



STATE OF NEW JERSEY
DEPARTMENT OF LABOR AND INDUSTRY
Percy A. Miller, Jr., Commissioner

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RULES AND REGULATIONS
for the
OPERATION & USE
of
POWERED INDUSTRIAL TRUCKS AND TRACTORS
in
FACTORIES AND PLACES OF EMPLOYMENT

BUREAU OF ENGINEERING AND SAFETY
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TENTATIVE SAFETY STANDARDS FOR THE OPERATION & USE OF POWERED INDUSTRIAL TRUCKS AND TRACTORS IN FACTORIES AND PLACES OF EMPLOYMENT

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SECTION 1 - GENERAL

1.1 Scope

These rules and regulations shall apply to all places of employment and industrial premises and shall be the accepted practice for the construction, inspection, maintenance and operation of powered industrial trucks and tractors, that are used to handle materials or are otherwise operated in factory mills, mines and workshops.

1.2 Purpose

These rules and regulations establish minimum operation, inspection and maintenance standards and specifications for the safe operation of industrial power trucks and tractors. The purpose is to prevent accidents such as collision, fire and explosion and further hazards which may be a source of damage to property, and a danger to the life, limb and health of the personnel employed in places where this type of equipment is used. These rules are not intended to be applicable to passenger vehicles or those vehicles which do not enter the plant.

1.3 Compliance

Compliance with the requirements of these rules and regulations shall be mandatory and shall be enforced on all places of employment over which the Department of Labor has jurisdiction.

1.4 Exceptions

In cases of practical difficulty or unnecessary hardship, the Commissioner may grant exceptions from these rules and regulations provided that a request for such exceptions has been made in writing to the Commissioner. Exceptions can only be granted when it is clearly evident that a satisfactory working condition is attained and fire and explosion hazards have been eliminated, but cannot be granted in any case where conflict would be created with mandatory requirements of the law.

1.5 General Definitions

- 1.5.1 Approved - approved by the Commissioner
- 1.5.2 Commissioner - Commissioner of Labor of the State of New Jersey or any of his authorized representatives
- 1.5.3 Department - New Jersey Department of Labor
- 1.5.4 Division - Division of Engineering and Safety of the Department
- 1.5.5 Effective Date - the date indicated elsewhere herein on which these rules and regulations become effective
- 1.5.6 Existing - installed or operated before the effective date and including work for which plans have been approved prior to the effective date.
- 1.5.7 Hereinafter Installed - installed on or after the effective date
- 1.5.8 Number of Employees - the maximum number of persons at work at any one time in a particular building
- 1.5.9 Number of Trucks - the maximum number of trucks owned or operated in any place
- 1.5.10 Place of Employment - every factory, workshop, mill, mine, transfer station mine and mercantile establishment, where persons are employed and over which the Commissioner has jurisdiction.
- 1.5.11 Place of Operation - every factory, workshop, mill, mine, transfer station mine and mercantile establishment
- 1.5.12 Shall - when used, the requirement is mandatory
- 1.5.13 Should - when used it indicates a practice recommended by the Department
- 1.5.14 Singular, Plural - the singular shall mean the plural and the plural the singular
- 1.5.15 Adequate, Effective, and Secure - shall mean conditions subject to determination by the Commissioner.

1.6 Special Definitions

1.6.1 Powered Industrial Trucks -- all commercial trucks operating under their own power and carrying the load on the same wheels, or tractors operating under their own power, that may push or pull the load that is on another carriage. This shall include all vehicles with auxiliary equipment used in loading, unloading, lifting and turning of materials. This shall apply to Electric Powered Trucks of Gasoline Powered Trucks.

1.6.2 Electric Powered Industrial Trucks are trucks propelled by electric motors which are supplied power from replaceable electric storage batteries.

1.6.3 Standard Electric Powered Industrial Trucks shall mean the standard model for general use, and does not include any special safeguards and equipment that could be incorporated in the construction of the truck in order to be approved for operation in certain hazardous locations.

1.6.4 Explosion Proof Electric Power Industrial Trucks are trucks of special build, that involve explosion proof construction, spark enclosed construction and dust tight enclosures for motor and switches, and are intended for use in extra hazardous locations involving flammable vapors and dust.

1.6.5 Gasoline Powered Industrial Trucks -- Power trucks that are driven by internal combustion engines, in which gasoline or some other type of fuel is used.

1.6.6 Standard Model Gasoline Powered Industrial Trucks shall mean the standard model as manufactured without the special fire safeguards included in its construction.

1.6.7 Approved Type Gasoline Power Industrial Truck shall mean trucks that are equipped with special fire safeguards and approved by the Commissioner.

1.6.8 Explosion Proof shall mean enclosed in a case which is capable of withstanding an explosion of a specified gas or vapor which may occur within it, and of preventing the ignition of the specified gas or vapor surrounding the enclosure by sparks, flashes or explosions of the gas or vapor within.

SECTION 2 - ELECTRIC POWERED INDUSTRIAL TRUCKS

2.1 General

Electric Powered Industrial Trucks are inherently safer from fire hazard than gasoline powered trucks. They can be used safely in practically all industrial occupancies. This includes textile or other processes involving storage and handling of combustible fibres.

2.2 Limitations

For hazardous locations involving flammable vapors or dusts, special trucks are built with dust-tight or explosion proofed enclosures for motors and switches, and other safety type electrical equipment. The use of any storage battery powered industrial truck is acceptable in the following locations provided clean equipment, safe storage and repair areas are available and maintenance, etc. is in accordance with regulations.

2.3 Use

Requirements for Electric Powered Industrial Trucks may involve special construction and equipment as set forth in Sec. 3 in order to be approved for operations in hazardous locations. Requirements depend upon the degree of hazard, as classified herein.

2.3.1 Electric Powered Industrial Trucks shall not be used except when completely equipped with approved explosion proof equipment in the following locations.

(a) Locations (1) in which hazardous concentrations of flammable gases or vapors exist continuously, intermittently or periodically under normal operating conditions, (2) in which hazardous concentrations of such gases or vapors may exist frequently because of repair of maintenance operations or because of leakage, or (3) in which breakdown or faulty operations of equipment or processes which might release hazardous concentrations of flammable gases or vapors might also cause simultaneous failure of electrical equipment. (b) This classification would usually include locations where flammable volatile liquids or liquefied flammable gases are transferred from one container to another; interiors of spray booths and areas in the vicinity and painting operations where volatile flammable solvents are used; locations containing open tanks or vats of volatile 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; pump rooms for flammable gas or for volatile flammable liquids; and all other locations where hazardous concentrations of flammable vapors or gases are likely to occur in the course of normal operations.

2.3.2 Electric Powered Industrial Trucks constructed in accordance with the specifications set forth in Sec. 3:2 for spark enclosed construction are considered acceptable in the following locations.

(a) Locations (1) in which flammable volatile 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. (2) 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 (3) which are adjacent to Sec. 2.3.1 locations, and to which hazardous concentrations of gases or vapors might occasionally be communicated.

(b) This classification would usually include locations where flammable volatile liquids or flammable gases or vapors are used, but which 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 explosion or fires are all factors that should receive consideration in determining the classification and extent of each hazardous area. Piping without valve checks, meter 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 liquefied or compressed gases in sealed containers would not normally be considered hazardous unless subject to other hazardous conditions also.

(c) Locations (1) in which combustible dust is or may be in suspension in the air continuously, intermittently, or periodically under normal operating conditions, in quantities sufficient to produce explosive or ignitable mixtures, (2) where the normal or abnormal operation or the failure of equipment or apparatus might cause such mixtures to be produced in or in the vicinity of electrical equipment or apparatus, or (3) in which dusts of an electrically conducting nature may be present.

(d) This classification would usually include the working area of grain handling and storage plants; rooms containing grinders or pulverizers, cleaners, graders, scalpels, 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, and other occupancies of similar nature; coal pulverizing plants (except where the pulverizing equipment is essentially dust tight) all working areas where metal dust and powders are produced, processed, handled, packed or stored (except in tight containers); and all other similar locations where combustible dust may, under normal operating conditions, be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

(e) Combustible dusts which are electrically non-conducting will include dusts produced in the handling and processing of grain and grain products, pulverized sugar and cocoa, dried egg and milk powders, pulverized spices, starch and pastes, potato and wood flour, oil meal from beans and seed, dried hay, and other organic materials which may produce combustible dusts when processed or handled. Electrically conducting non-metallic dusts will include dusts from pulverized coal, coke and charcoal. Metallic dusts from magnesium, aluminum and aluminum bronze

are particularly hazardous, and every precaution must be taken to avoid ignition and explosion.

2.3.3 Electric powered industrial trucks constructed with well arranged wiring and complete tight enclosures around arcing of sparking parts are considered acceptable in the following locations.

(a) Locations in which combustible dust will not normally be in suspension in the air, or will not likely to be thrown into suspension by the normal or abnormal operation or the failure of equipment or apparatus, in quantities sufficient to produce explosive or ignitable mixtures, but (1) where deposits or accumulations of such dust may be sufficient to interfere with the safe dissipation of heat from electrical equipment or apparatus or (2) where such deposits or accumulations of dust on, in or in the vicinity of electrical equipment might be ignited by arcs, sparks or burning material from such equipment.

(b) Locations where dangerous concentrations of suspended dust would not be likely, but where dust accumulations might form on, in or in the vicinity of electric equipment, would include rooms and areas containing only closed sorting and conveyers, closed bins or hoppers, or machines and from which appreciable quantities of dust would escape only under abnormal operating conditions; rooms or areas adjacent to locations described in paragraph (a) of this section, and into which explosive or ignitable concentrations of suspended dust might be communicated only under abnormal operating conditions; rooms or areas where the formation of explosive or ignitable 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.

(c) Locations which are hazardous because of the presence of easily ignitable fibres or flyings but in which such fibres or flyings are not likely to be in suspension in air in quantities sufficient to produce ignitable mixtures.

(d) Locations in which easily ignitable fibres or materials producing combustible flyings are handled, manufactured or used. Such locations would include some parts of rayon, cotton and other textile mills, combustible fibre manufacturing and processing plants; cotton gins and cotton seed mills; flax processing plants; clothing manufacturing plants; woodworking plants; and establishments and industries involving similar hazardous processes or conditions.

(e) Locations in which easily ignitable fibres are stored or handled (except in process of manufacture). Easily ignitable fibres and flyings will include rayon, cotton (including cotton linters and cotton waste) sisal or henequen, thistle, jute, hemp, tow, cocoa fibre, oakum, baled waste, kapok, Spanish moss, excelsior and other materials of similar nature.

2.3.4 Standard Electric Powered Trucks may be operated in all other locations that are omitted from and not classified and defined as hazardous locations as heretofore described in Sec. 2.3.1, Sec. 2.3.2, and Sec. 2.3.3.

SECTION 3 - ELECTRIC POWERED INDUSTRIAL TRUCK SPECIFICATIONS

3.1 Explosion proof trucks are to be so constructed that all the electrical equipment and wiring shall be so enclosed and protected in a case which is capable of withstanding an explosion of a specific gas or vapor which may occur within it, and of preventing the ignition of the specified gas or vapor within.

3.2 Spark enclosed construction of Electric Powered Industrial Trucks requires that the enclosures of the sparking devices be sealed in such a manner that any dust or gas from the surrounding atmosphere is substantially excluded or its infiltration greatly retarded. This construction is not intended for continuous use in heavily laden dust or gas atmospheres, and is not acceptable (in accordance with the Bureau of Mines or Underwriter's Specification) for hazardous locations. The following minimum specifications apply.

3.2.1 Motors, controllers, contacts, switches, and all other sparking devices are to be encased in substantially constructed dust or vapor tight housings as described below: Covers for inspection shall preferably be of a metal to metal type with a minimum joint width of half inch. Bolt spacing shall be such that the clearance between the cover and housing in no case exceeds .005 inch. Gaskets if used,

shall be of a material which is mechanically strong and not readily effected by the changes in temperature or humidity. The gasket shall be bonded to the stationary housing and not to the removable cover, by means of a stable, high strength, bonding material.

3.2.2 Shafts where they form a dust or vapor tight case into the open atmosphere, the length of path (the distance from inside to outside of the enclosure) shall not be less than $\frac{1}{2}$ " with a maximum radial clearance of .005". For greater radial clearances the minimum length of path shall be obtained from the following formula:

$$L=166C-0.33$$

Where L—Length of path at shaft opening, inches

Where C—Radial Clearance, inches

3.2.3 Leads or Conductors shall be tightly fitted where they pass into dust or vapor tight housing. The path length of Bushings shall be twice that given for shaft openings for the same radial clearance. Provision must be made to avoid abrasion or cutting of conductor insulation throughout the entire wiring system. Conductors that are exposed are to be protected against mechanical damage by rigid or flexible conduct, rubber hose, or equal. Flexible metal tubing when used shall be of the interlocking type.

3.2.4 Terminal boards where used are to be so enclosed that accidental shorting is impossible. Nuts of all terminal boards are to be fastened by means of spring-lock washers to prevent loosening of conductors.

3.2.5 All resistors are to be enclosed in a substantially constructed dust or vapor tight housing as described in item 4.2.2. Conductors are to be tightly fitted where they pass into the housings in the same manner as described above in item 4.2.3.

3.2.6 Battery Compartments are to be provided with a lock and the upper vent holes are to be covered with heavy gauge, wire mesh, expanded metal or equal to prevent accidental shorting. Compartments for the battery are not to be dust or vapor tight. Battery leads are to be mechanically protected by means of loom, rubber hose, or equal.

3.2.7 Plugs and receptacles are to be of the latched type when mounted within a locked battery compartment. If they are so mounted as to be accessible without opening the locked battery compartment cover, an additional lock is to be provided for the plug and receptacle.

3.2.8 A static discharge device is required on each vehicle of this type. At least two static conductive tires shall be used for this purpose.

3.2.9 The warning signal shall be of the enclosed electric vibrator type operated by means of a dust-or vapor tight switch. A foot gong or hand operated klaxon are considered equally acceptable.

SECTION 4 - INSPECTION & MAINTENANCE-ELECTRIC POWERED INDUSTRIAL TRUCKS

4.1 *General* - A regular inspection and maintenance schedule shall be established.

4.1.1 For the purpose of inspection, maintenance and repairs, trucks shall be removed to buildings, repair shops or areas set aside for the purpose, at a safe distance from hazardous locations.

4.1.2 Cover plates shall never be removed nor shall inspection and testing be done in hazardous areas.

4.1.3 Inspect sealing surfaces, gaskets, insulation, wiring, batteries, warning devices, braking devices, starting control devices and steering controls.

4.1.4 Maintenance and repairs shall be made with first class materials and workmanship and equipment shall be serviced on schedule as prescribed by manufacturers.

4.2 *Check-up* - The following items shall be particularly investigated for conditions.

4.2.1 wiring, connections and insulation that are deteriorated shall be replaced.

4.2.2 Cover bolts, connections, sealing surfaces gaskets should be tight.

4.2.3 Damaged insulation and gaskets shall be replaced.

4.2.4 Mechanical parts that are broken or worn out shall be replaced.

4.2.5 Motors should not be over lubricated and all excessive oils and grease removed.

4.2.6 Tires that are worn out, should be replaced, care shall be taken that at least two tires are of the static conductor type.

4.3 Batteries - The following precautions should be observed for the care and maintenance of batteries.

4.3.1 Electric Batteries may require recharging each day. Usually the battery is charged without removing it from the truck; however, occasionally it is necessary to lift out the battery for general repairs. During the charging operation, the vents should be open to effectively exhaust all gases. Open flames and smoking shall not be permitted in the charging room. To avoid damaging etc. it is advisable to disconnect the truck line and insert the charging plug into the battery so that it is impossible to move the truck while connected to the charging panel.

4.3.2 Switchboard and charging apparatus shall be installed in full accordance with the rules of the National Electric Code.

4.3.3 Preparing Electrolytes - while preparing electrolytes, workman should be equipped with personal protective devices such as rubber gloves, goggles and rubber aprons:

4.3.4 Splash Prevention - To prevent splashes, the acid should be poured in water; water should never be poured into acid.

4.3.5 Neutralizer Solutions - A solution that will act as a neutralizer for lead battery acid shall be kept in the maintenance department to use in the event of spills of battery acid on persons or clothing. Nicol-iron storage batteries which use an alkali solution for the electrolyte, requires a 10 percent solution of acetic acid available for neutralizing in the event of splashes. Potable running water from faucets or hose shall be available for washing acids or alkalis from the eyes or other parts of the body or clothing in case of splashes or spills.

SECTION 5 - GASOLINE POWERED INDUSTRIAL TRUCKS

5.1 General

Gasoline Powered Industrial Trucks involve fire hazards which cannot be wholly eliminated. They may be used outside and inside of buildings, but their operations are limited to certain locations depending upon the degree of hazard of the location.

5.2 Limitations

Standard Gasoline Powered Industrial Trucks shall not operate in hazardous locations that are defined and classified in Sec. 2.3.1, 2.3.2 and 2.3.3 of these regulations. This excludes them from baling and fibre storehouses, fibre preparation occupancies such as cotton opener and picker rooms, waste paper storage, areas containing paper working, combustible scrap and processes involving hazardous chemicals, areas where flammable liquids are used in open containers and at painting and spraying operations.

5.3 Exceptions

In cotton carding, spinning and weaving rooms and in occupancies of comparable combustibility the use of gasoline powered industrial trucks should be avoided wherever possible and shall be limited to clear, wide open, main aisles and otherwise strictly controlled areas, if there is no reasonable or practical alternative. Under such conditions if the operation, inspection and maintenance, are of approved standards, the Department may give approval for operation in the such locations.

5.4 Use

Standard Model Gasoline Powered Industrial trucks may be used outdoors or indoors provided the building occupancy and materials are non-combustible and provided further that the specifications and requirements of Section 6 are met.

SECTION 6 - GASOLINE POWERED INDUSTRIAL TRUCK SPECIFICATIONS

6.1 *Standard Industrial Gasoline Powered Trucks* shall meet the following minimum specifications and shall be substantially constructed in order to be approved..

6.2 *Special Features* to be included on approved type trucks are:

1. Proper arrangement of fuel systems to avoid ignition sources.
2. Protection of fuel systems against mechanical injury.
3. Elimination of grease and oil-collecting pans and pockets.
4. Safe arrangement of electrical wiring.
5. Metal cup for fuel line sediment bowl.
6. Special muffler, fill and vent openings, flame arresters.

6.3 *Fire safeguards* shall in particular include the following:

6.3.1 Mufflers shall be specially designed to cool exhaust gases and prevent emission of sparks and flames. A water type muffler is preferred. In water type muffler, the flame is directed against the water surface which extinguishes sparks and cools the gases. Maintenance of water level is essential.

6.3.2 Condensing-type mufflers are acceptable if the installation of the water type is impractical. Condensing mufflers have extensive cooling surfaces. Hot carbon particles are dropped out by changing the direction of the exhaust gas discharge. Efficiency is lowered after the temperature of the surface is increased by continued heavy duty service.

6.3.3 Fill and Vent Fittings shall protect the vapor space of the fuel tank and allow for displacement of vapor under normal and emergency conditions. This device includes a flame arrester consisting of two concentric perforated brass tubes which project into the fill pipe. The cap cannot be removed from the fitting and a spring makes it strap shut when released.

6.3.4 Flame Arrester is required on the carburetor airintake to prevent discharge of flame in the event of a back-fire at this point.

SECTION 7 - INSPECTION & MAINTENANCE - GASOLINE POWERED INDUSTRIAL TRUCKS

7.1 *General*

Gasoline Powered Industrial Trucks have fire hazards confined to the truck, due to various causes, that should be eliminated by careful inspection, maintenance and operation.

7.2 *Check up and Fire Causes* - The following items shall be particularly guarded against and investigated.

- (a) Gasoline spilled during refueling
- (b) Fuel from broken or leaking fuel lines
- (c) Flooded carburetor
- (d) Accumulations of oils and greases from lubrication
- (e) Mechanical injury to fuel tanks and fuel lines caused by collision upsets and careless operation

(f) Gasoline, oils and greases as mentioned above may be ignited by:

1. Hot Engines
2. Back fire or sparks from exhaust
3. By starting or short circuited ignition
4. Outside sparks and surrounding conditions

7.3 *Inspection and Maintenance* shall be performed with first class materials and workmanship and shall conform to the following:

7.3.1 A regular inspection and maintenance schedule shall be established preferably on a weekly basis.

7.3.2 Inspect and Service in accordance with manufacturer's instructions. Check the motor brakes, electrical equipment and mechanical features.

7.3.3 Lubricating oil and grease in excessive amounts shall be removed. Too much may be more serious than too little. Keep machinery and trucks clean at all times.

7.3.4 The Carburetor should have preventors for backfires and flooding. They shall be kept clean and properly adjusted.

7.3.5 Mufflers shall be given special attention to prevent ignition as a result of blazing gases or hot carbon. The water level of water type mufflers shall be maintained at proper height.

7.4 *Refueling* shall be done in accordance with the following minimum requirements.

7.4.1 Refuel outdoors in a safe location. Gasoline tanks shall be filled in the open air or in a safe location away from hazardous areas.

7.4.2 Filling hose and equipment should be properly grounded.

7.4.3 Tanks shall not be filled from open containers such as buckets etc.

7.4.4 Run overs from filling the tank too full, or by careless manipulation of the filling hose are to be avoided.

7.4.5 Drained gasoline tanks shall be done into standard safety, self-closing cans at suitable locations. They shall never be drained into sewers. The safety of the adjoining buildings or other property may be involved.

7.4.6 Drains connected with town and city sewers should be equipped with oil separators which should be cleaned frequently.

SECTION 8 - ADDITIONAL SAFETY STANDARDS

8.1 *Collision Hazards*

The use of industrial power trucks inside of buildings introduces the possibility that operators will run trucks into pipes or columns collide with objects and cause breakage or structural damage. Collision hazards may be minimized by efficient maintenance of buildings, proper storage of materials carefully laid out aisles and passageways and providing traffic passageways properly lighted and posted with warning signs. Frequent inspection and maintenance of equipment, obeying traffic regulations and the careful operation of equipment is mandatory.

8.2 *Building Structures*

Building structures must have sufficient strength to support the vehicle plus the load. Companies contemplating the purchase of power industrial trucks and tractors should give careful consideration to the strength of floors to be used by such equipment. The weight of this equipment may cause severe stresses in floors, and elevators not built for such heavy concentrated loads. All floors and elevators to be used by trucks and tractors, shall be constructed to support safely the loads they are to carry. Floors shall be built according to standard specifications taking into account the weight per square foot of load, speed of the truck, and type of tires on the equipment.

8.3 *Floors & Surfaces*

Flooring may be of different types, such as wood, planks, wood block, bricks and asphalt and should give satisfactory service for all types of plant traffic when properly constructed and maintained. Earth floors may be satisfactory if they can be kept dry, with a hard smooth surface that is free of holes and ruts. Some buildings have I beams laid in concrete floors, so that the upper surfaces of the I beams form a track or road for trucks and tractors. This is satisfactory from the standpoint of hauling, but it offers a distinct slipping hazard to workers who are employed in or about such tracks, as ultimately the steel becomes smooth and polished, and steel either wet or oily, has an extremely low coefficient of friction. Where used, they should be kept free of water and oil and if necessary, roughened occasionally with a cape chisel or sand blasting apparatus. This should be accomplished when the plant is closed down, such as during week-ends. Floors with holes, those badly worn or otherwise damaged, not only impede traffic, delay operations, and make for inefficiency, but also create serious accident hazards. A comparatively small hole in a floor may cause a truck to swerve from its course, spill the load, or even upset the truck. This may result in injury to the

operator or to workmen who are stationed near the aisles, and may also damage machines and materials. Floors over which trucking is done shall be kept smooth and free from obstructions. They shall be inspected and repaired frequently. When repairs cannot be made immediately and the situation warrants it, traffic should be rerouted or the damaged location suitably guarded with barricades or marked with legible signs.

8.4 Aisles

Aisles shall for the purpose and intent of these regulations conform to the following standards and recommended practices.

8.4.1 Marking

All traffic aisles shall be plainly marked and neither materials nor equipment shall be permitted to project over or be left inside these traffic lines. Marking border lines may be made by the use of ordinary whitewash or various colored paints or by metal floor markers or by inserting different colored or different patterned brick, concrete or wood in the floor. Where such markings are used the border line should not project above the level of the floor to create a stumbling hazard. Traffic in narrow aisles should be routed for one way traffic only. This will reduce congestion, increase production, and eliminate the hazard of passing. All aisles and passageways must be kept clear and free from obstructions.

8.4.2 Width of Aisles

For one way traffic the aisles should be not less than two feet wider than the widest vehicle loaded. For two way traffic the aisles should be not less than three feet wider than twice the width of the widest vehicle loaded. Where materials must be transferred from one department to another by trucks, the aisleways should be sufficiently wide to permit trucks to pass one another without crowding and without endangering persons who may be at work at machines along the aisleways. It is essential also that sufficient width be maintained for fire apparatus to be moved through the plant without hindrance.

8.4.3 Recommendations for Aisles

Some companies have provided main aisles 20 feet in width, and cross aisles 8 feet in width, others find that main aisles 15 feet in width are sufficient. It is recommended that wherever trucking is done, the aisleways should be at least 8 feet in width, or if special trucks are used, a width that will allow two trucks to pass in safety. In some buildings where traffic is heavy, aisles from 12 to 20 feet in width may be necessary, depending upon the nature of the material handled and type of power equipment used.

8.4.4 Ramps

These aisleways and traffic routes include ramps and inclines, the ramps and inclines shall be as wide as the aisles to avoid "bottlenecks". Grade-Ramps should be constructed at a grade sufficiently low (not more than 10 per cent) to permit safe use of power trucks and tractors, and should be constructed of material that will afford suitable traction. Ramps should be well lighted to show the difference in levels.

8.4.5 Cross Aisles

Cross aisles should be avoided at top and bottom of ramps and inclines and if possible, the aisles and ramp should be in a straight line.

8.4.6 Speed

Operators should reduce the speed of the vehicles and test their brakes before descending ramp and inclines or when crossing aisles or rounding corners.

8.4.7 Pedestrians

Workers should not be permitted to walk down ramp ahead of descending vehicles. Ramps used for both truck and pedestrian traffic should have an extra three foot width reserved and physically separated for pedestrian traffic.

8.5 Traffic Layout in New Buildings and Control

In constructing new buildings and laying out traffic routes, it is important to avoid sharp ramps and inclines, corners, narrow passageways, and low ceilings. Building pillars and stanchions should be so located or guarded as to avoid collision. Constructional defects in existing buildings can in some measure be counteracted. Angle mirrors located at sharp turns and intersections lessen the danger of collision.

Passageways that are necessarily narrow should be restricted to one way traffic. The relocating of machines and other equipment may make for better routing of traffic.

8.6 Lighting

Buildings shall be well lighted for good visibility. In locations subject to explosion hazards all electric fixtures shall be explosive proof and wiring in conduit in accordance with the National Electric Code. Ramps, and aisles and trucking areas shall be lighted in accordance with Department Rules and Regulations governing Lighting in Places of Employment.

8.7 Visibility

To increase the visibility, building columns, posts, etc. should be painted with contrasting colors such as orange and white, black and white, or orange and black bands. Stop signs should be installed to indicate the need for stopping before crossing aisles used for through traffic. A standard system of painting assists in regulating traffic, reduces confusion at cross-overs, and helps to eliminate a number of serious accident hazards.

8.8 Ventilation

Building shall be kept free of accumulations of flammable vapors, dusts or carbon monoxide from the operation of gasoline trucks. Sufficient ventilation should be provided at the ceiling and floor level by blowers, exhaust fans, ventilators or some other efficient means.

8.9 Fire Fighting Equipment

It is required that each power Industrial Truck be equipped with a 4 lb. carbon dioxide fire extinguisher or vaporizing liquid extinguisher of at least 1 quart capacity or with a dry powder type extinguisher. It is advisable, but not compulsory that an automatic extinguisher system be a part of the truck fire equipment in addition to the portable extinguishers.

8.10 Qualifications and Conduct of Operators

Operators - All vehicles shall be operated by experienced operators, learners under the supervision of an experienced operator, a repair man, or an inspector. No one but an authorized person shall operate a vehicle.

8.10.1 Qualifications of Operators

- (a) No person shall operate a vehicle unless he can read and understand the signs, notices, operating instructions, and is familiar with the work involved.
- (b) No person under the age of 18 shall operate this type of equipment.
- (c) No person with seriously defective eyesight or hearing shall be an operator.
- (d) No person subject to epilepsy, heart failure or similar ailments shall be an operator.
- (e) No person failing to meet the above qualifications shall be permitted to operate vehicles.
- (f) Regular operators shall be given a physical examination.
- (g) Operators shall not be under the influence of intoxicating liquors.

8.10.2 Choice of Operators

A particular group of men should be assigned to be operators, and each should become familiar with the vehicle, thereby gaining greater efficiency and cooperation of the working force.

8.10.3 Loading

A vehicle shall not be loaded beyond the safe working load. The operator shall be responsible for knowing the capacity of his equipment and the permissible load in all operating areas.

8.10.4 Moving the Load

- (a) The operator shall see that the load is well secured and properly balanced and that the load will not obstruct his vision in such a way as to make the operation of the vehicle hazardous.
- (b) Sudden starts and stops shall be avoided.
- (c) No person shall be permitted to stand under the load.

Responsibility - Operator shall familiarize himself with the vehicle and its proper care. If adjustments or repairs are necessary, or any defects are known, he shall report the same promptly to proper authority.

8.10.5 Re-fueling

Operators shall see that all trucks are refueled outdoors in a safe location in accordance with section 7.7

8.10.6 Idle Trucks and Storage - Idle trucks shall be stored by the operator in a garage or in locations away from manufacturing areas or stored combustible materials.