
* NOT MEASUREMENT *

* SENSITIVE *

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SUPERSEDING
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FEDERAL SPECIFICATION

SEMITRAILERS, TANK: GASOLINE AND FUEL OIL, COMMERCIAL

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE

1.1 Scope. This specification covers commercial tank semitrailers having either forced or gravity discharge systems, and is designed for transporting gasoline and fuel oil.

1.2 Classification. Semitrailers covered by this specification are of the types and sizes specified (see 6.2), as shown in table I.

TABLE I. Semitrailer classification.

* Type *	* Characteristics *	* Size *		

* I *	* Forced discharge *	* A *	* B *	* C *
* II *	* Gravity discharge *	* A *	* - *	* - *

*Beneficial comments (recommendations, additions, deletions) and any
*pertinent data which may be of use in improving this document should be
*addressed to: Commanding Officer (Code 156), Naval Construction Battalion
*Center, 1000 23rd Avenue, Port Hueneme, CA 93043-4301, by using the
*Standardization Document Improvement Proposal (DD Form 1426) appearing at
*the end of this document or by letter.

FSC 2330

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1.2.1 Size. Size of the semitrailer is determined by its liquid carrying capacity, as follows:

- Size A - 2,000 gallons (7571 liters (L)), single axle.
- Size B - 3,000 gallons (11 356 L), single axle.
- Size C - 4,000 gallons (15 142 L), tandem axle.
- Size D - 5,500 gallons (20 820 L), tandem axle.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Federal Specifications

- W-B-131 - Battery, Storage: Vehicular, Ignition, Lighting and Starting
- VV-F-800 - Fuel Oil, Diesel

Federal Standards

- FED-STD-123 - Marking for Shipment (Civil Agencies)
- FED-STD-297 - Rustproofing of Commercial (Nontactical) Vehicles

Military Specifications

- MIL-G-3056 - Gasoline, Automotive, Combat
- MIL-C-5541 - Chemical Conversion Coatings on Aluminum and Aluminum Alloys
- MIL-T-5624 - Turbine Fuel, Aviation, Grades JP-4 and JP-5
- MIL-N-5877 - Nozzle, Pressure Fuel Servicing, Locking, Type D-1, D-1R, D-2, and D-2R, Nominal 2 1/2-Inch Diameter
- MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys
- MIL-F-8901 - Filter-Separators, Liquid Fuel: and Filter- Coalescer Elements, Fluid Pressure: Inspection Requirements and Test Procedures for
- MIL-C-27487 - Coupling Halves, Quick-Disconnect, Cam-Locking Type
- MIL-F-52308 - Filter Element, Fluid Pressure
- MIL-V-62038 - Vehicles, Wheeled: Preparation for Shipment and Storage of
- MIL-T-83133 - Turbine Fuels, Aviation, Kerosene Types, Grade JP-8
- MIL-C-83413 - Connector, Electrical Ground

Military Standards

- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-1223 - Nontactical Wheeled Vehicles Treatment, Painting, Identification Marking and Data Plate Standards
- MS75021 - Connector, Receptacle, Electrical-12 Contact, Intervehicular, 28 Volt, Waterproof

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(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government documents and publications. The following other Government documents and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DEPARTMENT OF TRANSPORTATION (DoT)
CODE OF FEDERAL REGULATIONS (CFR)

Title 49, CFR, Part 178 - Shipping Container Specifications

DEPARTMENT OF TRANSPORTATION (DoT)

Federal Motor Vehicle Safety Standards
Federal Motor Carrier Safety Regulations

NATIONAL BUREAU OF STANDARDS (NBS)

Handbook 44 - Specifications, Tolerances, and Regulations for
Commercial Weighing and Measuring Devices

(Application for copies of CFR, DoT, and NBS publications should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

2.2 Other publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

American Petroleum Institute (API):

API RP1004 - Bottom Loading and Vapor Recovery for MC-306 Tank Motor
Vehicles

(Application for copies should be addressed to the American Petroleum Institute, 1220 L Street, Northwest, Washington DC 20005.)

American Society For Testing and Materials (ASTM):

ASTM D-910 - Standard Specification for Aviation Gasolines

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

National Association of Architectural Metal Manufacturers (NAAMM):

Metal Bar Grating Manual

(Application for copies of NAAMM publications should be addressed to the National Association of Architectural Metal Manufacturers, 600 S. Federal Street, Suite 400, Chicago, IL 60605.)

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National Fire Protection Association (NFPA):

- NFPA 10 - Portable Fire Extinguishers
- NFPA 385 - Tank Vehicles for Flammable and Combustible Liquids
- NFPA 407 - Aircraft Fuel Servicing

(Application for copies should be addressed to the National Fire Protection Association, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101.)

Society of Automotive Engineers, Inc. (SAE):

- SAE J318 - Air Brake Gladhand Service (Control) and Emergency (Supply) Line Couplers-Trucks, Truck-Tractors, and Trailers
- SAE J534 - Lubrication Fittings
- SAE J551 - Performance Levels and Methods of Measurement of Electromagnetic Radiation from Vehicles and Devices (30 to 1000 MHz)
- SAE J553 - Circuit Breakers
- SAE J560 - Seven-Conductor Electrical Connector for Truck-Trailer Jumper Cable
- SAE J682 - Rear Wheel Splash and Stone Throw Protection
- SAE J700 - Upper Coupler Kingpin- Commercial Trailers and Semitrailers
- SAE J702 - Brake and Electrical Connection Locations - Truck-Tractor and Truck-Trailer
- SAE J1292 - Automobile, Truck, Truck-Tractor, Trailer, and Motor Coach Wiring

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

The European Tyre Rim Technical Organisation (ETRTO):

Standards Manual

(Application for copies of the ETRTO publications should be addressed to the European Tyre and Rim Technical Organisation, 32, Avenue Brugmann, 1060 Brussels, Belgium.)

Tire and Rim Association, Inc. (TRA):

TRA Yearbook

(Application for copies should be addressed to the Tire and Rim Association, Inc., 175 Montrose West Avenue, Suite 150, Copley, OH 44321.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. REQUIREMENTS

3.1 First production vehicle. The contractor shall furnish a semitrailer for first production vehicle inspection.

3.2 Standard semitrailer, components, and accessories. Except as specified herein, the semitrailer, components, and accessories shall be standard or optional items which meet or exceed the requirements of the specification. All items shall be as represented and rated in the manufacturer's sales information, including special or mounted equipment.

3.2.1 Special requirements. In addition to the standard semitrailer and components specified in 3.2, the semitrailer shall be furnished with special equipment as specified herein.

3.2.1.1 Electromagnetic radiation. Electromagnetic radiation from the semitrailer shall be within the limits of SAE J551.

3.2.1.2 Center of gravity. When specified (see 6.2), the longitudinal center of gravity of the unloaded semitrailer shall be located and permanently indicated in a manner to be defined by the procuring activity.

3.3 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification.

3.3.1 Prohibited materials. Asbestos materials shall not be used in any form in any part of the vehicle. No item, part or assembly shall contain radioactive materials in which the specific activity is greater than 0.002 microcurie per gram or activity per item equals or exceeds 0.01 microcuries.

3.3.2 Dissimilar metals. All dissimilar metals used throughout the vehicle shall be insulated from one another to prevent galvanic or electrolytic action.

3.4 Interchangeability. All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to ensure interchangeability of component parts, assemblies, accessories, and spare parts.

3.5 Weights, loads, dimensions, and design.

3.5.1 Net weight. The net weight of the fully equipped semitrailer shall be the minimum practicable for the service intended.

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3.5.2 Rated payload capacity. The rated payload capacity shall be not less than the weight computed from the rated liquid capacity, using 7.5 pounds (lb) (3.4 kilograms (kg)) per gallon for fuel.

3.5.3 Gross weight. The gross vehicle weight (gvw) shall consist of the net weight and the payload.

3.5.4 Weight distribution. Load bearing members of the semitrailer shall be rated for the loads imposed with the tank filled to nominal capacity, the fifth wheel height as specified in table II, and a maximum tank slope of 1 percent to the rear. The proportion of the gvw to be supported on the axle suspensions, measured at the wheels at the ground, shall be not more than the rating of the axles. In addition, the load shall not exceed 19,000 lb (8618 kg) for single axle suspension systems and 34,000 lb (15 422 kg) for tandem axle suspension systems.

3.5.5 Design. The semitrailer, when uncoupled from the truck tractor, and resting on landing legs on level ground, shall conform to the dimensions specified in table II. This shall be accomplished with the tank sloped, as specified in 3.5.4, and without payload.

3.5.6 Department of Transportation Standards. The semitrailer shall comply with all Federal Motor Vehicle Safety Standards (FMVSS), Federal Motor Carriers Safety Regulations (FMCSR), applicable to the type of vehicle furnished, and in effect on the date of manufacture. The vehicle shall be designed and constructed for the legal highway transportation of all types of gasoline, diesel fuel, and turbine fuel, including fuels conforming to MIL-T-5624, MIL-T-83133 and ASTM D-910. Accordingly, the vehicle shall conform in all respects to the Department of Transportation (DoT) Regulations Governing the Transportation of Dangerous Articles in Tank Motor Vehicles. The vehicle shall conform to 49 CFR, Sections 178.345 and 178.346, Specification DOT-406, as published in the latest issues of the Federal Regulations and as modified by all issues of the Federal Register published and in effect prior to completion of the vehicle.

3.5.7 Accessibility. The design of the vehicle and optional equipment shall permit access for routine servicing and shall permit access for replacement and adjustments of component parts and accessories with minimal disturbance of other components and systems.

3.6 Performance. The semitrailer, fully equipped and loaded with rated payload, shall be capable of being towed at speeds as great as 10 miles per hour (mph) (16 kilometers per hour (km/h)) over unimproved roads or reasonably hard uneven terrain and at speeds as great as 65 mph (105 km/h) over improved roads.

3.6.1 Turning ability. The semitrailer shall be capable of assuming a 90 degree (o) angle to the towing vehicle without cramping or damage to the semitrailer or the towing vehicle.

3.6.2 Tracking ability. The semitrailer shall conform to the tracking requirements of DoT Federal Motor Carrier Safety Regulations, section 393.70(a).

3.6.3 Brake performance. The service brakes shall stop the truck tractor-semitrailer combination, with the semitrailer loaded with specified payload, within the stopping distance requirements of DoT Federal Motor Carrier

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Safety Regulations, section 393.52. Requirements shall be met with a truck tractor loaded to its full rated gross vehicle weight (GVW) and gross combination weight (GCW).

3.7 Chassis components.

3.7.1 Chassis. Chassis construction shall be the manufacturer's standard frame, or frameless type, but in either case, the structural integrity requirements of 3.5.6 shall be met.

TABLE II. Dimensions and clearances.

Clearance	Dimension
Ground clearance	Maximum possible, but not less than 10 inches (254 millimeters (mm))
Landing gear ground clearance	See 3.7.9
Minimum swing clearance (radius from center of kingpin to any point 6 inches (152 mm) below upper fifth wheel plate) (not less than)	66 inches (1676 mm) for sizes A and B 82 inches (2083 mm) for sizes C and D
Swing radius from centerline of kingpin to most distant point on semitrailer nose (not more than)	50.5 inches (1283 mm) for sizes A and B 56 inches (1422 mm) for sizes C and D
Distance from centerline of kingpin to front end of semitrailer	24-inch (610 mm) minimum (position for proper load distribution)
Overall length, minimum practicable, but not more than	30 feet (9.14 meter (m)) for sizes A and B 32 feet (9.75 m) for size C 35 feet (10.7 m) for size D
Upper fifth wheel height	47 inches +/-1 inch (1194 mm +25 mm) for sizes A, B and C 52 inches +/-1 inch (1321 mm +25 mm) for size D
Overall semitrailer height	Minimum practicable
Overall semitrailer width	Maximum, 96 inches (2438 mm)

3.7.2 Suspension system. Unless otherwise specified (see 6.2), the semitrailer shall be furnished with the manufacturer's standard suspension system. Each component of the suspension system shall have a rated capacity at least equal to the load imposed on each member measured at the ground, when the semitrailer is loaded with its rated payload (see 3.5.2). Clearance shall preclude interference between wheels and with any other part of the semitrailer under the operating conditions specified herein.

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3.7.3 Axle(s). Size A and size B semitrailers shall be furnished with a single axle. Size C and size D semitrailers shall be furnished with a tandem axle. Axle rating shall be at least equal to the load imposed on each axle, measured at the ground, when the semitrailer is loaded with the applicable rated payload. The wheel bearings and axle spindles shall be oil lubricated. The oil viscosity shall be in accordance with the manufacturer's recommendations. The hubcaps shall have a window for visual determination of oil level. Provision for venting, or other method of withstanding internal pressure buildup, and for replenishing the oil supply shall be incorporated. The hubs shall be fitted with seals.

3.7.4 Wheels, rims and tires.

3.7.4.1 Wheels, rims, and tires. Semitrailer shall be equipped with dual wheels on each axle. Disk type wheels shall be furnished. The rims and tire ratings shall conform to TRA or European Tyre and Rim Technical Organisation recommendations for the type and size of tires furnished. Multipiece rims shall not be furnished. Tires shall conform to TRA or European Tyre and Rim Technical Organisation recommendations. Tire and rim sizes shall be the same for all wheels on the semitrailer. Tires shall be tubeless type with highway tread. Steel belted radial tires shall be furnished. Tires shall be of rated capacity at least equal to the load imposed on each tire, measured at each wheel at the ground when the semitrailer is loaded with the applicable rated payload.

3.7.4.2 Tire carrier. One tire carrier shall be provided and installed in an unused cabinet or other readily accessible location. Means shall be provided for securing the tire within the carrier to prevent accidental loss.

3.7.4.3 Spare wheel. Unless otherwise specified (see 6.2), a spare wheel or rim shall be mounted on the tire carrier. Treaded fasteners, when used to secure the spare tire in the carrier, shall be constructed of or plated with corrosion-resistant material. The carrier design shall enable safe removal or mounting of the spare tire assembly from and to the vehicle and carrier without personnel positioning themselves or any part of their body under the spare tire assembly.

3.7.4.4 Spare tire. When specified (see 6.2), an inflated spare tire shall be mounted on the spare wheel or rim specified in 3.7.4.3. The spare tire shall be of the same size, tread design, and ply rating as tires installed on the semitrailer.

3.7.5 Brakes.

3.7.5.1 Brakes. The brakes shall be of the full air internal expanding type and shall conform to DoT Federal Motor Carrier Safety Regulations, sections 393.40, 393.43, and 393.45 through 393.52. Brake linings shall be of non-asbestos material. The break system shall include slack adjusters, piping hose connections, gladhands, spring loaded dust covers or dummy gladhands equipped with security chains or cables, air reservoirs (with remote operating control for the drain valve shall be positioned above the bottom of the frame rail), brake chambers, relay emergency valve, and all other parts and connections required for a complete air-brake shall be furnished. Gladhands shall conform to SAE J318. Location of air braking system shall be installed in such a manner as to provide adequate road clearance when traveling over uneven or rough terrain, including objects liable to strike and cause damage to the

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brake system components. No part of the braking system shall extend below the bottom of the wheel rims. Slack adjusters and air chambers shall be located above the bottom edge of the axle carrier.

3.7.5.2 Parking brake. Spring or air diaphragm mechanical lock type parking brakes shall be provided. The parking brakes shall be automatically applied upon disconnection of the supply (emergency) air line and under emergency braking conditions. When applied, the parking brake shall hold the semitrailer with rated payload on a 20 percent grade despite depletion of the compressed air supply. The parking brake shall hold the loaded semitrailer headed either up or down the grade. The parking brakes shall conform to DoT Federal Motor Carrier Safety Regulation 393.41.

3.7.6 Upper fifth wheel plate. The upper fifth wheel plate shall be designed for coupling to a full oscillating and fore and aft rocking fifth wheel. It shall be of sufficient size to cover a fifth wheel 36 inches (910 mm) in diameter, and shall conform to DoT Motor Carrier Safety Regulation 393.70(b). The kingpin shall be of heat treated alloy steel and shall conform to SAE J700. The forward end of the upper fifth wheel plate shall have a turned up lip, not less than 2 inches (51 mm) high, for ease of coupling.

3.7.7 Auxiliary fifth wheel plate. When specified for the size D semitrailer (see 6.2), an auxiliary upper fifth wheel plate, meeting the requirements of 3.7.6, shall be furnished. The upper fifth wheel height for the size D semitrailer shall be 47 inches \pm 1 inch (1194 mm \pm 25 mm), with the auxiliary fifth wheel plate installed, and 52 inches \pm 1 inch (1321 mm \pm 25 mm), with the auxiliary fifth wheel plate removed. The auxiliary fifth wheel plate shall be readily removable. Retaining brackets shall be provided on semitrailer for stowing the auxiliary plate while not in use.

3.7.8 Electrical equipment. Electrical equipment installed in any cabinet which contains fuel handling equipment or piping shall have all wiring in vaporproof conduit with the threaded connections at the lamps and vaporproof junction boxes and shall conform to paragraph 4-3.8 of NFPA 407.

3.7.8.1 Lighting. All lights and reflectors shall be protected from operational hazards by mounting in recessed or otherwise guarded locations. Lights and reflectors shall not be mounted on vertical surfaces of rub rails (unless recessed and fully protected) or on the semitrailer bumper. Clearance and identification lights shall be constructed for easy removal and replacement of lamps and lenses without the use of hand tools.

3.7.8.1.1 Receptacle, 12 volt (V). The front of the semitrailer shall be equipped with a 7-contact receptacle conforming to SAE J560 with the connectors connected and color coded as specified therein. The receptacle shall be provided with a spring loaded cover. The receptacle shall be located in accordance with SAE J702. The brake lights shall override the four-way emergency flasher or the two systems shall be independent of each other.

3.7.8.1.2 Direct current (dc) system, 12V. A 12V dc lighting system, conforming to 3.7.8.1 and 3.7.8.1.1, shall be provided. The 12V dc lighting system shall conform to DoT Federal Motor Carrier Safety Regulations, section 393.14, 393.20, 393.22, 393.25 through 393.29, 393.32, and 393.33.

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3.7.8.1.3 Independent 24V dc system. When specified (see 6.2), a 24V dc lighting system, independent of the 12V dc lighting system, shall be provided. Separate wiring and bulbs shall be provided for the 24V dc system. The system shall conform to 3.7.8.1. The 24V dc system shall also conform to the DoT Federal Motor Carrier Safety Regulations referenced in 3.7.8.1.2, except the 24V dc stop and turn lamps shall be combined.

3.7.8.1.4 Interconnected 24V dc system. When specified (see 6.2), capability of operating the 12V dc system (see 3.7.8.1.2) from a towing vehicle equipped with a nominal 24V dc electrical system shall also be provided.

3.7.8.1.5 Receptacle, 24V dc. When either an independent or interconnected 24V dc system is specified, the front of the semitrailer shall also be equipped with a 12-contact receptacle and cover conforming to MS75021, part number MS75021-1. The receptacle shall be located in accordance with SAE J702. The 24V dc, 12-contact receptacle shall be connected as follows:

- Contact B. Connect to left hand turn signal and stop lamp (yellow).
- Contact D. Connect to ground (white).
- Contact E. Connect to clearance, side marker, identification, and tail lamps (black and brown).
- Contact J. Connect to right hand turn signal and stop lamp (green).
- Contact L. Connect to ground (white).

The rest of the contacts shall not be connected. Circuits B and J on tactical trucks are combination stop and turn indicator circuits. On the interconnected 24V system, the normal 12V dc turn signal lights will function both as turn signals and stop lights, and the normal 12V dc stop lights and any antilock brake system will not be operational when the semitrailer is connected to a towing vehicle with a 24V dc power supply. Because of this condition, the stop light (red) circuit is not connected to the 24V dc, 12-contact receptacle.

3.7.8.1.6 Resistors. When an interconnected 24V dc system is specified (see 3.7.8.1.4), the 12-contact receptacle shall be provided with resistance in each circuit to reduce the voltage of the tactical (military design) towing vehicle from a nominal 28V dc to 12V dc. Each circuit resistor shall be selected to reduce the 28V dc regulated voltage of the tactical truck to within the maximum rated voltage of the semitrailer electrical components. The resistor assembly shall be located in a protective housing and provided with adequate ventilation or a heat sink to preclude overheating and any damage to resistors, wiring, or adjacent components.

3.7.8.2 Wiring. Wiring shall conform to SAE J1292 and to DoT Federal Motor Carrier Safety Regulations, sections 393.27 through 393.30, 393.32, and 393.33. All wiring shall be firmly attached to the semitrailer. All wiring shall be in conduit with threaded connections at the lamps and junction boxes.

3.7.8.3 Circuit protection. The circuit breakers shall conform to SAE J553 and shall be located near the wiring connector socket, readily accessible for service. Switches and circuit protection devices installed on the semitrailer shall be of permanent vaporproof design or enclosed in vaporproof boxes.

3.7.9 Landing gear. Semitrailer shall have two vertical lift, telescopic, nonrotating landing legs, with two speed gears and a handcrank on the curb side. Landing legs shall be equipped with self leveling skid pads. When specified

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(see 6.2), each leg shall be capable of being simultaneously operated from either side of the semitrailer. Supports for the crank extension shafts and clips for holding cranks when folded shall be provided. The landing gear shall withstand, without deformation, the combined static and dynamic forces due to proportion of gross weight sustained and the forces resulting from impact during coupling and uncoupling operations. The landing gear assembly shall be braced or mounted to plates that are gusseted to resist forward and rearward dynamic thrust on the landing legs. When placed in travel position, the landing gear legs shall remain positively locked. The landing gear shall have a range of adjustment to vary the height of the upper fifth wheel from 47 inches (1194 mm) to not less than 52 inches (1321 mm) from the ground. With the semitrailer coupled to a towing tractor and in level position, the clearance under the fully retracted landing gear shall exceed the semitrailer ground clearance, but shall in no case be less than 11 inches (280 mm).

3.7.10 Rear end protection. Semitrailer rear end protection shall be in accordance with DoT Federal Motor Carrier Safety Regulations, section 393.86.

3.7.11 Rear wheel splash and stone throw protection. Rear wheels shall have mud flaps at rear. Splash and stone throw protection shall be in accordance with SAE J682. A metal strip not less than 1/8-inch (3.2 mm) thick and not less than 1-inch (25 mm) wide, extending the entire width of the mud flap, shall be installed to prevent the bolt heads or bolt nuts from damaging the mud flaps. As an alternate method of attaching the mud flaps, tabs or clips with minimum surface contact dimensions of 1-inch (25 mm) high by 1 1/4-inch (32 mm) wide by 3/32-inch (2.4 mm) thick shall be furnished at each bolt.

3.7.12 Safety markings. The following markings shall be applied to each side and rear of the vehicle.

- a. "FLAMMABLE" in 6-inch (152 mm) block letters, with a 1-inch (25 mm) border all around.
- b. "NO SMOKING WITHIN 50 FEET (15.2 m)" in 3-inch (76 mm) block letters, with a 1-inch (25 mm) border all around.

3.7.13 Stress analysis. When specified (see 6.2), the contractor shall provide a stress analysis. The analysis shall verify conformance of the chassis and tank structure in accordance with 49 CFR, Sections 178.345, 178.346 and Specification DOT-406 and shall include at least the following calculations and diagrams:

- a. The sprung GVW load distribution diagram.
- b. The vertical shear diagram for the length of the vehicle.
- c. The bending moment diagram for the length of the vehicle.
- d. The loads, sections, and stresses in members that carry maximum shear and moment, to include the analysis of the stresses and attaching weldments or other fastenings.
- e. The load, section, shear, and bending moment diagrams at kingpin and rear under construction sub-frame members, and for the drop section when drop frame semitrailers are provided.
- f. The load, section, shear, and bending moment diagram for the most critical cross-member, to include the analysis of stresses in attaching weldments or other fastenings.

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- g. The loads, sections, and stresses in members that carry maximum compressions.
- h. A list of all assumptions and references utilized to provide the required data.

3.8 Semitrailer types.

3.8.1 Type I. Type I semitrailer shall be of the forced discharge, fuel servicing type, designed for transporting and dispensing gasoline and fuel oil. Unless otherwise specified (see 6.2), the tank shell, baffles, bulkhead(s), saddles, pads, manhole(s), manhole platform(s), and other appurtenances shall be of type 304 stainless steel. When specified (see 6.2), the tank shell, baffles, bulkhead(s), saddles, pads, manhole(s), manhole platform(s), and other appurtenances shall be of aluminum alloy. Static protection, conforming to paragraphs 2-3.4.1 of NFPA 407, shall be provided. Where dissimilar metals are used, effective means shall not be taken to impede electrolytic action. Teflon packing and tape shall not be used on adjacent parts that are of aluminum content. The tank and all associated fittings, components, and piping shall be free of all dirt, loose scale, and petroleum soluble coating.

3.8.1.1 Tank. Tank shall have a round, elliptical, or modified rectangular cross section and shall be all welded construction. Unless otherwise specified (see 6.2) tank shall be single compartment construction.

3.8.1.1.1 Tank capacity. The liquid capacity of the tank shall conform to 1.2.1 for the specified size of the vehicle, plus not less than 3 percent extra capacity for expansion. In addition, the height from the top of the liquid cargo to the bottom of the automatic vent(s), with the tank fully loaded and the liquid then expanded 3 percent, shall be adequate to prevent any fluid from exiting from or being trapped in the automatic vent(s) with the vent(s) open and the vehicle parked on a 5 percent grade, headed first up and then down the grade.

3.8.1.2 Tank heads and baffles. Tank heads and baffles shall be flanged, dished, and reinforced, as required, to provide structural strength for hydraulic pressure and shall conform to CFR 49, Sections 178.345, 178.346 and Specification DOT 406. Half round or full round openings of not less than 1-inch (25 mm) radius shall be provided at the 3 o'clock and 9 o'clock positions of the baffles. The edges of the manway openings shall have a flange of approximately 1-inch (25 mm). Maximum unreinforced portion of tank length shall be not more than 60 inches (1524 mm). Baffles shall have half or full round openings, top and bottom, of not less than 3-3/8 inches (86 mm) radius. The cross sectional area of baffle shall be not less than 80 percent of the cross sectional area of the tank. Each baffle shall also be provided with a manway opening, not less than 17 inches (432 mm) in diameter.

3.8.1.2.1 Flanging and dishing. The heads and baffles shall be uniformly flanged and uniformly dished. Flanges shall be formed by a multi-pass roller operation or by a one-step, die press operation. Heads and flanges shall be dished by uniform hydraulic or uniform air pressure or by a one-step, die press operation. Neither the flanging or dishing operations shall involve repeated hammer blows, either manually or automatically.

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3.8.1.3 Manhole. Each tank compartment shall have a manhole with a minimum diameter of 19 inches (483 mm), located at the middle of the top of the tank. The marker or indicator shall be set to indicate rated tank capacity plus or minus 1 percent. A lightweight, liquidtight, easy opening manhole cover or bolted cover with liquidtight easy opening fill cover, of not less than 10 inches (254 mm) in diameter, shall be provided. The cover shall have a forward mounted operating hinge and self latching catches. The manhole cover or fill cover shall be provided with necessary safety features to eliminate possibility of spark occurring during opening or closing of the cover. Static protection shall be provided in the tank structure for bonding of the semitrailer to the fill cover opening or closing of the cover. Static protection shall be provided in the tank structure for bonding of the semitrailer to the fill cover opening or the manhole cover opening during semitrailer loading operations. Capacity marker or indicator disk of corrosion resistant construction shall be provided in the tank at the side of the manhole.

3.8.1.3.1 Sensor connection. When specified (see 6.2), a 2-inch (51 mm) national taper pipe thread coupling and plug shall be provided near the manhole in the tank top to permit future installation of a level sensing device.

3.8.1.4 Bottom loading capability. The tank shall have top and bottom loading capability. The tank shall be capable of being bottom loaded at a rate of 600 gallons per minute (gpm) (2271 L). To provide bottom loading capability, the tank shall be furnished with vent valve(s), level sensor valve(s), and adapter(s).

3.8.1.4.1 Tank vent valve(s). Each tank compartment shall be furnished with a tank vent valve of sufficient venting capabilities to release the increased pressure as the tank is being loaded at a rate of 600 gpm (2271 L). The tank vent valve(s) shall be corrosion resistant steel or aluminum with a corrosion resistant steel weld ring with the aluminum isolated from contact with steel. The tank vent valve(s) shall be furnished with an interlock to assure that the vent is open when the off loading valve is open. The vent valve(s) shall be furnished with a vapor recovery hood and a teflon coated seat for cold weather protection.

3.8.1.4.2 Tank level sensor valve(s). Each tank compartment shall be furnished with a tank level sensor valve that shall shut off the intake flow when the tank has reached its rated fluid capacity. The valve(s) shall be for automatic bottom loading and off loading. The valve(s) shall have a control that provides a surge control closure. The valve(s) shall automatically shut off if a leak develops in the pilot lines and connections. The material used in the construction of the valve(s) shall be compatible with the fuel and metal construction of the tank and its components. The valve(s) shall be capable of remote operation for off loading operations. The level sensor valve(s) consists of a nozzle and receiver. When pressure is imposed upon the nozzle, the nozzle causes a jet stream to be directed to the receiver. This pressure signal, transmitted to the receiver, holds the pilot valve open allowing fueling operations. When the level in the compartment of the tank reaches the level sensor valve(s), the pilot pressure drops, closes the valve, and immediately stops flow of fuel into the compartment(s). An emergency flow control shall be provided and shall conform to CFR 49, Sections 178.345, 178.346 and Specification DOT 406. A collector can and valve with deflector to preclude

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static electricity and spray shall be furnished. The level sensors and valves shall be free of liquids with a freezing point above -50 degrees Fahrenheit (oF) (-46o Celsius (C)).

3.8.1.4.3 Adapter valve(s). Adapter valve(s) shall be furnished for each compartment of the tank. The adapter valve shall provide a quick disconnect for bottom filling of tanks. A dust cap with corrosion resistant chain or cable shall be furnished. The poppet valve shall be full swiveling and free floating to prevent any leakage. The poppet valve shall be a fuel resistant seal. All parts shall be corrosion resistant. A nonelectrical interference type interlock shall be provided to lock the semitrailer brakes when a hydrant coupler is in place on a bottom loading adapter. Unless otherwise specified (see 6.2), the bottom loading adapter shall be of the Y-type capable of connection to both a 4-inch (102 mm) coupler conforming to API RP1004 and to a 2-1/2-inch (64 mm) type D-1 nozzle conforming to MIL-N-5877. The adapter(s) shall be on the right (curb) side of the semitrailer.

3.8.1.4.4 Hydrant coupler. When specified (see 6.2), a hydrant coupler shall be furnished. The coupler shall be leaktight from the hydrant to the adapter valve. The coupler shall be used with the product selection nozzle on the adapter. A flow control handle shall be provided for opening the coupler poppets against fuel pressure. The coupler shall be provided with safety interlocks to prevent fuel spillage and cannot be disengaged unless the flow control handle is closed. A floating nose seal shall be provided in the coupler.

3.8.1.4.5 Vapor recovery system. The semitrailer shall be equipped for vapor recovery in general conformance to the recommended practice of API RP1004 as summarized herein. The vent valves shall be furnished with a vapor recovery hood or collecting chamber and shall be manifolded to an overturn rail or other suitable manifold piping. Connections between the tank vapor space vents and the header tube(s) shall be not less than 7 square inches (45 square millimeters (mm²)) in total open cross sectional area. The header tube shall be not less than 3 inches (76 mm) in diameter.

3.8.1.4.6 Vapor recovery flange. A standard pipe flange, suitable for future installation of a vapor recovery adapter, shall be furnished. The flange shall be suitable for installation, at the user's option, of either a 4-inch (102 mm) groove quick coupling conforming to API RP1004 or a 3-inch (76 mm) cam and groove quick coupling conforming to MIL-C-27487. The flange shall be stainless steel or aluminum.

3.8.1.4.7 Vapor recovery flange location. The vapor recovery flange shall be located on the curb side of the semitrailer, not more than 7 feet (ft) (2.13 m) forward or rearward of the bottom loading adapter and between 2.5 and 5 ft (0.76 and 1.5 m) above ground level.

3.8.1.4.8 Vapor recovery system protection. Any portion of the vapor recovery system installed on the top of the tank which could damage the tank in the event of overturn shall be protected by a rollover device. Any portion of the vapor recovery system installed at the rear of the tank shall not extend beyond the rear end protection devices (see 3.7.10).

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3.8.1.4.9 Vapor discharge outlet. Provision shall be made for discharging the vapors to atmosphere from the vapor recovery system when facilities are not available for vapor collection. The location for the outlet shall be on the top of the semitrailer, remote from the driver's loading area, and isolated from the exhaust of the auxiliary engine.

3.8.1.4.10 Vents. Each tank compartment shall be vented to comply with the requirements of 49 CFR, Section 178.345, 178.346 and Specification DOT 406.

3.8.1.4.11 Normal venting pressure limits. The lower opening limits for normal venting (inbreathing, outbreathing) shall comply with the opening limits required by the California Air Resources Board for vapor recovery, as summarized herein:

- a. The entire tank and venting system shall be sufficiently vaportight such that a pressure change of not more than 1-inch (25 mm) of water shall occur within 5 minutes, when the tank is pressurized to 18 inches (457 mm) of water (gage) or evacuated to 6 inches (152 mm) of water (gage).
- b. The outbreathing pressure vents shall remain closed as tank compartment pressure is increased above 18 inches (457 mm) of water (gage), but shall open before compartment pressure reaches 27.7 inches (704 mm) of water (1 pound force per square inch gage (psig)) (108 kilopascals (kPa)).
- c. The inbreathing vacuum vents shall remain closed until the tank compartment vacuum drops below 6 inches (152 mm) of water, but shall open before 10.4 inches (264 mm) of water is reached (6 ounces force psig) (102 kPa).

3.8.1.5 Tank support. Support of tank shall conform to 49 CFR, Sections 178.345, 178.346, Specification DOT-406. Tank provided with continuous external frame type construction shall have supports directly under each bulkhead, baffle, and at the front and rear of the tank. Adequate support required by CFR 49, paragraph 178.340-6(b), shall be provided when frameless type tank construction (see 3.7.1) is used, in which the tank constitutes in whole or in part the structural member used in lieu of the frame.

3.8.1.6 Platform and access ladder. A platform shall be provided for access to each manhole. The platform shall be integral with, or securely attached to the tank, and shall be covered with an abrasive type of paint, ships' grip surface, or covered with not less than 3/16-inch (4.8 mm) thick rubber or synthetic rubber blend ribbed material. Liquidtight flashing shall be provided around the platform to prevent spilled fuel from draining near possible sources of ignition or auxiliary equipment. The platform shall be provided with front and rear drains and stainless steel or polyvinyl chloride drain lines on opposite sides of the vehicle and in such other locations as are necessary to prevent liquids from standing on the platform and on top of the tank. Polyvinyl chloride drain lines shall have a wall thickness of not less than 1/8-inch (3.2 mm). An access ladder or equivalent access steps, handles, and rails shall be furnished, providing easy access to and from the platform. Ladders, steps, handles, and rails shall be functionally spaced and arranged for maximum safety of personnel climbing up onto and down from the platform. All platform components shall be of stainless steel.

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3.8.1.7 Vent. A vent, having sufficient capacity to allow loading at a rate of 600 gpm (2271 L) or unloading of each compartment, with manhole and fill cover closed, at pumping rates 25 percent in excess of applicable flow rates specified in 3.8.1.11.1 shall be provided. A corrosion resistant warning plate shall be provided at tank outlet and fill opening, warning the operator to open the fill opening during loading and unloading operations in excess of these rates.

3.8.1.8 Emergency controls. The tank level sensor controlled valves shall also be operable by cable linked controls. An opening and a quick acting closing control for each compartment shall be located in the right underslung cabinet. Controls shall be mounted to provided interference with one of the doors of the cabinet to insure that the valves are closed when the cabinet doors are closed. Remote, emergency, quick acting controls for closing (but inoperable for opening) shall be provided. One set of such controls shall be located at the streetside on or near the nose of the semitrailer, and one set of controls shall be operable from the catwalk. Each control shall be outlined by a contrasting color panel at least 12 square inches (77 mm²), identified by the words: "emergency shutoff" and provided with indicator arrows or instructions such as "Push," "Pull," or other appropriate wording. Identification and instruction wording shall be in letters not less than 2 inches (50 mm) high. In addition, controls shall have fusible links to insure automatic closing of valves in case of fire. One fusible link shall be located adjacent to the valve and one shall be located in the right underslung cabinet.

3.8.1.9 Cabinet(s). Underslung cabinet(s) shall be provided on both sides of the semitrailer extending forward from rear wheelhousings. Cabinet(s) shall be full flanged, flush type, constructed to carry at least a 200-lb (91 kg) load on any square foot (0.09 m²) of floor area and of a size to house the equipment specified herein. Equipment shall be suitably located for operation with ample clearance for maintenance. Cabinet compartments shall be provided with lights. Wiring and electrical equipment shall conform to the requirements of 3.7.8. All doors shall be side hung. Hinges shall be continuous rod or hem type with stainless steel hinge pins or stainless steel, nylon, or nylon insert type sockets. Doors shall have countersunk locking handles and two point locking mechanisms. All door locks shall be operable by the same key. Cabinet(s) shall be constructed of not less than 0.0598-inch (1.519 mm) (U.S. revised standard gage No. 16) hot rolled mild steel or aluminum providing equal structural strength. The cabinet(s) floor shall be constructed of fattened expanded metal grating, weighing not less than 3 lb per square foot (0.126 per square meter (kg/m²)) or metal bar grating, type W-19-4, conforming to Metal Bar Grating Manual, ANSI/NAAMM MBG 531. Flooring shall be in accordance with paragraph 2-3.8 of NFPA No. 407. Floors shall be designed to accept the loads imposed by all installed equipment and shall be supported by appropriate structural members. All fasteners and support structures shall be corrosion-resistant material. The grating shall be free of exposed sharp edges. Doors shall have rubber door bumpers and 180° open door retainers. Hooks for retaining delivery nozzle above the delivery hose reel shall be provided.

3.8.1.9.1 Fire extinguisher brackets. In conformance with paragraph 2-3.9 of NFPA No. 407, brackets for two 20B fire extinguishers shall be furnished. The fire extinguishers conforming to NFPA No. 10, shall be installed upon receipt of the vehicle by the Government. Each mounting/carrying bracket shall be capable of easy and quick operation. One fire extinguisher bracket shall be

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mounted vertically on each side of the vehicle. Protection shall be provided from splashing of mud and water. A contrasting background color shall be furnished behind the normal location of the fire extinguisher.

3.8.1.10 Hose tubes. An enclosed hose tube shall be provided on each side of the tank for stowing the hose specified in 3.8.1.14. The hose tubes shall be totally enclosed, dust-proof, and shall be equipped with hinged access doors with provisions for padlocking. The hose tubes shall be stainless steel. Means for draining the hose tubes shall be provided.

3.8.1.11 Pump engine unit. The pump and engine shall be directly coupled, mounted on a common structural steel base, and the base mounted on vibration damping pads. The base shall be of sufficient rigidity to maintain alignment of the unit during operation. All controls shall be readily accessible to an operator standing on the ground by the semitrailer. The pump and engine shall be accessible for draining and filling crankcase, lubrication, and adjustments.

3.8.1.11.1 Pump. The pump shall be self priming, positive displacement rotary type, with replaceable, lapped, carbon ring, mechanical seals to protect lubricated bearings from fuel. The minimum flow rate in gpm, measured at the metered discharge faucet, shall be 100 gpm (379 L) for size A, 150 gpm (568 L) for sizes B and C, and 200 gpm (757 L) for size D semitrailers. The rotary type pump shall incorporate a bypass pressure regulator with a pressure control, adjustable from 50 to 75 psig (446 to 618 kPa). Pump shall have a capacity of a 20-ft (6.1 m) lift. The pump shall be capable of producing a vacuum of not less than 18 inches (4.6 mm) of mercury (Hg), when loading the tank from an outside source.

3.8.1.11.2 Engine. The pump engine shall have horsepower, torque, and speed characteristics to satisfactorily meet all pumping performance requirements specified herein. The engine shall be furnished complete with all accessories required for operation, including a fuel tank of sufficient capacity for 8 hours of normal operation, a fuel line sediment bowl, and an externally adjustable governor capable of limiting the engine speed within the pump operating range. A 12V starting system, with battery of the maintenance-free characteristics listed in W-B-131, and an alternator or generator and regulator, shall be provided. The engine fuel tank shall be mounted outside the cabinet. Fill pipe shall be accessible for easy fuel tank filling. A spark arresting muffler shall be provided on the outside of the cabinet with the exhaust pipe pointing downward to the rear. Muffler and exhaust pipe shall be covered with a metal shield to guard against contact by operating personnel. The exhaust pipe inside the cabinet shall be wrapped with a heat resistant material. The exhaust system shall conform to paragraph 2-3-6 of NFPA 407. Adequate ventilation shall be provided in the engine cabinet. This may include provision whereby the compartment doors must remain open when the engine is in operation.

3.8.1.12 Piping, couplings, and drains.

3.8.1.12.1 Pump connections. Inlet and outlet connections to the pump and meter shall be made using schedule 40 pipe (not tubing) and victaulic couplings.

3.8.1.12.2 Pipe grooves for couplings. Pipe grooves for couplings shall be in accordance with dimensions specified by victaulic coupling manufacturer. The groove and outside diameter shall be concentric to each other. The groove and the ends of the pipe shall have a chamfer of 0.003-inch (0.08 mm) to 0.005-inch

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(0.13 mm). The outside diameter of pipe between groove and end of pipe shall be smooth without evidence of scale, seams, weld spatter, digs, or scratches. The fittings shall be capable of accepting a 100-pound force per square inch (psi) hydrostatic test for at least 5 minutes. Fittings gasket shall be capable of service in -20 to +180oF (-29 to +82oC) without evidence of deformation or change in dimensions.

3.8.1.12.3 Piping system. Except for the inlet and outlet connections at the pump and meter (see 3.8.1.12.1), the piping shall be steel tubing with long sweep bends. Victaulic couplings shall not be used on tubing. The piping shall be installed to withstand expansion and vibration without failure. The pump suction line shall include a Y-type strainer with not less than a 40-mesh brass screen. The piping system, including manifold and valve arrangement shall provide for:

- a. Gravity discharge, nonmetered flow from tank through the nonmetered faucet.
- b. Gravity discharge, metered flow from tank through the metered faucet.
- c. Forced discharge, metered flow from tank through the metered faucet and hose reel.
- d. Self loading from an external nonpressurized source through the nonmetered faucet by utilizing the pump unit, suction hose and suction stubs, and the reel mounted hose for filling tank through the filler opening.

3.8.1.12.4 Drains. Any section of the fuel discharge system including pump and meter, that are not self draining shall be equipped with marked drain plugs located to assure complete drainage of the system. Drain valves that can be opened from outside the pumping compartments shall have provisions for locking with a padlock.

3.8.1.13 Measuring meter. A positive displacement meter shall be furnished having built-in strainer and air release and shall be calibrated for handling light fuel oils or gasoline to a flow capacity compatible with the flow rate of the size of semitrailer required (see 3.8.1.11.1). The meter shall be accurate within 1 percent at 75 gpm (284 L) flow rate and accurate within 2 percent at other flow rates between 25 gpm (95 L) and maximum flow. Adjustment shall be accomplished without disassembly except for cover plate. The meter shall have a 7-figure totalizer to record the total gallons pumped and not less than a 4-figure setback counter and shall be located to facilitate reading of numerals. The meter shall conform to the applicable requirements of NBS Handbook 44.

3.8.1.14 Noncollapsible hoses and suction stubs. Two 10-ft (3.05 m) lengths of 3-inch (76 mm) inside diameter noncollapsible hose, with cam-locking type couplers, shall be provided and placed in hose tubes (see 3.8.1.10). Two suction stubs, each 36 inches (914 mm) long, and each with a 90o elbow having 3-inch (76 mm) cam-locking type couplers, shall be furnished. One suction stub shall be fabricated from 2-3/8-inch (60 mm) outside diameter and the other from 1-7/8-inch (26 mm) outside diameter nonsparking tubing. The suction stubs shall be used for filling underground tanks and for drafting from drums. When specified (see 6.2), in lieu of two 36-inch (910 mm) suction stubs, the following equipment shall be furnished:

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- a. Two suction stubs, each 20 inches (508 mm) long and each with a 90o elbow having 3-inch (76 mm) cam-locking type couplers. One suction stub shall be fabricated from 2-7/8-inch (56 mm) outside diameter and the other from 1-7/8-inch (26 mm) outside diameter nonsparking tubing.
- b. One suction stub, 36 inches (914 mm) long with a 90o elbow having 3-inch (76 mm) cam-locking type couplers, fabricated from 1-3/8-inch (26 mm) outside diameter tubing.

3.8.1.15 Hose reel and hose. A hose reel with valve shall be furnished with 100 ft (30.5 m) of 1-1/2-inch (38 mm) inside diameter synthetic rubber hose. Hose shall be of first line quality, compatible with fuel oils and gasoline, and shall withstand pressures of not less than 150 psi (1136 kPa). A crank shall be provided for hand rewind of winding mechanism. Rollers shall be provided to prevent damage to the hose when the reel location is such that the hose contact surfaces might cause abrasion. The delivery end of the hose shall be equipped with a sparkproof metal nozzle having a 1-1/2-inch (38 mm) inlet. The nozzle shall be trigger action operated, with balanced poppet dashpot control valve, and shall have rigid nozzle tube and not less than 80-mesh brass screen strainer. Provisions shall be made for a properly stowed and secured hose nozzle after the hose has been wound on the reel.

3.8.1.16 Instruction plate. A metal plate, showing a schematic layout of all valves, emergency valve controls, and equipment with full operating instructions, shall be fastened on the inside of the right side cabinet door. Each valve, switch, and other pertinent components on the schematic shall be properly identified to correspond to marking on like parts on the semitrailer. Valves that are normally closed or normally opened shall be identified as to their normal mode. All valves, switches, levers, controls, and other devices used in the operation of the fuel servicing system shall be properly identified by identification plates. The identification and instruction plates shall incorporate a numerical or alphabetical system of identification keyed to the schematic and an indication of the relative position of the lever or control handles, such as "ON" or "OFF." The plates shall be installed with corrosion-resistant metal fasteners. Plates shall be masked prior to painting.

3.8.1.16.1 Operating instructions. Operation instructions shall be clearly and concisely stated. All designations used in the operation instructions shall be the same as shown on the schematic diagrams. Operations which affect safety of the pumping system shall be listed under the title "CAUTION" at the top of the plate. Operations which affect safety of the operator shall be listed under the title "WARNING" at the top of the plate. The words "CAUTION" and "WARNING" shall be larger than the operational instructions. Specific instructions shall be listed separately for each pumping system operating mode, with the pumping system mode as the title for the various sections on the plate. At least the following notices shall be included: "WARNING: AUTOMATIC FLOW CONTROL VALVE CONTROL MUST BE IN CLOSED POSITION WHEN BOTTOM LOADING," and "WARNING: DO NOT LOAD AT RATES IN EXCESS OF 600 (2270 L) GPM WITHOUT OPENING MANHOLE."

3.8.1.17 Ground cable reel. One ground cable reel shall be installed in a location that will permit an easy withdrawal and recovery of the grounding wire. The cable reel shall contain a ratchet for retaining the ground cable in any extended position so that tension is not maintained on the ground cable. The reel shall have a roller type guide. The grounding cable shall be No. 12 stranded copper, of 7 by 7-inch (180 by 180 mm) stainless or galvanized steel,

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covered with petroleum resistant rubber or nylon, and shall be approximately 80 ft (0.24 m) in length. The cable shall have Y-ends approximately 20 ft (0.06 m) long, with each end fitted with a grounding type clamp connector. Ground cable reel shall be located in the underslung cabinets. Ground cable reel mounting surfaces shall be free of paint and contamination and shall be securely mounted to the cabinet so as to preclude cable reel assembly from being pulled away from its mountings. A warning plate shall be attached to the cable reel stating: "Walk back grounding cable to the reel." The clamp connectors shall conform to MIL-C-83413, part number M83413.

3.8.1.18 Dust cap. Each fuel discharge opening shall be provided with a dust cap, complete with corrosion-resistant security chain or cable.

3.8.1.19 Filter separator. When specified (see 6.2), a filter separator unit shall be provided and mounted in one of the underslung cabinets in such a manner that water removal and filter coalescer elements are readily accessible for replacement through access doors in the cabinet. Filter separator unit shall be of aluminum or stainless steel construction and designed for the applicable pump flow rate specified in 3.8.1.11.1 for motor fuels conforming to VV-F-800 and MIL-G-3056. Filter separator unit shall utilize a multiple number of filter coalescer elements conforming to MIL-F-52308 at a rating of not more than 20 gpm (76 L) each. Performance requirements of filter separator unit shall be in accordance with MIL-F-8901. All aluminum parts shall be anodized in accordance with MIL-A-8625 or coated in accordance with MIL-C-5541, class 1A. Inlet and outlet connections shall be not less than 2-inch (50 mm) Victaulic. A 3/4-inch (19 mm) water drain system shall be provided. Automatic air eliminator shall be provided at the high point of the filter separator unit to expel air to the tank as liquid rises in the vessel. The filter separator unit and components shall be mounted to minimize vibration, oscillation, or swing of the various components. The air bleed line to the tank shall be rubber hose that is compatible for the type of fuel.

3.8.1.19.1 Liquid level indicator. A transparent liquid level indicator, having a travel of approximately 2 inches (51 mm) and containing a 1/4-inch (6.4 mm) diameter red or black polypropylene float, suitable for observing the water accumulation shall be provided and attached directly to the vessel or shall be an integral part of the filter separator vessel. The midpoint of the indicator shall be located at a level of at least 1-inch (25 mm) below the bottom of the filter coalescer elements.

3.8.1.19.2 Automatic water sump drain. A vessel of aluminum or stainless steel construction for an automatic water sump drain shall be furnished. The sump drain shall be provided with an automatic water discharge and a manually operated drain. The automatic water sump shall discharge accumulated water from the filter separator. Provisions shall be provided to discharge accumulated water to the ground. The water sump shall be structurally supported to preclude vibration on any fitting.

3.8.1.19.3 Flow limiter and pressure indicator. A rate of flow limiter shall be installed in the inlet line of the filter separator. The pressure drop through the limiter at rated flow shall be not more than 10 psi (170 kPa) differential and at 125 percent of rated flow shall be not less than 75 psi (618 kPa) differential. A maximum pressure differential indicator, set to trigger at 20 psi (239 kPa) differential, shall be provided to sense the differential across the filter separator vessel or a 2-1/2-inch (64 mm) minimum

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diameter differential pressure gage shall be furnished. The gage shall range from 0 to 25 psi (0 to 274 kPa). From 0 to 20 psi (0 to 239 kPa) shall be green and above 20 psi (239 kPa) shall be red.

3.8.1.20 Fuel load chart. A temperature compensated chart for converting inches of depth in the tank to gallons of fuel in the tank shall be provided. The chart shall be permanently installed in the streetside underslung cabinet so as to be readily visible. The chart shall be fabricated of a material so as to remain legible for the life of the semitrailer.

3.8.2 Type II. Type II semitrailer shall be of the gravity discharge type, designed for transporting and dispensing gasoline and fuel oil.

3.8.2.1 Type II tank. Type II tank shell or tank assembly shall be fabricated of stainless steel or aluminum alloy, as specified (see 6.2). The tank shall conform to the requirements for type I tank as specified in 3.8.1.1. Unless otherwise specified (see 6.2), tank shall be single compartment construction. Tank components and accessories shall be provided as follows:

- a. Tank heads and baffles, as specified in 3.8.1.2.
- b. Manhole, as specified in 3.8.1.3.
- c. Platform and access ladder, as specified in 3.8.1.6.
- d. Emergency controls, as specified in 3.8.1.8.

3.8.2.2 Vent and warning plate. A vent, having sufficient capacity to allow loading and unloading of the tank, with manhole closed, at flow rates not less than 125 gpm (473 L), shall be furnished. A warning plate shall be provided at tank outlet and fill opening, warning the operator to open the fill opening during loading and unloading operations.

3.8.2.3 Type II piping. Piping shall be steel tubing, installed between tank emergency valve and the rear of the semitrailer for gravity discharge. A gate valve shall be installed on the pipe at the rear of the semitrailer. A protective cover shall be provided for the outlet valve.

3.8.2.4 Type II cabinet(s). Underslung cabinet(s) shall be provided on each side of the semitrailer, extending forward from rear wheel housings for stowage of tools and accessory equipment. Cabinet material and construction, including doors, hinges, locks, and other accessories, shall be in accordance with the requirements of 3.8.1.9.

3.8.2.5 Type II hose. Two 10-ft (3.05 m) lengths of 3-inch (60 mm) inside diameter non-collapsible hose, with cam-locking type couplers, shall be furnished.

3.8.2.6 Type II hose tubes. Hose tubes, conforming to 3.8.1.10, shall be provided for stowing the hose specified in 3.8.2.5.

3.9 Stowage of on-vehicle equipment. Provisions shall be made for securing all equipment on the semitrailer.

3.10 Tools. Such tools as are normally required for operation of the equipment shall be furnished and stowed in the left side cabinet. Tools furnished shall include a wheel nut wrench.

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3.11 Lubrication. Means for lubrication shall be in accordance with the manufacturer's standard practice. The lubricating points shall be easily visible and accessible. Hydraulic lubrication fittings shall be in accordance with SAE J534. Where use of high pressure lubricating equipment, 1,000 psi (6996 kPa) or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location.

3.12 Treatment, painting, identification marking, and data plates. As specified by the procuring activity for the appropriate service (see 6.2), treatment, painting, identification marking, and data plates shall be in accordance with MIL-STD-1223.

3.13 Rustproofing. When specified (see 6.2), the vehicle shall be rustproofed in accordance with FED-STD-297.

3.14 Servicing and adjusting. Prior to acceptance of the semitrailer by the Government, the contractor shall service and adjust the semitrailer for immediate operational use as required in the operator's manual. The servicing and adjusting shall include at least the following:

- a. Inflation of all tires.
- b. Adjustment of brakes (when required).
- c. Proper functioning of all lighting and electrical systems.
- d. Adjustment of engine to include tune up (when required).
- e. Complete lubrication with grades of lubricants recommended for ambient temperature at the delivery point.
- f. Cooling system filled to capacity with a clean solution of equal parts by volume of water and antifreeze (ethylene glycol).

The semitrailer shall be conspicuously tagged to identify the lubricants and their temperature range.

3.15 Workmanship.

3.15.1 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to ensure uniformity of size and shape.

3.15.2 Bolted connections. Bolt holes shall be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided in accordance with good commercial practice, and all bolts, nuts, and screws shall be tight.

3.15.3 Riveted connections. Rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads, when not countersunk or flattened, shall be of approved shape and uniform size for the same diameter of rivet. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.

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3.15.4 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the welds. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings.

3.15.5 Castings. All castings shall be sound and free from patching, misplaced coring, warping, or any other defect which reduces the casting's ability to perform its intended function.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Material inspection. The contractor is responsible for insuring that supplies and materials are inspected for compliance with all the requirements specified herein and in applicable referenced documents.

4.1.3 Government verification. Quality assurance operations performed by the contractor will be subject to Government verification at unscheduled intervals. Verification will consist of observation of the operation to determine that practices, methods, and procedures of the contractor's inspection are being properly applied. Failure of the contractor to promptly correct product deficiencies discovered shall be cause for suspension of acceptance until correction has been made or until conformance of product to specification criteria has been demonstrated.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First production vehicle inspection (see 4.2.1).
- b. Quality conformance inspection (see 4.2.2).

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4.2.1 First production vehicle inspection. The first production vehicle produced under the contract shall be inspected by the contractor at his plant under the direction and in the presence of Government representatives. This inspection shall include the examination of 4.3 and the tests of 4.4. The purpose of the inspection shall be to determine vehicle conformity with the requirements of the contract. Acceptance of the first production vehicle shall not constitute a waiver by the Government of its right under the provisions of the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.3, the tests of 4.4.4 and 4.4.8, and the packaging inspection of 4.6. This inspection shall be performed on all semitrailers.

4.3 Examination. Each semitrailer shall be examined for compliance with the requirements specified in section 3 of this specification. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.4 Tests.

4.4.1 Vehicle weight. Semitrailer shall be weighed to determine net weight and distribution of net weight on fifth wheel and axle(s). The imposed loading on the fifth wheel and axle(s) shall be computed using the net weight and the payload. Calculated imposed loads on fifth wheel axle(s) shall be utilized to ascertain that the suspension, axle(s), and tires furnished are of adequate capacity to meet contract requirements, and for conformance to 3.5.2 and 3.5.4.

4.4.2 Road test. Road test shall consist of coupling the semitrailer loaded with rated payload to a truck tractor. The tractor-semitrailer combination shall be driven a distance of not less than 100 miles (161 km) under the conditions specified in 3.6. At least 20 percent of the distance shall be over hard uneven terrain. At least five sudden stops shall be made from a speed of not less than 20 mph (32 km/h). Tracking ability shall be observed to verify conformance to 3.6.2, and turning ability shall be observed to determine conformance to 3.6.1. After the test the semitrailer shall be examined for evidence of misalignment, binding, or other malfunction.

4.4.3 Pump test. The type I semitrailer pumping equipment shall be tested by discharging a tank full of liquid at the capacity discharge flow rate specified in 3.8.1.11.1. The operation of the pump bypass pressure regulator shall be tested.

4.4.4 Test for leaks. The semitrailer tank shall be tested for leaks by air or hydraulic pressure of not less than 3 psig (122 kPa) applied to the tank. Air pressure, if used, shall be maintained for a period of at least 5 minutes during which the entire surface of all joints under pressure shall be coated with a solution of soap and water or other material suitable for the purpose.

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The piping of semitrailers with discharge pumps shall be tested at the functional discharge pressure. Any leak shall be corrected, and upon completion of repairs, shall be retested in accordance with the above procedure.

4.4.5 Electrical test. An electrical test shall be conducted to determine that all semitrailer lights are functioning. In addition, when an interconnected 24V system is furnished, the circuits of the 12-contact receptacle shall be energized with not less than 28V dc regulated voltage for a time sufficient to stabilize the temperature of the resistor assembly for not less than 30 minutes in an ambient temperature of not less than 77°F (25°C). After the test, the resistor assembly, including resistors, wiring, and adjacent components shall be examined for evidence of overheating, deterioration, or damage.

4.4.6 Vent test. The tank body and vents shall be tested for conformance to 3.8.1.4.10, 3.8.1.4.11, and 3.8.1.7.

4.4.7 Emergency venting. The exposed liquid surface area of the tank compartment shall be measured and the capacity of each vent determined by its required stamping and certification (see DOT-406). The total venting capacity shall be calculated and compared to the surface area to determine conformance to the requirements of CFR 49, Sections 178.345, 178.346 and Specification DOT 406.

4.4.8 Final cleaning. The tank shall be inspected for cleanliness to determine conformance to 3.15.

4.4.9 Failure. Failure of the first production vehicle to meet requirements of the contract shall be cause for the Government to refuse acceptance of all vehicles under the contract until corrective action has been taken.

4.4.10 First production vehicle. Upon acceptance of the first production vehicle, it shall remain at the manufacturing facility as a production sample and be the last semitrailer shipped on the contract. The contractor shall maintain the vehicle in a serviceable condition for the duration of the contract.

4.5 Production semitrailer tests. The contractor's testing system shall, as a minimum, assure that the semitrailer conforms to the requirements of this specification and is capable of meeting the performance requirements specified herein. Each production semitrailer shall be tested as specified in 4.2.2.

4.6 Preparation for delivery inspection. The preservation, packaging, packing, and marking of the semitrailers shall be inspected to verify conformance to the requirements of section 5.

5. PREPARATION FOR DELIVERY

5.1 Vehicle preservation, packaging, and packing. The equipment shall be preserved and packed in accordance with the contractor's standard practice. When specified (see 6.2), equipment shall be preserved and packed in accordance with the requirements of MIL-V-62038 with the level of preservation and packing as specified (see 6.2).

5.2 Marking.

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5.2.1 Military agencies. Shipments to military agencies shall be marked in accordance with MIL-STD-129.

5.2.2 Civil agencies. Shipments to civil agencies shall be marked in accordance with FED-STD-123.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The type I semitrailer is equipped with pump, measuring meter, hoses, and other accessories required for fuel servicing operations. The type II semitrailer is intended for bulk hauling of gasoline and fuel oils.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in acquisition documents:

- a. Title, number, and date of this specification
- b. Type and size of semitrailer required (see 1.2)
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1)
- d. When longitudinal center of gravity is to be located and permanently indicated, and method required (see 3.2.1.2)
- e. When suspension system other than manufacturer's standard is required (see 3.7.2)
- f. When spare wheel or rim is not required (see 3.7.4.3)
- g. When spare tire is required (see 3.7.4.4)
- h. When parking brakes are not required (see 3.7.5.2)
- i. When auxiliary fifth wheel plate is required for the size D semitrailer (see 3.7.7)
- j. When an independent 24V dc lighting system is required (see 3.7.8.1.3)
- k. When an interconnected 24V dc system is required (see 3.7.8.1.4)
- l. When operation of the landing gear from either side of the semitrailer is required (see 3.7.9)
- m. When stress analysis is required (see 3.7.13).
- n. When tank assembly shall be other than type 304 stainless steel (see 3.8.1)
- o. When the aluminum alloy, type I tank assembly is required (see 3.8.1)
- p. Number of type I tank compartment, if other than as specified (see 3.8.1.1)
- q. When a sensor connection is to be provided (see 3.8.1.3.1)
- r. When the bottom loading adapter is to be other than as specified (see 3.8.1.4.3)
- s. When a hydrant coupler is required (see 3.8.1.4.4)
- t. When other than two 36-inch (910 mm) suction stubs are required (see 3.8.1.14)
- u. When filter separator unit is required (see 3.8.1.19)
- v. Material required for type II tank shell or tank assembly (see 3.8.2.1)
- w. Number of type II tank compartments, if other than as specified (see 3.8.2.1)
- x. Appropriate service for treatment, painting, identification marking, and data plates (see 3.12)

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- y. When rustproofing is required (see 3.13)
- z. When preservation and packing in accordance with MIL-V-62308 is required and the level of preservation and packing required (see 5.1)

6.3 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DoD Federal Acquisition Regulations (FAR) Supplement, Part 27, Sub-Part 227.405-70 are invoked and the DD Form 1423 is not used, the data should be delivered by the contractor in accordance with the contract or purchase order requirements.

6.4 Subject term (keyword) listing.

Engine
 Fuel tank
 Positive displacement pump

6.5 Supersession data. This specification replaces military specification MIL-S-45310H dated 01 March 1989.

6.6 Classification cross reference. Classifications used in this specification (see 1.2) are identical to those found in the superseded military specification, MIL-S-45310H.

MILITARY INTERESTS:

Custodians

Army - AT
 Navy - YD1

Review Activity

Navy - MC

CIVIL AGENCY COORDINATING ACTIVITY:

GSA-FSS

PREPARING ACTIVITY

Navy - YD1

(Project 2330-0140)