

NFPA 407

Standard for Aircraft Fuel Servicing

2007 Edition



NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471
An International Codes and Standards Organization

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NFPA 407
Standard for
Aircraft Fuel Servicing
2007 Edition

This edition of NFPA 407, *Standard for Aircraft Fuel Servicing*, was prepared by the Technical Committee on Aircraft Fuel Servicing. It was issued by the Standards Council on July 28, 2006, with an effective date of August 17, 2006, and supersedes all previous editions.

This edition of NFPA 407 was approved as an American National Standard on August 17, 2006.

Origin and Development of NFPA 407

Active work by NFPA leading toward the development of this standard began in 1951. Since then, the technical committee responsible has made every effort to keep the text up-to-date, and subsequent editions have been published almost every year from 1955 to 1975. The 21st edition was issued in 1980, and the technical committee completed a partial revision in 1984.

The 1990 edition was a complete rewrite that reorganized the design and operational requirements into separate chapters. The requirements for grounding were deleted, and the requirements for bonding were clarified.

The 1996 edition was a partial revision. Requirements for self-service fueling and rapid refueling of helicopters were added.

The 2001 edition included new requirements for non-driven hydrant carts.

This edition is a partial revision.

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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 firesafe procedures, equipment, and installations for aircraft fuel servicing.



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Changes other than editorial are indicated by a vertical rule beside the paragraph, table, or figure in which the change occurred. These rules are included as an aid to the user in identifying changes from the previous edition. Where one or more complete paragraphs have been deleted, the deletion is indicated by a bullet (•) between the paragraphs that remain.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex C. Editorial changes to extracted material consist of revising references to an appropriate division in this document or the inclusion of the document number with the division number when the reference is to the original document. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex C.

Chapter 1 Administration

1.1 Scope. This standard applies to the fuel servicing of all types of aircraft using liquid petroleum fuel. It does not apply to any of the following:

- (1) In-flight fueling
- (2) Fuel servicing of flying boats or amphibious aircraft on water
- (3) Draining or filling of aircraft fuel tanks incidental to aircraft fuel system maintenance operations or manufacturing

1.2* Purpose.

1.2.1 The purpose of this standard is to establish reasonable minimum fire safety requirements for procedures, equipment, and installations for the protection of persons, aircraft, and other property during ground fuel servicing of aircraft using liquid petroleum fuels. These requirements are based upon sound engineering principles, test data, and field experience.

1.2.2 The fire hazard properties of aviation fuels vary; however, for the purpose of this standard, the same fire safety precautions are specified for all types.

1.3 Units. Where the value for a measurement as specified in this standard is followed by an equivalent value in other units, the first value shall be regarded as the requirement. The equivalent value could be approximate.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2007 edition.

NFPA 30, *Flammable and Combustible Liquids Code*, 2003 edition.

NFPA 70, *National Electrical Code*®, 2005 edition.

NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*, 2000 edition.

NFPA 410, *Standard on Aircraft Maintenance*, 2004 edition.

NFPA 415, *Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways*, 2002 edition.

NFPA 418, *Standard for Heliports*, 2006 edition.

2.3 Other Publications.

2.3.1 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th floor, New York, NY 10036.

ANSI B31.3, *Chemical Plant and Petroleum Refinery Piping*, 1993.

2.3.2 API Publications. American Petroleum Institute, 1220 L Street, N.W., Washington, DC 20005-4070.

API BULL 1529, *Aviation Fueling Hose*, 1998.

2.3.3 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM D 380, *Standard Test Methods for Rubber Hose*, 1994.

2.3.4 AWS Publications. American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.

AWS A5.10, *Specification for Bare Aluminum and Aluminum Alloy Welding Electrodes and Rods*, 1992.

2.3.5 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III Division 1, Hazardous (Classified) Locations*, 2002. Revised August 2004.

2.3.6 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402.

Title 49, Code of Federal Regulations, 1998.

2.3.7 Other Publications. Merriam-Webster's *Collegiate Dictionary*, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 385, *Standard for Tank Vehicles for Flammable and Combustible Liquids*, 2000 edition.



Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster's Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 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.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is 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 that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

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

3.2.7 Standard. A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix or annex, footnote, or fine-print note and are not to be considered a part of the requirements of a standard.

3.3 General Definitions.

3.3.1 Aircraft. A vehicle designed for flight that is powered by liquid petroleum fuel.

3.3.2 Aircraft Fuel Servicing. See 3.3.27.1.

3.3.3 Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Vehicle). See 3.3.35.1.

3.3.4 Aircraft Fuel Servicing Ramp or Apron. An area or position at an airport used for the fuel servicing of aircraft.

3.3.5 Aircraft Fuel Servicing Tank Vehicle (Fueller). See 3.3.35.2.

3.3.6 Aircraft Fueling Vehicle. See 3.3.35.3.

3.3.7 Airport Fueling System. An arrangement of aviation fuel storage tanks, pumps, piping, and associated equipment, such

as filters, water separators, hydrants and station, or aircraft fuel servicing vehicles, installed at an airport and designed to service aircraft at fixed positions.

3.3.8* Aviation Fuel. Any petroleum fuel for use in aircraft engines.

3.3.9 Bulkhead. A liquidtight transverse closure between compartments of a cargo tank.

3.3.10 Burst Pressure. See 3.3.24.1.

3.3.11* Cargo Tank. A container used for carrying fuels and mounted permanently or otherwise secured on a tank vehicle.

3.3.12 Cathodic Protection. A method of controlling or impressing an electrical current to prevent corrosion of metal components of airport fueling systems that are in contact with the ground.

3.3.13 Deadman Control. A device that requires a positive continuing action of a person to allow the flow of fuel.

3.3.14 Electric Hand Lamp. A portable lamp other than a flashlight.

3.3.15 Emergency Fuel Shutoff. A function performed to stop the flow of fuel in an emergency.

3.3.16* Fuel Servicing Station. A unit that includes all necessary equipment to enable the transfer of fuel into or from an aircraft or fueller.

3.3.17 Fueller. See 3.3.35.2, Aircraft Fuel Servicing Tank Vehicle (Fueller).

3.3.18 Head. A liquidtight transverse closure at the end of a cargo tank.

3.3.19 Hydrant Cart. A non-driven vehicle used to deliver fuel from a hydrant to an aircraft.

3.3.20 Hydrant Valve. An outlet of an airport fueling system that includes a deadman-controlled valve and adapter assembly to which a coupler on a hose or other flexible conduit on an aircraft fuel servicing vehicle can be connected.

3.3.21 Hydrant Vehicle. See 3.3.35.4.

3.3.22 Misfueling. The accidental fueling of an aircraft or refueling vehicle tank with an incorrect grade of product.

3.3.23 Overshoot. The quantity of fuel passing through the valve after the deadman control is released.

3.3.24 Pressure.

3.3.24.1 Burst Pressure. The pressure at which a component ruptures.

3.3.24.2 Test Pressure. The pressure to which a system or a component of a system is subjected to verify the integrity of the system or component.

3.3.24.3 Working Pressure. The maximum allowable pressure, including momentary surge pressure, to which a system, hose, or other component can be safely subjected while in service.

3.3.25 Pressure Fuel Servicing. See 3.3.27.2.

3.3.26 Self-Service Fueling. The dispensing of aviation fuels into aircraft fuel tanks by persons other than the facility owner/operator.

3.3.27 Servicing.

3.3.27.1 Aircraft Fuel Servicing. The transfer of fuel into or from an aircraft.

3.3.27.2 Pressure Fuel Servicing. A system used to fuel an aircraft by close coupling under pressure.

3.3.28 Tank Baffle. A nonliquidtight transverse partition in a cargo tank.

3.3.29 Tank Compartment. A liquidtight division in a cargo tank.

3.3.30 Tank Full Trailer. A vehicle that is not self-propelled and that has a cargo tank for the transportation of aviation fuel mounted thereon or built as an integral part thereof. It is so constructed that its weight and load rest on its own wheels.

3.3.31 Tank Semitrailer. A vehicle that is not self-propelled and that has a cargo tank for the transportation of aviation fuel mounted thereon or built as an integral part thereof. It is so constructed that when drawn by a tractor by means of a fifth wheel connection, some of its load and weight rests upon the towing vehicle.

3.3.32 Tank Truck. Any single self-propelled motor vehicle equipped with a cargo tank mounted thereon and used for the transportation of flammable and combustible liquids or asphalt. [385, 2000]

3.3.33 Tank Vehicle. See 3.3.35.5.

3.3.34 Test Pressure. See 3.3.24.2.

3.3.35 Vehicle.

3.3.35.1 Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Vehicle). A vehicle equipped with facilities to transfer fuel between a fuel hydrant and an aircraft.

3.3.35.2 Aircraft Fuel Servicing Tank Vehicle (Fueler). A vehicle having a cargo tank (tank truck, tank full trailer, tank semitrailer) designed for or used in the transportation and transfer of fuel into or from an aircraft.

3.3.35.3 Aircraft Fueling Vehicle. A fuel servicing hydrant vehicle, hydrant cart, or an aircraft fuel servicing tank vehicle.

3.3.35.4 Hydrant Vehicle. See 3.3.35.1, Aircraft Fuel Servicing Hydrant Vehicle (Hydrant Vehicle).

3.3.35.5 Tank Vehicle. Any tank truck, tank full trailer, or tractor and tank semitrailer combination.

3.3.36 Working Pressure. See 3.3.24.3.

Chapter 4 Design

4.1 General.

4.1.1 Fueling Hose Apparatus. Nozzle receptacles and hose storage shall be arranged to avoid kinks and maintain the hose bend radius within the requirements of API BULL 1529.

4.1.2 Electrostatic Hazards and Bonding.

4.1.2.1 A provision for bonding shall be incorporated in the design of fuel servicing vehicles or carts and systems to prevent differences in electrostatic potential in accordance with Section 5.4.

4.1.2.2 The maximum resistance between the bonding cable clip and the fueling system framework shall not exceed 25 ohms.

4.1.2.3 Bonding cables shall be constructed of conductive, durable, and flexible material.

4.1.2.4 Bonding connections shall be electrically and mechanically firm. Jacks, plugs, clamps, and connecting points shall be clean, unpainted metal to provide a positive electrical connection.

4.1.2.5 API BULL 1529 Type C hose (semiconductive) shall be used to prevent electrostatic discharges but shall not be used to accomplish required bonding. API BULL 1529 Type A hose that does not have a semiconductive cover shall not be used. Type F hose (hard wall) and Type CT hose (cold temperature) shall be permitted because they have semiconductive covers.

4.1.2.6* The design of airport fueling systems shall incorporate the provision of a 30-second relaxation period between the filter separator, monitors, or other filtration devices discharging into tanks.

4.1.2.6.1 Paragraph 4.1.2.6 shall not apply to the actual refueling of an aircraft.

4.1.2.6.2 Paragraph 4.1.2.6 shall not apply to fuels with static dissipater additives.

4.1.3 No Smoking Signs. Entrances to fueling areas shall be posted with "no smoking" signs.

4.1.4 Radar Equipment.

4.1.4.1 Aircraft Radar Equipment.

4.1.4.1.1 Surveillance radar equipment in aircraft shall not be operated within 90 m (300 ft) of any fueling, servicing, or other operation in which flammable liquids, vapors, or mist could be present.

4.1.4.1.2 Weather-mapping radar equipment in aircraft shall not be operated while the aircraft in which it is mounted is undergoing fuel servicing.

4.1.4.2* Ground Radar Equipment.

4.1.4.2.1 Antennas of airport flight traffic surveillance radar equipment shall be located so that the beam will not be directed toward any fuel storage or loading racks within 90 m (300 ft). Aircraft fuel servicing shall not be conducted within this 90 m (300 ft) distance.

4.1.4.2.2 Antennas of airport ground traffic surveillance radar equipment shall be located so that the beam will not be directed toward any fuel storage or loading racks within 30 m (100 ft). Aircraft fuel servicing or any other operations involving flammable liquids or vapors shall not be conducted within 30 m (100 ft) of such antennas.

4.1.5 Emergency Fire Equipment Accessibility. Accessibility to aircraft by emergency fire equipment shall be considered in establishing aircraft fuel servicing positions.

4.1.6 Portable Fire Extinguishers.

4.1.6.1* Portable extinguishers shall be provided in accordance with 4.3.9 and Section 5.13.

4.1.6.2 Extinguishers shall conform to the requirements of NFPA 10.



4.1.7* Deadman Controls.

4.1.7.1 The valve that controls the flow of fuel to an aircraft shall have a deadman control. The deadman control device shall be arranged to accommodate the operational requirements of Section 5.15. The fuel flow control valve shall be one of the following:

- (1) The hydrant pit valve
- (2) At the tank outlet on a tank vehicle
- (3) A separate valve on the tank vehicle
- (4) On the hose nozzle for overwing servicing

4.1.7.2 Deadman controls shall be designed to preclude defeating their intended purpose.

4.1.8 **Pressure Fuel Servicing System Controls.** The system shall be designed to minimize surge pressure. The overshoot shall not exceed 5 percent of actual flow rate from the time the deadman is released until the flow stops completely. The control valve shall be located and designed so that it will not be rendered inoperative by a surface accident, power failure, or spill. The control valve shall be fail-safe by closing completely in the event of control power loss.

4.2* Aircraft Fueling Hose Requirements.

4.2.1 **Performance Requirements.** Hose shall comply with the requirements of API BULL 1529. Couplings shall comply with the requirements of API BULL 1529.

4.2.2 Additional Requirements.

4.2.2.1 Each coupled length of hose shall be tested at the same minimum proof pressure rating for that grade of hose as defined in API BULL 1529.

4.2.2.2 A test certificate shall be provided for each coupled length of hose and shall state the following:

- (1) Manufacturer's name of hose
- (2) Manufacturer's name of couplings
- (3) Hose type
- (4) Hose grade
- (5) Size and length of hose
- (6) Serial number or reference number of hose
- (7) Quarter and year of manufacture of hose
- (8) Model number of couplings
- (9) Sizes of coupling ferrules
- (10) Hydrostatic test pressures
- (11) Coupled length serial number
- (12) Identification of individual responsible for coupling the hose
- (13) Name and address of company responsible for coupling the hose
- (14) Date of certification

4.2.2.3 The coupling tests as specified in API BULL 1529 shall be performed for each hose grade, type, and manufacturer.

4.2.2.4 Each coupling of a coupled length of hose shall be permanently marked with a serial number corresponding to its hydrostatic test certificate.

4.2.2.5 The hose at the end of each coupling ferrule shall be permanently marked prior to hydrostatic testing to serve as a reference to determine whether a coupling has slipped during testing or while in service.

4.2.3 **Hydrostatic Testing.** Hydrostatic testing shall be in accordance with ASTM D 380.

4.2.3.1 Following a hydrostatic test, all of the water shall be drained and the hose shall be dried internally. The open ends, including the threads of the couplings, shall be suitably covered to protect the threads and to prevent contamination.

4.2.3.2 A hose that is recoupled for any reason shall be hydrostatically tested and recertified to the same criteria as a newly coupled hose.

4.3 **Aircraft Fuel Servicing Vehicles and Carts.** Aircraft fuel servicing tank vehicles that are used on public highways also shall comply with NFPA 385.

4.3.1 Materials.

4.3.1.1 In addition to any specific requirements in this chapter, only materials safe for use in the service intended and compatible with fuel applications shall be used in the construction of aircraft fuel servicing vehicles and hydrant fuel service carts.

4.3.1.2 Magnesium shall not be used in the construction of any portion of an aircraft fuel servicing vehicle or cart.

4.3.2 **Vehicle Cargo Tanks.** Every cargo tank shall be supported by and attached to, or shall be a part of, the tank vehicle upon which it is carried in accordance with NFPA 385.

4.3.3 Static Protection.

4.3.3.1 All metallic components and vehicle or cart chassis shall be electrically bonded to prevent a difference in their electrostatic potential.

4.3.3.2 A provision shall be made for the bonding of the tank to the fill pipe or the loading rack as specified in 5.20.2.1. Electrical continuity between the loading rack and fill pipe shall be accomplished as specified in Section 5.4.

4.3.3.3 Cables shall be provided on the vehicle or cart to allow the bonding operations specified in Section 5.4.

4.3.3.4 A cable with a clip or plug shall be attached to each overwing nozzle to facilitate compliance with 5.4.2.

4.3.4 **Propulsion or Power Engine Compartments.** Propulsion or power engine equipment shall be in a compartment housing that shall minimize the hazard of fire in the event of leakage or spillage of fuel during the servicing of an aircraft.

4.3.4.1 The engine air intake shall retain the manufacturer's configuration to prevent the emission of flame in case of back-firing.

4.3.4.2 Where provided, the sediment bowl in the fuel supply line shall be of steel or material of equivalent fire resistance.

4.3.5 Containers and Systems for Flammable Liquids Other than Cargo Tanks.

4.3.5.1 Vehicle or cart fuel tanks and containers for other flammable liquids shall be made of metal and shall be designed, constructed, and located in a manner that precludes hazardous arrangements. Tanks shall be substantially protected by their location, and fill pipes shall not project beyond the vehicle profile. Tanks and containers shall vent away from sources of ignition during filling. Any arrangement not protected by location shall be listed for such use. The fuel tank arrangement shall allow for drainage without the tank's removal from its mountings.

4.3.5.2 Gravity feed systems shall not be used.

4.3.5.3 All portions of the flammable liquid feed system shall be constructed and located to minimize the fire hazard. The lines shall be made of materials not adversely affected by the fluid or by other materials likely to be encountered, shall be of adequate strength for the purpose, and shall be secured to avoid chafing or undue vibration.

4.3.6 Engine Exhaust System.

4.3.6.1* The engine exhaust system shall be designed, located, and installed to minimize the hazard of fire in the event of any of the following:

- (1) Leakage of fuel from the vehicle or cart (where applicable) fuel tank or fuel system
- (2) Leakage from the fuel dispensing system of the vehicle or cart
- (3) Spillage or overflow of fuel from the vehicle or cart (if applicable) fuel tank or the cargo tank
- (4) Spillage of fuel during the servicing of an aircraft

4.3.6.2 Exhaust system components shall be secured and located clear of components carrying flammable liquids and separated from any combustible materials used in the construction of the vehicle.

4.3.6.3 Suitable shielding shall be provided to drain possible fuel spillage or leakage away from exhaust system components safely.

4.3.6.4 Exhaust gases shall not be discharged where they could ignite fuel vapors that could be released during normal operations or by accidental spillage or by leakage of fuel.

4.3.6.5 A muffler (or silencer) cutout shall not be provided.

4.3.6.6 Gasoline-powered engines on fuel servicing vehicles shall be provided with flame and spark arresting exhaust systems.

4.3.6.7 All engines on fuel servicing vehicles shall be provided with flame and spark arresting exhaust systems.

4.3.7 Vehicle or Cart Lighting and Electrical Equipment.

4.3.7.1 Battery Compartments. Batteries that are not in engine compartments shall be securely mounted in compartments to prevent accidental arcing. The compartment shall be separate from fueling equipment. Suitable shielding shall be provided to drain possible fuel spillage or leakage away from the compartment. The compartment shall be provided with a vent at the top of the compartment.

4.3.7.2 Wiring shall be of adequate size to provide the required current-carrying capacity and mechanical strength. Wiring shall be installed to provide protection from physical damage and from contact with spilled fuel either by its location or by enclosing it in metal conduit or other oil-resistant protective covering. All circuits shall have overcurrent protection. Junction boxes shall be weatherproofed.

4.3.7.3 Spark plugs and other exposed terminal connections shall be insulated to prevent sparking in the event of contact with conductive materials.

4.3.7.4* Motors, alternators, generators, and associated control equipment located outside of the engine compartment or vehicle cab shall be of a type listed for use in accordance with NFPA 70 Class I, Division 1, Group D locations.

4.3.7.5 Electrical equipment and wiring located within a closed compartment shall be of a type listed for use in accordance with NFPA 70 Class I, Division 1, Group D locations.

4.3.7.6 Lamps and switching devices, other than those covered in 4.3.7.4 and 4.3.7.5, shall be of the enclosed, gasketed, weatherproof type. Other electrical components shall be of a type listed for use in accordance with NFPA 70 Class I, Division 2, Group D locations.

4.3.7.7 Electrical service wiring between a tractor and trailer shall be designed for heavy-duty service. The connector shall be of the positive-engaging type. The trailer receptacle shall be mounted securely.

4.3.8 Cabinets. All cabinets housing vehicle auxiliary equipment shall have expanded metal flooring, perforated metal grating-type flooring, or open floor to facilitate air circulation within the enclosed space and to prevent the accumulation of fuel.

4.3.9 Fire Extinguishers for Aircraft Fuel Servicing Vehicles or Carts.

4.3.9.1 Each aircraft fuel servicing tank vehicle shall have two listed fire extinguishers, each having a rating of at least 20-B:C with one extinguisher mounted on each side of the vehicle.

4.3.9.2 One listed extinguisher having a rating of at least 20-B:C shall be installed on each hydrant fuel servicing vehicle or cart.

4.3.9.3 Extinguishers shall be readily accessible from the ground. The area of the paneling or tank adjacent to or immediately behind the extinguisher(s) on fueling vehicles or carts shall be painted with a contrasting color.

4.3.9.4 Extinguishers shall be kept clear of elements such as ice and snow. Extinguishers located in enclosed compartments shall be readily accessible, and their location shall be marked clearly in letters at least 50 mm (2 in.) high.

4.3.10 Full Trailers and Semitrailers.

4.3.10.1 Trailer connections shall be designed to secure the trailer firmly and to prevent the towed vehicle from swerving from side to side at the speeds anticipated so that the trailer essentially remains in the path of the towing vehicle.

4.3.10.2 Full trailers and semitrailers shall be equipped with brakes on all wheels.

4.3.11 Smoking Restrictions.

4.3.11.1 A "no smoking" sign shall be posted prominently in the cab of every aircraft fuel servicing vehicle.

4.3.11.2 Smoking equipment such as cigarette lighters and ash trays shall not be provided. If a vehicle includes such equipment when initially procured, it shall be removed or rendered inoperable.

4.3.12 Cargo Tanks.

4.3.12.1 Cargo tanks shall be constructed in accordance with 49 CFR 178.34, 5 DOT MC406, or other equivalent standard for international application.

4.3.12.2 Aluminum alloys for high strength welded construction shall be joined by an inert gas arc welding process using filler metals R-GR40A, E-GR40A (5154 alloy), R-GM50A, and E-GM50A (5356 alloy) in accordance with AWS A5.10.



4.3.12.3 Tank outlets shall be of substantial construction and shall be attached securely to the tank.

4.3.12.4 Every cargo tank or compartment over 2.3 m (7½ ft) long shall be provided with baffles, the total number of which shall be such that the distance between any two adjacent baffles, or between any tank head or bulkhead and the baffle closest to it, shall in no case exceed 1.5 m (5 ft). The cross-sectional area of each baffle shall be not less than 80 percent of the cross-sectional area of the tank, and the thickness of a baffle shall be not less than that required for the heads and bulkheads of the cargo tank in which it is installed.

4.3.12.5 Venting shall be in accordance with 49 CFR, DOT MC406.

4.3.12.6 Cargo drawoff valves or faucets projecting beyond the frame of a tank vehicle shall be protected against damage.

4.3.13 Fill Openings and Top Flashings.

4.3.13.1 Dome covers shall be provided with a forward-mounted hinge and self-latching catches and shall be fitted with watertight fuel-resistant seals or gaskets (designed to prevent spillage or leakage from overturn and to prevent water entry). Dome covers shall automatically close and latch with the forward motion of the vehicle.

4.3.13.2 Drains from top flashing shall divert spilled fuel from possible sources of ignition, including the engine, the engine exhaust system, the electrical equipment, or an auxiliary equipment enclosure.

4.3.13.3 The tank fill openings shall be protected against overturn damage by a rigid member(s) fixed to the tank and extending a minimum of 25 mm (1 in.) above any dome cover, handle, vent opening, or projection of the unit. Overturn protection shall be braced adequately to prevent collapse. The overturn protection shall be designed to channel rain water, snow, or fuel to the exterior of the cargo tank.

4.3.14 Piping, Joints, Flanged Connections, and Couplings.

4.3.14.1 Product piping shall be metal and rated for the system working pressure or at least 860 kPa (125 psi), whichever is greater.

4.3.14.2 Except as provided in 4.3.14.3, all joints shall be welded. Elbows and fittings shall be kept to a minimum and, where used, shall be of the preformed welding type.

4.3.14.3 Flanged connections or approved couplings shall be provided to avoid the need for cutting and welding where components are serviced or replaced. Gaskets in flanged connections shall be of a material and design that resist fire exposure for a time comparable to the flange and bolts.

4.3.14.4 Piping shall be supported adequately.

4.3.15 Outlet Valves and Emergency Shutoff Controls.

4.3.15.1 The outlets of each cargo tank or compartment, including water drawoffs, shall be equipped with shutoff valves located inside the shell or in the sump where it is an integral part of the shell. The cargo tank outlet shall be designed so that the valve needs to be kept closed except during loading and unloading operations. The water drawoff connection shall be of a type that cannot be blocked open.

4.3.15.2 The operating mechanism for each tank outlet valve shall be adjacent to the fuel delivery system operating controls and shall be arranged so that the outlet valve(s) can be closed

simultaneously and instantly in the event of a fire or other emergency. A means shall be provided to assure proper operation. The vehicle shall have at least two emergency shutoff controls, one mounted on each side of the vehicle. These controls shall be quick-acting to close the tank outlet valve in case of emergency. They also shall be remote from the fill openings and discharge outlets and shall be operable from a ground-level standing position. In addition, all vehicles or carts equipped with a top deck platform shall have an emergency shutoff control operable from the deck.

4.3.15.3 Emergency fuel shutoff controls shall be placarded EMERGENCY FUEL SHUTOFF in letters at least 50 mm (2 in.) high and shall be of a color that contrasts with the placard background for visibility. The method of operation shall be indicated by an arrow or by the word PUSH or PULL, as appropriate. The words EMERGENCY FUEL SHUTOFF shall not be used to identify any control or device on the vehicle other than the emergency fuel shutoff controls.

4.3.15.4 Each outlet valve shall be provided with a fusible device that causes the valve to close automatically in case of fire.

4.3.15.5 A shear section shall be provided between shutoff valve seats and discharge outlets that breaks under strain unless the discharge piping is arranged to afford the same protection and leave the shutoff valve seat intact.

4.3.15.6 Openings in cargo tank compartments that are connected to pipe or tubing shall be fitted with a spring-loaded check valve, a self-closing valve, or similar device to prevent the accidental discharge of fuel in case of equipment malfunction or line breakage. Unless such valves are located inside the tank, they shall be equipped with a shear section as described in 4.3.15.5.

4.3.16 Fuel Dispensing System.

4.3.16.1 The valve that controls the flow of fuel from an aircraft fuel servicing vehicle or cart to an aircraft shall have a deadman control(s) in accordance with the requirements of 4.1.7.

4.3.16.2 The deadman flow control in the nozzle shall be permitted for overwing fueling. Notches or latches in the nozzle handle that could allow the valve to be locked open shall be prohibited. Each overwing servicing nozzle shall have a cable with a plug or clip for bonding to the aircraft. (See 5.4.2.)

4.3.16.3 Nozzles for underwing fueling shall be designed to be attached securely to the aircraft adapter before the nozzle can be opened. Disengaging the nozzle from the aircraft adapter shall not be possible until the nozzle is fully closed.

4.3.16.4 Fuel servicing pump mechanisms shall be designed and arranged so that failure or seizure does not cause rupture of the pump housing, a tank, or of any component containing fuel. Fuel pressure shall be controlled within the stress limits of the hose and plumbing by means of either an in-line pressure controller, a system pressure relief valve, or other suitable means. The working pressure of any system component shall equal or exceed any pressure to which it could be subjected.

4.3.16.5 On tank full trailer or tank semitrailer vehicles, the use of a pump in the tractor unit with flexible connections to the trailer shall be prohibited unless one of the following conditions exists:

- (1) Flexible connections are arranged above the liquid level of the tank in order to prevent gravity or siphon discharge in case of a break in the connection or piping.