for the safe use, maintenance and operation of industrial trucks and other material handling equipment to minimize fire hazards.

Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks

NFPA No. 505 — 1972

Part A

Areas of Use of Powered Industrial Trucks

100. General

101. This Standard applies 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 does not apply to compressed air or nonflammable compressed gas-operated industrial trucks, nor to farm vehicles, nor automotive vehicles for highway use.

NOTE 1. Reference is made to the Safety Standard for Powered Industrial Trucks (ANSI B56.1-1969) for further information. (Copies available from the American Society of Mechanical Engineers, 345 East 47th Street, New York, N.Y. 10017 and the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.)

NOTE 2. Reference is made to the Standard for the Storage and Handling of Liquefied Petroleum Gas (NFPA No. 58 — 1972; ANSI Z106.1 — 1972) for information on the design and installation of LP-gas fuel systems on industrial trucks.

102. Approved industrial trucks are those trucks that are listed for the use intended by a nationally recognized testing laboratory. Trucks shall bear a label or some other identifying mark to that effect authorized by such laboratory. The word "listed" herein shall mean compliance with the above.

NOTE: In order to prevent confusion it is intended that all testing laboratories should use the same designations to identify the various types of industrial trucks.

103. For the purpose of this standard there are eleven different designations of industrial trucks or tractors as follows: D, DS, DY, E, ES, EE, EX, G, GS, LP and LPS.

NOTE 1. Specific standards covering the "types" of industrial trucks detailed in Paragraphs 103.a. through k. have been published by the Underwriters' Laboratories, Inc. (207 East Ohio St., Chicagos Ill. 60611), and are identified as Standard for Internal Combustion Engine-Powered Industrial Trucks (UL 558; Third

Edition, July 1970; ANSI B56.4—1972) and Standard for Electric-Battery-Powered Industrial Trucks (UL 583, Fifth Edition). UL 558 (ANSI B56.4) covers Types G, D, LP, GS, DS, and LPS; UL 583 covers Types E, EE, and EX. Standards for Types DY and ES designated trucks are not in published form, however, information may be obtained from the Underwriters' Laboratories, Inc.

NOTE 2. Underwriters' Laboratories, Inc. examination of industrial trucks relates to fire hazards only for Types D, DS, DY, G, GS, LP and LPS internal combustion engine-powered industrial trucks; to fire and electrical shock hazard only for Types E and EE battery-powered industrial trucks; and to the fire, electric shock, and explosion hazards for Type EX trucks, suitable either for use in Class I, Group D or Class II, Group G hazardous locations. Trucks which have been examined and classified as meeting the respective Underwriters' Laboratories Standards for the particular area of use are listed in their "Index of Classified Products."

NOTE 3. Specific approval standards covering the "Types" of industrial trucks detailed in Paragraphs 103.a. through k. have been published by the Factory Mutual Research Corporation (1151 Boston-Providence Tpke., Norwood, Mass. 02062), and are identified as Approval Standards for Gasoline or Diesel Engine Powered Industrial Trucks, Types G, GS, D, or DS, August 10, 1971, Class Nos. 7811 and 7813; Approval Standard for Electric Battery-Powered Industrial Trucks, Types E and EE, August 6, 1971, Class No. 7820; and Approval Standard for LP-Gas Engine Powered Industrial Trucks, Types LP and LPS, August 9, 1971, Class No. 7812. Approval standards for Types DY, ES and EX designated trucks are not in published form although information may be obtained from Factory Mutual Research Corporation as to their requirements for these Types. The Factory Mutual approval standards emphasize fire protection regarding design and equipment arrangement.

a. The D designated units are units similar to the G units except that they are diesel engine powered instead of gasoline engine powered.

b. The DS designated units are diesel powered units that are provided with additional safeguards to the exhaust, fuel and electrical systems. They may be used in some locations where a D unit may not be considered suitable.

c. The DY designated units are diesel powered units that have all the safeguards of the DS units and in addition do not have any electrical equipment, including the ignition, and are equipped with temperature limitation features.

d. The E designated units are electrically powered units having minimum acceptable safeguards against inherent fire and electrical shock hazards.

e. The ES designated units are electrically powered units that, in addition to all of the requirements for the E units, are provided with additional safeguards to the electrical system to prevent emission of hazardous sparks and to limit surface temperatures. They may be used in some locations where the use of an E unit may not be considered suitable.

f. The EE designated units are electrically powered units that have, in addition to all of the requirements for the E and ES units, the electric motors and all other electrical equipment completely enclosed. In certain locations the EE unit may be used where the use of an E and ES unit may not be considered suitable.

g. The EX designated units are electrically powered units that differ from the E, ES or EE units in that the electrical fittings and equipment are so designed, constructed and assembled that the units may 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 or for Class II, Group G hazardous locations as defined in the National Electrical Code (NFPA No. 70 — 1971; ANSI C1 — 1971). The Class I, Group G units may also be used in Class III locations (as described in the National Electrical Code) with the limit indicated in Note 2 to Paragraph 207.a.

h. The G designated units are gasoline powered units having minimum acceptable safeguards against inherent fire hazards.

i. The GS designated units are gasoline powered units that are provided with additional safeguards to the exhaust, fuel and electrical systems. They may be used in some locations where the use of a G unit may not be considered suitable.

j. The LP designated unit is similar to the G unit except that liquefied petroleum gas is used for fuel instead of gasoline.

k. The LPS designated units are liquefied petroleum gas powered units that are provided with additional safeguards to the exhaust, fuel and electrical systems. They may be used in some locations where the use of an LP unit may not be considered suitable.

104. The authority having jurisdiction shall determine the hazard classification of any particular atmosphere or location. The atmosphere or location shall have been classified as to whether it is hazardous or nonhazardous prior to the consideration of industrial trucks being used therein and the type of industrial truck required shall be as provided in Article 200 of this standard for such location.

105. Any one plant or building may have several areas of different hazard classification. The authority having jurisdiction may limit the use of industrial trucks in certain hazardous areas in a plant or building in accordance with the hazard classification of such areas. The responsibility for enforcement of restricted use in such areas will rest on management.

NOTE: Attention is called to the recommendations for marking trucks and areas for hazard classification. Details may be found in Paragraph 802.

106. The industrial trucks specified under Article 200 are the minimum types required but industrial trucks having greater safeguards may be used if desired.

200. Specific Areas of Use

NOTE 1: Table I tabulates the information contained in this Section.

NOTE 2: References in parentheses in the following Paragraph headings in this Section are to the corresponding classification as used in the National Electrical Code (NFPA No. 70-1971, ANSI C1-1971) for the convenience of people familiar with those classifications.

201. 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).

a. Power-operated industrial trucks shall not be used in atmospheres containing hazardous concentrations of acetylene, butadiene, ethylene oxide, hydrogen, manufactured gases containing more than 30 percent hydrogen (by volume), propylene oxide, acetaldehyde, cyclopropane, diethyl ether, ethylene, isoprene, or unsymmetrical dimethyl hydrazine (UDMH).

202. Atmospheres Containing Metal Dusts, Carbon Black, Coke or Coal Dust (Class II, Groups E and F, Division 1).

a. Power-operated industrial trucks shall not be used in atmospheres containing hazardous concentrations of

metal dust, including aluminum, magnesium, and their commercial alloys, other metals of similarly hazardous characteristics, or in atmospheres containing carbon black, coal or coke dust except approved power-operated industrial trucks designated as EX may be used in such atmospheres subject to special investigation by the authority having jurisdiction. In atmospheres where dust of magnesium, aluminum or aluminum bronze may be present, fuses, switches, motor controllers and circuit breakers of trucks shall have enclosures specifically approved for such locations.

203. Atmospheres Where Vapors of Flammable Liquids and Some Gases Exist Under Normal Operating Conditions (Class I, Group D, Division 1 — See Note).

a. Only approved power-operated industrial trucks designated as EX and classified for Class I, Group D hazardous locations may be used in atmospheres containing vapors of such flammable liquids or gases* as: acetone, acrylonitrile, benzene, butane, ethylene dichloride, gasoline, hexanes, methane, propane, propylene, styrene, vinyl acetate, vinyl chloride, or xylenes in quantities sufficient to produce explosive or ignitible mixtures and where such concentrations of these gases or vapors exist continuously, intermittently or periodically under normal operating conditions or may exist frequently because of repair, maintenance operations, leakage, breakdowns or faulty operation of equipment.

NOTE: This classification usually includes 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 may 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.

*For complete listing of air mixtures of hazardous gases or vapors classified as Class I, Group D, see Table 500-2(c) of the National Electrical Code (NFPA No. 70-1971; ANSI C1-1971).

204. Atmospheres Where Volatile Flammable Liquids and Their Vapors or Flammable Gases Are Normally Confined (Class I, Group D, Division 2 — See Note).

a. Only approved power-operated industrial trucks designated as DY, EE or EX (classified for Class I, Group D hazardous locations) may be used in locations where volatile flammable liquids or flammable gases are handled, processed or used, but in which the hazardous liquids, vapors or gases will normally be confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of such containers or systems, or in case of abnormal operation of equipment; also in locations in which hazardous concentrations of gases or vapors are normally prevented by positive mechanical ventilation but which might become hazardous through failure or abnormal operation of the ventilating equipment; or in locations which are adjacent to Class I, Division 1 locations, and to which hazardous 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.

b. In locations used for the storage of hazardous liquids in sealed containers or liquefied or compressed gases in containers, approved power-operated industrial trucks designated as DS, ES, GS or LPS may be used if permitted for such location by the authority having jurisdiction.

NOTE: This classification includes locations where volatile flammable liquids or flammable gases or vapors are used, but which, in the judgment of the authority having jurisdiction, would become hazardous only in case of an accident or of some unusual operating condition. The quantity of hazardous material that might escape in case of 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 the DS or DY, ES, EE, GS, LPS designated truck possesses sufficient safeguards for the location. Piping without valves, checks, meters and similar devices would not ordinarily be deemed to introduce a hazardous condition even though used for hazardous liquids or gases. Locations used for the storage of hazardous liquids or of liquefied or compressed gases in sealed containers would not normally be considered hazardous unless subject to other hazardous conditions also.

205. Atmospheres Containing Combustible Dusts in Suspension Other Than Those Specified in Paragraph 202 (Class II, Group G, Division 1 — See Note).

a. Only approved power-operated industrial trucks designated as EX classified for Class II, Group G hazardous locations may be used in atmospheres in which combustible dust is or may be in suspension continuously, intermittently or periodically 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.

NOTE: This classification usually includes 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, 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, hay grinding plants, and other occupancies of similar nature where combustible dust may, under normal operating conditions, be present in the air in quantities sufficient to produce explosive or ignitible mixtures.

206. Locations Where Combustible Dusts Are Present But Not Normally in Suspension in the Atmosphere (Class II, Group G, Division 2 — See Note).

a. Only approved power-operated industrial trucks designated as DY, EE or EX classified for Class II, Group G hazardous locations may be used in atmospheres in which combustible dusts will not normally be in suspension in the air or will not be 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 may be ignited by arcs or sparks originating in the truck.

b. Approved power-operated industrial trucks designated as DS, ES, GS or LPS may be used in locations as indicated in the above paragraph if permitted by the authority having jurisdiction.

NOTE: Locations where dangerous concentrations of suspended dust would not be likely, but where dust accumulations might form on, in, or in the vicinity of electrical equipment would include rooms and areas containing only closed spouting and conveyors, closed bins or hoppers, or machines and equipment from

which appreciable quantities of dust would 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.

207. Locations Where Ignitible Fibers Are Processed (Class III, Division 1 — See Note).

a. Only approved power-operated industrial trucks designated as DY, EE or EX may be used in locations which are hazardous because of the presence of easily ignitible fibers or 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.

NOTE 1. Locations where easily ignitible fibers or flyings are found usually include some parts of rayon, cotton, and other textile mills; combustible fiber manufacturing and processing plants; cotton gins and cotton-seed mills; flax processing plants; clothing manufacturing plants; and establishments and industries involving similar hazardous processes or conditions. Woodworking plants (except wood flour mills) shall not be considered as being in the type of locations defined in paragraph 207.

NOTE 2. Type EX units classified for Class II, Group G hazardous locations are also suitable for use in Class III locations, except for fan-cooled type motors where there is a very large amount of lint or combustible flyings which are liable to choke or clog the air passage of the motor.

208. Locations Where Ignitible Fibers Are Stored (Class III, Division 2 — See Note).

a. Only approved power-operated industrial trucks designated as DS, DY, ES, EE, EX, GS or LPS may 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 E, which have been previously used in these locations may be continued in use with the approval of the authority having jurisdiction.

NOTE 1. 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, and other materials of similar nature.

Table 1 — Summary Table on Use of Powered Industrial Trucks as Described in Part A of this Standard

	Diesel-Powered			Electric-Powered				Gasoline-Powered		LP-Gas-Powered		Text Par.
Locations	**D**	**DS**	**DY**	**E**	**ES**	**EE**	**EX**	**G**	**GS**	**LP**	**LPS**	**Reference**
Class I												
Division 1												
Group A												201 (a)
Group B												201 (a)
Group C												201 (a)
Group D							A					203 (a)
Class I												
Division 2												
Group A		X	X		X	X	X		X		X	209 (a)
Group B		X	X		X	X	X		X		X	209 (a)
Group C		X	X		X	X	X		X		X	209 (a)
Group D		A*	A		A*	A	A		A*		A*	204 (a), (b)
Class II												
Division 1												
Group E							A*					202 (a)
Group F							A*					202 (a)
Group G							A					205 (a)
Class II												
Division 2												
Group E		X	X		X	X	X		X		X	209 (a)
Group F		X	X		X	X	X		X		X	209 (a)
Group G		A*	A		A*	A	A		A*		A*	206 (a), (b)
Class III												
Division 1			A			A	A					207 (a)
Class III												
Division 2		A	A	A*	A	A	A		A		A	208 (a)

Key To Table Symbols

A = Type truck authorized in location described.
A* = Type truck authorized in location described with approval of the authority having jurisdiction.
X = Type truck authorized to be determined by the authority having jurisdiction.
Blank spaces = Type truck not authorized in location described.

NOTE 2. Type EX units classified for Class II, Group G hazardous locations are also suitable for use in Class III locations, except for fan-cooled type motors where there is a very large amount of lint or combustible flyings which are liable to choke or clog the air passage of the motor.

209. Hazardous Locations Not Otherwise Classified

a. The authority having jurisdiction shall determine what types of power-operated industrial truck, if any, may be used based on an engineering survey of the property and an evaluation of the fire and explosion hazards.

210. Piers and Wharves

a. On piers and wharves handling general cargo, any approved power-operated industrial truck designated as Type D, E, G or LP may be used, or trucks which conform to the requirements for these Types may be used with the approval of the authority having jurisdiction. Where the authority having jurisdiction determines an area of a pier or wharf as hazardous, only approved power-operated industrial trucks specified for such locations in the preceding paragraphs may be used.

211. General Inside and Outside Storage

a. The authority having jurisdiction shall determine the classification of hazard for storage warehouses and outside storage locations. If classified as hazardous only the approved power-operated industrial truck specified for such locations in the preceding paragraphs may be used. If not classified as hazardous, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements for these Types may be used with the approval of the authority having jurisdiction.

212. General Industrial or Commercial Properties

a. The authority having jurisdiction shall determine the classification of hazard for those areas in which industrial trucks are operated and where materials are being handled and/or processed, but where storage is incidental to the processing or handling. If classified as hazardous, only approved power-operated industrial trucks specified for

such locations in the preceding paragraphs may be used. If not classified as hazardous, any approved power-operated industrial truck designated as Type D, E, G, or LP may be used, or trucks which conform to the requirements of these Types may be used with the approval of the authority having jurisdiction.

213. Converted Industrial Trucks

a. Power-operated industrial trucks that have been originally approved for the use of gasoline for fuel, when converted to the use of liquefied petroleum gas fuel in accordance with Part B, may be used in those locations where G, GS or LP and LPS designated trucks have been specified in the preceding paragraphs (See paragraph 311 and Appendix).

Part B

Maintenance of Industrial Trucks

300. General:

301. It is essential that the safety built into power-operated industrial trucks be maintained. Maintenance to compensate for wear should be performed properly and as frequently as may be necessary.

302. Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel.

303. Precautions:

a. No repairs shall be made in Class I, II and III locations.

b. Those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in locations designated for such repairs.

c. Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.

d. Designated areas should preferably be a separate garage constructed and protected in accordance with the NFPA Standard on Garages (No. 88) or be cut off by fire division walls or partitions from operational areas where the truck may be in use.

304. All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design.

305. Except as approved by the authority having jurisdiction, industrial trucks shall not be altered so that the relative positions of the various parts are different from what they were when originally received from the manufacturer, nor shall they be altered either by the addition of extra parts not provided by the manufacturer or by the elimination of any parts, except as provided in Paragraph 311. Additional counterweighting of fork trucks shall not be done unless approved by the truck manufacturer.

306. Industrial trucks shall be examined before being placed in service, and shall not be placed in service if the examination shows any condition adversely affecting the safety of the vehicle. Such examination shall be made at least daily and preferably before the day's work has started. Where industrial trucks are used on a round-the-clock basis, they shall be examined after each shift. Defects when found shall be immediately reported and corrected.

307. Water mufflers shall be filled daily or as frequently as is necessary to prevent depletion of the supply of water below 75 per cent of the filled capacity. Vehicles with mufflers having screens or other parts that may 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 immediately be removed from service, and not returned to service until the cause for the emission of such sparks and flames has been eliminated.

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

309. Industrial trucks shall be kept in a clean condition, free of lint, excess oil, and grease. Noncombustible agents should be used for cleaning trucks. Low flash point (below 100°F) solvents shall not be used. High flash point (at or above 100°F) solvents may be used, subject to approval of the authority having jurisdiction. Precautions regarding toxicity, ventilation, and fire hazard shall be consonant with the agent or solvent used.

310. Where it is necessary to use anti-freeze in the engine cooling system, only those products having a glycol base shall be used.

311. Industrial trucks originally approved for the use of gasoline for fuel may be converted to liquefied petroleum gas fuel provided the complete conversion results in a truck which in the judgment of the authority having jurisdiction embodies the features specified for LP or LPS designated

trucks. The authority having jurisdiction shall require that the conversion equipment is "Listed by Report" by a recognized testing laboratory. The description of the component parts of this conversion system and the recommended method of installation on specific trucks are contained in the "Listing by Report" available for the use of the authority having jurisdiction. (See Par. 213; Appendix)

312. The truck designations (see Section 103) as shown on the nameplate and the Type markers (see Par. 802) should not be painted over so as to obscure their content.

Part C

Operation of Industrial Trucks

400. General:

401. Industrial trucks are designed for safe operation. Carelessness or improper use or application can nullify much of the care that has been exercised in their design. For these reasons, proper equipment selection and plant layout, lighting, the establishment of plant traffic rules, and the use of operator aids in the form of floor markings, bumper guards or curbs, and warning signs are essential to minimize fire hazard, property damage and injury to personnel.

500. Operator Qualifications and Training:

501. Operator Qualifications.

a. Operator should be physically and mentally fit and capable of reading and understanding posted instructions. In general, the qualifications should be the same as those necessary to obtain a license to operate an automotive type vehicle.

502. Operator Training.

a. Operators should be trained before operating trucks. The training program should include safe operating practices, actual supervised experience in driving over a training course, and emphasis on safety as a habit.

b. Trained and authorized operators should be equipped with badges or other visual indication of authorization, and this should be displayed at all times.

c. Operator records should be kept and accidents recorded by the responsible authority as "preventable" and "non-preventable."

600. Fuel Handling and Storage Safety:

601. Liquid Fuels (Such as Gasoline and Diesel Fuel).

a. The storage and handling of liquid fuels shall be in accordance with the Flammable and Combustible Liquids Code (NFPA No. 30).

b. Trucks using liquid fuels should be refueled only at locations designated for that purpose. Safe outdoor locations are preferable to those indoors. The Flammable and Combustible Liquids Code (NFPA No. 30), Chapter VII (Section 7310), outlines recommendations for arranging safe indoor fueling facilities.

c. Engines shall be stopped and operator off the truck during refueling.

d. Liquid fuels not handled in approved dispensing pumps shall be transported in safety cans. Safety cans should be inspected regularly for damage to closures and for leaks; faulty cans repaired or replaced. Care should be exercised in handling of safety cans to avoid damage.

e. Reasonable care shall be exercised to prevent the spillage of fuel or overfilling either the vehicle fuel tanks or safety cans. Filler cap shall be replaced and any spilled fuel disposed of by using a noncombustible absorbent before the engine is restarted.

f. Smoking shall be prohibited in the refueling area.

602. Liquefied Petroleum Gas Fuel.

a. The storage and handling of liquefied petroleum gas (LP-Gas) shall be in accordance with the Standard for Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58 — 1972; ANSI Z106.1 — 1972).

b. Filling of fuel containers which are permanently mounted on trucks and the filling of removable DOT type LP-Gas containers should be done at locations designated for that purpose and in accordance with the Standard for Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58 — 1972; ANSI Z106.1 — 1972).

c. Care should be exercised when handling or transporting LP-Gas containers. Do not drop, throw, roll, or drag containers. When it is necessary to move more than one container at a time, a proper carrying device should be provided.

d. Do not over-fill LP-Gas containers.

e. Engine shall be stopped and operator off the truck during refueling.

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

g. Personnel engaged in refilling LP-Gas containers should wear long sleeves and gloves.

h. Never use a match or flame to check for leaks, use a soap solution.

i. Removable LP-Gas containers shall not be exchanged and LP-Gas powered vehicles shall not be parked near sources of heat, open flames, or similar sources of ignition, nor near open pits, underground entrances, elevator shafts or other similar areas unless such areas are adequately ventilated to prevent accumulations of LP-Gas.

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

k. Exchange of removable LP-Gas containers preferably should be done outdoors, but may be done indoors. Means shall be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. This shall be accomplished by:

(1) using an approved automatic quick closing coupling (a type which closes in both directions, when uncoupled) in the fuel line.

(2) Where such an automatic quick closing coupling is not used the fuel line shall be emptied by closing the valve on the LP-Gas container and allowing the engine to run until the fuel in the line is consumed.

l. Removable LP-Gas containers shall be securely mounted to prevent jarring loose, slipping, or rotating, and shall be so positioned that the safety pressure relief valve opening is always in contact with the vapor space (top) of the container. This is accomplished by an indexing pin and container clamps which, when the container is properly installed, position the container.

m. All reserve LP-Gas containers should 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.

n. Physical damage such as dents, scrapes, or gouges, may materially weaken the structure of the LP-Gas container and render it unsafe for use. All LP-Gas containers

should be examined before refilling and again before reuse, for the following defects or damage:

(1) Dents, scrapes, and gouges of the pressure vessel.

(2) Damage to the various valves and liquid level gage.

(3) Debris in the relief valve.

(4) Damage to or loss of relief valve cap.

(5) Indications of leakage at valves or threaded connections.

(6) Deterioration damage or loss of flexible seals in the fill or servicing connections.

o. Smoking shall be prohibited in the refueling area when exchanging LP-Gas containers.

p. Whenever vehicles using LP-Gas as a fuel are parked overnight or stored for protracted periods of time indoors, with the fuel container in place, the service valve of the fuel container should be closed.

700. Changing and Charging Storage Batteries:

NOTE: The two types of batteries in common use are (1) lead and (2) nickel-iron. They contain corrosive chemical solutions, either acid or alkali, and therefore present a chemical hazard. On charge, they give off hydrogen and oxygen which, when mixed with air in certain concentrations, may be explosive. They are of relatively small bulk and great weight making handling a special consideration.

701. Battery charging installations shall be located in areas designated for that purpose. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of fumes from gassing batteries.

702. When racks are used for support of batteries, they should be made of materials not conducive to spark generation or be coated or covered to achieve this objective.

703. Handling Batteries:

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

b. Chain hoists should be equipped with load-chain containers. When hand hoist is used, uncovered batteries should be covered with a sheet of plywood or other non-conducting material to prevent the hand chain from shorting on cell connectors or terminals. A properly insulated spreader bar should be used with any overhead hoist.

c. Reinstalled batteries shall be properly positioned and secured in the truck.

704. A carboy tilter or siphon shall be provided for handling electrolyte. Always pour acid into water; not water into acid. Personnel maintaining batteries should wear protective clothing such as face shield, long sleeves and gauntlet gloves.

705. Electrical installations shall conform to the National Electrical Code (NFPA No. 70 — 1971; ANSI C1) and any local ordinances.

706. Trained and authorized personnel should change or charge batteries.

707. Trucks shall be properly positioned and brake applied before attempting to change or charge batteries.

708. When charging batteries, the vent caps should be kept in place to avoid electrolyte spray. Care shall be taken to assure that vent caps are functioning. The battery (or compartment) cover(s) shall be open to dissipate heat.

709. Smoking shall be prohibited in the charging area.

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

711. Tools and other metallic objects shall be kept away from the top of uncovered batteries.

800. Use of Trucks in Hazardous Areas:

801. Industrial trucks shall not be used in hazardous areas except as specified in Part A of this Standard.

802. Markings of Types DS, DY, ES, EE, EX, GS and LPS Industrial Trucks and Areas of Use.

a. The use of proper equipment in hazardous areas is essential for the safety and protection of employees and property. For this reason, it is recommended that approved trucks, listed by a nationally recognized testing laboratory

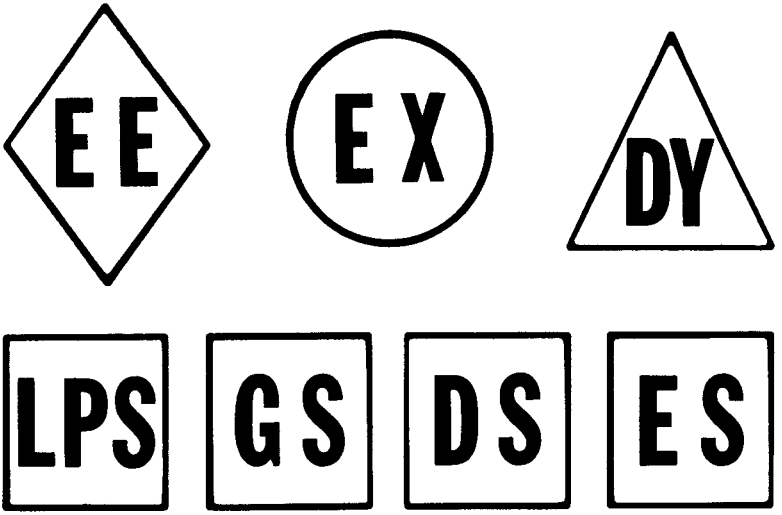

Figure 1. Markers to identify type of industrial truck. The markers for LPS, GS,DS, and ES are 4 inches square. The width of the others is 5 inches.

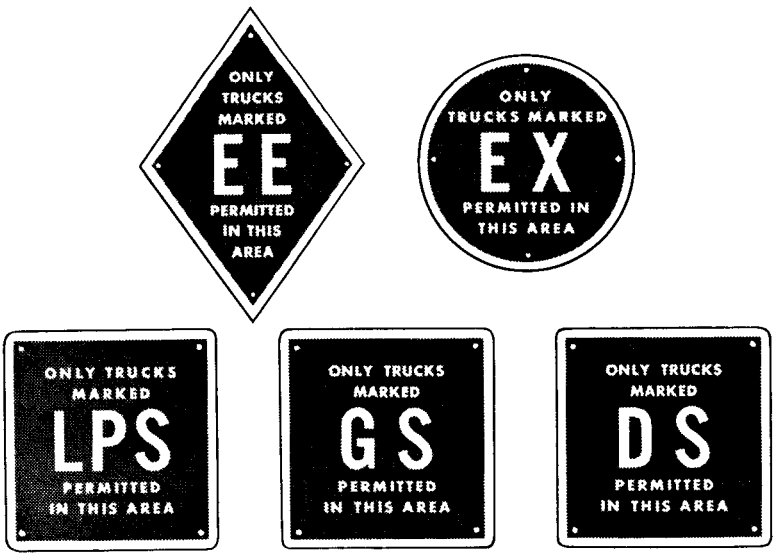

Figure 2. Building signs for posting at entrances to hazardous areas. The width of each is 11 inches. Building signs for Type DY and ES may be produced on demand.