

**§ 392.61**

**§ 392.61 [Reserved]**

**§ 392.62 Safe operation, buses.**

No person shall drive a bus and a motor carrier shall not require or permit a person to drive a bus unless—

(a) All standees on the bus are rearward of the standee line or other means prescribed in § 393.90 of this subchapter;

(b) All aisle seats in the bus conform to the requirements of § 393.91 of this subchapter; and

(c) Baggage or freight on the bus is stowed and secured in a manner which assures—

(1) Unrestricted freedom of movement to the driver and his proper operation of the bus;

(2) Unobstructed access to all exits by any occupant of the bus; and

(3) Protection of occupants of the bus against injury resulting from the falling or displacement of articles transported in the bus.

[63 FR 33278, June 18, 1998]

**§ 392.63 Towing or pushing loaded buses.**

No disabled bus with passengers aboard shall be towed or pushed; nor shall any person use or permit to be used a bus with passengers aboard for the purpose of towing or pushing any disabled motor vehicle, except in such circumstances where the hazard to passengers would be increased by observance of the foregoing provisions of this section, and then only in traveling to the nearest point where the safety of the passengers is assured.

[33 FR 19732, Dec. 25, 1968, as amended at 60 FR 38747, July 28, 1995]

**§ 392.64 Riding within closed commercial motor vehicles without proper exits.**

No person shall ride within the closed body of any commercial motor vehicle unless there are means on the inside thereof of obtaining exit. Said means shall be in such condition as to permit ready operation by the occupant.

[33 FR 19732, Dec. 25, 1968, as amended at 60 FR 38747, July 28, 1995]

**49 CFR Ch. III (10–1–04 Edition)**

**§ 392.65 [Reserved]**

**§ 392.66 Carbon monoxide; use of commercial motor vehicle when detected.**

(a) No person shall dispatch or drive any commercial motor vehicle or permit any passengers thereon, when the following conditions are known to exist, until such conditions have been remedied or repaired:

(1) Where an occupant has been affected by carbon monoxide;

(2) Where carbon monoxide has been detected in the interior of the commercial motor vehicle;

(3) When a mechanical condition of the commercial motor vehicle is discovered which would be likely to produce a hazard to the occupants by reason of carbon monoxide.

(b) [Reserved]

[60 FR 38747, July 28, 1995]

**§ 392.67 Heater, flame-producing; on commercial motor vehicle in motion.**

No open flame heater used in the loading or unloading of the commodity transported shall be in operation while the commercial motor vehicle is in motion.

[33 FR 19732, Dec. 25, 1968, as amended at 60 FR 38747, July 28, 1995]

**§§ 392.68–392.69 [Reserved]**

**§ 392.71 Radar detectors; use and/or possession.**

(a) No driver shall use a radar detector in a commercial motor vehicle, or operate a commercial motor vehicle that is equipped with or contains any radar detector.

(b) No motor carrier shall require or permit a driver to violate paragraph (a) of this section.

[58 FR 67375, Dec. 21, 1993]

**PART 393—PARTS AND ACCESSORIES NECESSARY FOR SAFE OPERATION**

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## § 393.1

### SPECIFIC SECUREMENT REQUIREMENTS BY COMMODITY TYPE

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- 393.201 Frames.
- 393.203 Cab and body components.
- 393.205 Wheels.
- 393.207 Suspension systems.
- 393.209 Steering wheel systems.

AUTHORITY: 49 U.S.C. 322, 31136, and 31502; Section 1041(b) of Pub. L. 102-240, 105 Stat. 1914, 1993 (1991); and 49 CFR 1.73.

SOURCE: 33 FR 19735, Dec. 25, 1968, unless otherwise noted.

EDITORIAL NOTE: Nomenclature changes to part 393 appear at 66 FR 49874, Oct. 1, 2001.

### Subpart A—General

SOURCE: 53 FR 49384, Dec. 7, 1988, unless otherwise noted.

#### § 393.1 Scope of the rules of this part.

Every employer and employee shall comply and be conversant with the requirements and specifications of this part. No employer shall operate a commercial motor vehicle, or cause or permit it to be operated, unless it is equipped in accordance with the requirements and specifications of this part.

[54 FR 48617, Nov. 24, 1989]

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### § 393.3 Additional equipment and accessories.

Nothing contained in this subchapter shall be construed to prohibit the use of additional equipment and accessories, not inconsistent with or prohibited by this subchapter, provided such equipment and accessories do not decrease the safety of operation of the motor vehicles on which they are used.

### § 393.5 Definitions.

As used in this part, the following words and terms are construed to mean:

*Aggregate working load limit.* The summation of the working load limits or restraining capacity of all devices used to secure an article of cargo on a vehicle.

*Agricultural commodity trailer.* A trailer that is designed to transport bulk agricultural commodities in off-road harvesting sites and to a processing plant or storage location, as evidenced by skeletal construction that accommodates harvest containers, a maximum length of 28 feet, and an arrangement of air control lines and reservoirs that minimizes damage in field operations.

*Anchor point.* Part of the structure, fitting or attachment on a vehicle or article of cargo to which a tie-down is attached.

*Antilock Brake System or ABS* means a portion of a service brake system that automatically controls the degree of rotational wheel slip during braking by:

(1) Sensing the rate of angular rotation of the wheels;

(2) Transmitting signals regarding the rate of wheel angular rotation to one or more controlling devices which interpret those signals and generate responsive controlling output signals; and

(3) Transmitting those controlling signals to one or more modulators which adjust brake actuating forces in response to those signals.

*Article of cargo.* A unit of cargo, other than a liquid, gas, or aggregate that lacks physical structure (e.g., grain, gravel, etc.) including articles grouped together so that they can be handled as a single unit or unitized by wrapping,

strapping, banding or edge protection device(s).

*Bell pipe concrete.* Pipe whose flanged end is of larger diameter than its barrel.

*Blocking.* A structure, device or another substantial article placed against or around an article of cargo to prevent horizontal movement of the article of cargo.

*Bracing.* A structure, device, or another substantial article placed against an article of cargo to prevent it from tipping, that may also prevent it from shifting.

*Brake.* An energy conversion mechanism used to stop, or hold a vehicle stationary.

*Brake tubing/hose.* Metallic brake tubing, nonmetallic brake tubing and brake hose are conduits or lines used in a brake system to transmit or contain the medium (fluid or vacuum) used to apply the motor vehicle's brakes.

*Bus.* A vehicle designed to carry more than 15 passengers, including the driver.

*Chassis.* The load-supporting frame in a truck or trailer, exclusive of any appurtenances which might be added to accommodate cargo.

*Clearance lamp.* A lamp used on the front and the rear of a motor vehicle to indicate its overall width and height.

*Container chassis.* A semitrailer of skeleton construction limited to a bottom frame, one or more axles, specially built and fitted with locking devices for the transport of cargo containers, so that when the chassis and container are assembled, the units serve the same function as an over the road trailer.

*Converter dolly.* A motor vehicle consisting of a chassis equipped with one or more axles, a fifth wheel and/or equivalent mechanism, and drawbar, the attachment of which converts a semitrailer to a full trailer.

*Curb weight.* The weight of a motor vehicle with standard equipment, maximum capacity of fuel, oil, and coolant; and, if so equipped, air conditioning and additional weight of optional engine. Curb weight does not include the driver.

*Dunnage.* All loose materials used to support and protect cargo.

*Dunnage bag.* An inflatable bag intended to fill otherwise empty space

between articles of cargo, or between articles of cargo and the wall of the vehicle.

*Edge protector.* A device placed on the exposed edge of an article to distribute tiedown forces over a larger area of cargo than the tiedown itself, to protect the tie-down and/or cargo from damage, and to allow the tiedown to slide freely when being tensioned.

*Emergency brake system.* A mechanism designed to stop a vehicle after a single failure occurs in the service brake system of a part designed to contain compressed air or brake fluid or vacuum (except failure of a common valve, manifold brake fluid housing or brake chamber housing).

*Fifth wheel.* A device mounted on a truck tractor or similar towing vehicle (e.g., converter dolly) which interfaces with and couples to the upper coupler assembly of a semitrailer.

*Frame vehicle.* A vehicle with skeletal structure fitted with one or more bunk units for transporting logs. A bunk unit consists of U-shaped front and rear bunks that together cradle logs. The bunks are welded, gusseted or otherwise firmly fastened to the vehicle's main beams, and are an integral part of the vehicle.

*Friction mat.* A device placed between the deck of a vehicle and article of cargo, or between articles of cargo, intended to provide greater friction than exists naturally between these surfaces.

*Fuel tank fitting.* Any removable device affixed to an opening in the fuel tank with the exception of the filler cap.

*g.* The acceleration due to gravity, 32.2 ft/sec<sup>2</sup> (9.81 m/sec<sup>2</sup>).

*Grommet.* A device that serves as a support and protection to that which passes through it.

*Hazard warning signal.* Lamps that flash simultaneously to the front and rear, on both the right and left sides of a commercial motor vehicle, to indicate to an approaching driver the presence of a vehicular hazard.

*Head lamps.* Lamps used to provide general illumination ahead of a motor vehicle.

*Heater.* Any device or assembly of devices or appliances used to heat the interior of any motor vehicle. This includes a catalytic heater which must meet the requirements of §177.834(1) of this title when flammable liquid or gas is transported.

*Heavy hauler trailer.* A trailer with one or more of the following characteristics:

(1) Its brake lines are designed to adapt to separation or extension of the vehicle frame; or

(2) Its body consists only of a platform whose primary cargo-carrying surface is not more than 40 inches above the ground in an unloaded condition, except that it may include sides that are designed to be easily removable and a permanent “front-end structure” as that term is used in Section 393.106 of this title.

*Hook-lift container.* A specialized container, primarily used to contain and transport materials in the waste, recycling, construction/demolition and scrap industries, which is used in conjunction with specialized vehicles, in which the container is loaded and unloaded onto a tilt frame body by an articulating hook-arm.

*Identification lamps.* Lamps used to identify certain types of commercial motor vehicles.

*Integral securement system.* A system on certain roll-on/roll-off containers and hook-lift containers and their related transport vehicles in which compatible front and rear hold down devices are mated to provide securement of the complete vehicle and its articles of cargo.

*Lamp.* A device used to produce artificial light.

*Length of a manufactured home.* The largest exterior length in the traveling mode, including any projections which contain interior space. Length does not include bay windows, roof projections, overhangs, or eaves under which there is no interior space, nor does it include drawbars, couplings or hitches.

*License plate lamp.* A lamp used to illuminate the license plate on the rear of a motor vehicle.

*Longwood.* All logs that are not shortwood, i.e., are over 4.9 m (16 feet) long. Such logs are usually described as long logs or treelength.

*Low chassis vehicle.* (1) A trailer or semitrailer manufactured on or after January 26, 1998, having a chassis which extends behind the rearmost point of the rearmost tires and which has a lower rear surface that meets the guard width, height, and rear surface requirements of §571.224 in effect on the date of manufacture, or a subsequent edition.

(2) A motor vehicle, not described by paragraph (1) of this definition, having a chassis which extends behind the rearmost point of the rearmost tires and which has a lower rear surface that meets the guard configuration requirements of §393.86(b)(1).

*Manufactured home* means a structure, transportable in one or more sections, which in the traveling mode, is eight body feet or more in width or forty body feet or more in length, or, when erected on site, is three hundred twenty or more square feet, and which is built on a permanent chassis and designed to be used as a dwelling with or without a permanent foundation when connected to the required utilities, and includes the plumbing, heating, air-conditioning, and electrical systems contained therein. Calculations used to determine the number of square feet in a structure will be based on the structure’s exterior dimensions measured at the largest horizontal projections when erected on site. These dimensions will include all expandable rooms, cabinets, and other projections containing interior space, but do not include bay windows. This term includes all structures which meet the *above* requirements except the size requirements and with respect to which the manufacturer voluntarily files a certification pursuant to 24 CFR 3282.13 and complies with the standards set forth in 24 CFR part 3280.

*Parking brake system.* A brake system used to hold a vehicle stationary.

*Play.* Any free movement of components.

*Pulpwood trailer.* A trailer or semitrailer that is designed exclusively for harvesting logs or pulpwood and constructed with a skeletal frame with no means for attachment of a solid bed, body, or container.

*Rail vehicle.* A vehicle whose skeletal structure is fitted with stakes at the

front and rear to contain logs loaded crosswise.

*Rear extremity.* The rearmost point on a motor vehicle that falls above a horizontal plane located 560 mm (22 inches) above the ground and below a horizontal plane located 1,900 mm (75 inches) above the ground when the motor vehicle is stopped on level ground; unloaded; its fuel tanks are full; the tires (and air suspension, if so equipped) are inflated in accordance with the manufacturer's recommendations; and the motor vehicle's cargo doors, tailgate, or other permanent structures are positioned as they normally are when the vehicle is in motion. Nonstructural protrusions such as taillamps, rubber bumpers, hinges and latches are excluded from the determination of the rearmost point.

*Reflective material.* A material conforming to Federal Specification L-S-300, "Sheeting and Tape, Reflective; Non-exposed Lens, Adhesive Backing," (September 7, 1965) meeting the performance standard in either Table 1 or Table 1A of SAE Standard J594f, "Reflex Reflectors" (January, 1977).

*Reflex reflector.* A device which is used on a vehicle to give an indication to an approaching driver by reflected lighted from the lamps on the approaching vehicle.

*Saddle-mount.* A device, designed and constructed as to be readily demountable, used in driveaway-towaway operations to perform the functions of a conventional fifth wheel:

(1) Upper-half. *Upper-half* of a "saddle-mount" means that part of the device which is securely attached to the towed vehicle and maintains a fixed position relative thereto, but does not include the "king-pin;"

(2) Lower-half. *Lower-half* of a "saddle-mount" means that part of the device which is securely attached to the towing vehicle and maintains a fixed position relative thereto but does not include the "king-pin;" and

(3) King-pin. *King-pin* means that device which is used to connect the "upper-half" to the "lower-half" in such manner as to permit relative movement in a horizontal plane between the towed and towing vehicles.

*Service brake system.* A primary brake system used for slowing and stopping a vehicle.

*Shoring bar.* A device placed transversely between the walls of a vehicle and cargo to prevent cargo from tipping or shifting.

*Shortwood.* All logs typically up to 4.9 m (16 feet) long. Such logs are often described as cut-up logs, cut-to-length logs, bolts or pulpwood. Shortwood may be loaded lengthwise or crosswise, though that loaded crosswise is usually no more than 2.6 m (102 inches) long.

*Sided vehicle.* A vehicle whose cargo compartment is enclosed on all four sides by walls of sufficient strength to contain articles of cargo, where the walls may include latched openings for loading and unloading, and includes vans, dump bodies, and a sided intermodal container carried by a vehicle.

*Side extremity.* The outermost point on a side of the motor vehicle that is above a horizontal plane located 560 mm (22 inches) above the ground, below a horizontal plane located 1,900 mm (75 inches) above the ground, and between a transverse vertical plane tangent to the rear extremity of the vehicle and a transverse vertical plane located 305 mm (12 inches) forward of that plane when the vehicle is unloaded; its fuel tanks are full; and the tires (and air suspension, if so equipped) are inflated in accordance with the manufacturer's recommendations. Non-structural protrusions such as taillights, hinges and latches are excluded from the determination of the outermost point.

*Side marker lamp (Intermediate).* A lamp shown to the side of a trailer to indicate the approximate middle of a trailer 30 feet or more in length.

*Side marker lamps.* Lamps used on each side of a trailer to indicate its overall length.

*Special purpose vehicle.* (1) A trailer or semitrailer manufactured on or after January 26, 1998, having work-performing equipment that, while the motor vehicle is in transit, resides in or moves through the area that could be occupied by the horizontal member of the rear impact guard, as defined by the guard width, height and rear surface requirements of §571.224 (paragraphs S5.1.1 through S5.1.3), in effect

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on the date of manufacture, or a subsequent edition.

(2) A motor vehicle, not described by paragraph (1) of this definition, having work-performing equipment that, while the motor vehicle is in transit, resides in or moves through the area that could be occupied by the horizontal member of the rear impact guard, as defined by the guard width, height and rear surface requirements of § 393.86(b)(1).

*Steering wheel lash.* The condition in which the steering wheel may be turned through some part of a revolution without associated movement of the front wheels.

*Stop lamps.* Lamps shown to the rear of a motor vehicle to indicate that the service brake system is engaged.

*Tail lamps.* Lamps used to designate the rear of a motor vehicle.

*Tiedown.* A combination of securing devices which forms an assembly that attaches articles of cargo to, or restrains articles of cargo on, a vehicle or trailer, and is attached to anchor point(s).

*Tractor-pole trailer.* A combination vehicle that carries logs lengthwise so that they form the body of the vehicle. The logs are supported by a bunk located on the rear of the tractor, and another bunk on the skeletal trailer. The tractor bunk may rotate about a vertical axis, and the trailer may have a fixed, scoping, or cabled reach, or other mechanical freedom, to allow it to turn.

*Turn signals.* Lamps used to indicate a change in direction by emitting a flashing light on the side of a motor vehicle towards which a turn will be made.

*Upper coupler assembly.* A structure consisting of an upper coupler plate, king-pin and supporting framework which interfaces with and couples to a fifth wheel.

*Upper coupler plate.* A plate structure through which the king-pin neck and collar extend. The bottom surface of the plate contacts the fifth wheel when coupled.

*Void filler.* Material used to fill a space between articles of cargo and the structure of the vehicle that has sufficient strength to prevent movement of the articles of cargo.

*Well.* The depression formed between two cylindrical articles of cargo when they are laid with their eyes horizontal and parallel against each other.

*Wheels back vehicle.* (1) A trailer or semitrailer manufactured on or after January 26, 1998, whose rearmost axle is permanently fixed and is located such that the rearmost surface of the tires (of the size recommended by the vehicle manufacturer for the rear axle) is not more than 305 mm (12 inches) forward of the transverse vertical plane tangent to the rear extremity of the vehicle.

(2) A motor vehicle, not described by paragraph (1) of this definition, whose rearmost axle is permanently fixed and is located such that the rearmost surface of the tires (of the size recommended by the vehicle manufacturer for the rear axle) is not more than 610 mm (24 inches) forward of the transverse vertical plane tangent to the rear extremity of the vehicle.

*Width of a manufactured home.* The largest exterior width in the traveling mode, including any projections which contain interior space. Width does not include bay windows, roof projections, overhangs, or eaves under which there is no interior space.

*Working load limit (WLL).* The maximum load that may be applied to a component of a cargo securement system during normal service, usually assigned by the manufacturer of the component.

[53 FR 49384, Dec. 7, 1988, as amended at 63 FR 8339, Feb. 18, 1998; 63 FR 24465, May 4, 1998; 64 FR 47707, Sept. 1, 1999; 67 FR 61224, Sept. 27, 2002; 68 FR 56208, Sept. 30, 2003]

**§ 393.7 Matter incorporated by reference.**

(a) *Incorporation by reference.* Part 393 includes references to certain matter or materials, as listed in paragraph (b) of this section. The text of the materials is not included in the regulations contained in part 393. The materials are hereby made a part of the regulations in part 393. The Director of the Federal Register has approved the materials incorporated by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. For materials subject to change, only the specific version approved by the Director of the Federal

Register and specified in the regulation are incorporated. Material is incorporated as it exists on the date of the approval and a notice of any change in these materials will be published in the FEDERAL REGISTER.

(b) *Matter or materials referenced in part 393.* The matter or materials listed in this paragraph are incorporated by reference in the corresponding sections noted.

(1) Highway Emergency Signals, Fourth Edition, Underwriters Laboratories, Inc., UL No. 912, July 30, 1979, (with an amendment dated November 9, 1981), incorporation by reference approved for § 393.95(j).

(2) Standard Specification for Strapping, Flat Steel and Seals, American Society for Testing and Materials (ASTM), D3953-97, February 1998, incorporation by reference approved for § 393.104(e).

(3) Welded Steel Chain Specifications, National Association of Chain Manufacturers, November 15, 1999, incorporation by reference approved for § 393.104(e).

(4) Recommended Standard Specification for Synthetic Web Tiedowns, Web Sling and Tiedown Association, WSTDA-T1, 1998, incorporation by reference approved for § 393.104(e).

(5) Wire Rope Users Manual, 2nd Edition, Wire Rope Technical Board November 1985, incorporation by reference approved for § 393.104(e).

(6) Cordage Institute rope standards approved for incorporation into § 393.104(e):

(i) PETRS-2, Polyester Fiber Rope, 3-Strand and 8-Strand Constructions, January 1993;

(ii) PPRS-2, Polypropylene Fiber Rope, 3-Strand and 8-Strand Constructions, August 1992;

(iii) CRS-1, Polyester/Polypropylene Composite Rope Specifications, Three-Strand and Eight-Strand Standard Construction, May 1979;

(iv) NRS-1, Nylon Rope Specifications, Three-Strand and Eight-Strand Standard Construction, May 1979; and

(v) C-1, Double Braided Nylon Rope Specifications DBN, January 1984.

(c) *Availability.* The materials incorporated by reference are available as follows:

(1) Standards of the Underwriters Laboratories, Inc. Information and copies may be obtained by writing to: Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, Illinois 60062.

(2) Specifications of the American Society for Testing and Materials. Information and copies may be obtained by writing to: American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania 19428-2959.

(3) Specifications of the National Association of Chain Manufacturers. Information and copies may be obtained by writing to: National Association of Chain Manufacturers, P.O. Box 22681, Lehigh Valley, Pennsylvania 18002-2681.

(4) Specifications of the Web Sling and Tiedown Association. Information and copies may be obtained by writing to: Web Sling and Tiedown Association, Inc., 5024-R Campbell Boulevard, Baltimore, Maryland 21236-5974.

(5) Manuals of the Wire Rope Technical Board. Information and copies may be obtained by writing to: Wire Rope Technical Committee, P.O. Box 849, Stevensville, Maryland 21666.

(6) Standards of the Cordage Institute. Information and copies may be obtained by writing to: Cordage Institute, 350 Lincoln Street, # 115, Hingham, Massachusetts 02043.

(7)-(9) [Reserved].

(10) All of the materials incorporated by reference are available for inspection at:

(i) The Federal Motor Carrier Safety Administration, Office of Bus and Truck Standards and Operations, 400 Seventh Street, SW., Washington, DC 20590; and

(ii) The National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: [http://www.archives.gov/federal\\_register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html).

[67 FR 61225, Sept. 27, 2002]

**§ 393.9**

**Subpart B—Lighting Devices, Reflectors, and Electrical Equipment**

**§ 393.9 Lamps operable.**

All lamps required by this subpart shall be capable of being operated at all times.

(49 U.S.C. 304, 1655; 49 CFR 1.48(b) and 301.60)  
[47 FR 47837, Oct. 28, 1982]

**§ 393.11 Lighting devices and reflectors.**

The following Table 1 sets forth the required color, position, and required

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lighting devices by type of commercial motor vehicle. Diagrams illustrating the locations of lighting devices and reflectors, by type and size of commercial motor vehicle, are shown immediately following Table 1. All lighting devices on motor vehicles placed in operation after March 7, 1989, must meet the requirements of 49 CFR 571.108 in effect at the time of manufacture of the vehicle. Motor vehicles placed in operation on or before March 7, 1989, must meet either the requirements of this subchapter or part 571 of this title in effect at the time of manufacture.

TABLE 1—REQUIRED COMMERCIAL VEHICLE LIGHTING EQUIPMENT

Item on the vehicle	Quantity	Color	Location	Position	Height above road surface in inches measured from the center of the lamp at curb weight	Required lighting devices/vehicles
Headlamps	2 At Least	White	Front	On the front at the same height, an equal number at each side of the vertical centerline as far apart as practicable.	Not less than 22 nor more than 54.	A, B, C
Turn Signal (Front) See Footnotes #2 & 12.	2	Amber	At or Near Front	One on each side of the vertical centerline at the same height and as far apart as practicable.	Not less than 15 nor more than 83.	A, B, C
Identification Lamp (Front) Footnote #1	3	Amber	Front	Mounted on the vertical centerline of the vehicle or the vertical centerline of the cab where different from the centerline of the vehicle.	All three on same level as close as practicable to the top of the vehicle with lamp centers spaced not less than 6 inches or more than 12 inches apart.	B, C
Tail Lamp See Footnotes #5 & 11	2	Red	Rear	One lamp each side of the vertical centerline at the same height and as far apart as practicable.	Both on the same level between 15 and 72.	A, B, C, D, E, F, G, H
Stop Lamp See Footnotes #5 & 13	2	Red	Rear	One lamp each side of the vertical centerline at the same height and as far apart as practicable.	Both on the same level between 15 and 72.	A, B, C, D, E, F, G
Clearance Lamps See Footnotes #9, 10, & 15.	2	Amber	One on each side of front.	One on each side of the vertical centerline to indicate width.	Both on same level as high as practicable.	B, C, D, G, H
	2	Red	One on each side of rear.	One on each side of the vertical centerline to indicate overall width.	Both on same level as high as practicable.	B, D, G, H
Side Marker Lamp, Intermediate	2	Amber	One on each side.	At or near midpoint between front and rear side marker lamps, if over 30' in length.	Not less than 15	A, B, D, F, G
Reflex Reflector Intermediate (Side)	2	Amber	One on each side.	At or near midpoint between front and rear side reflectors if over 30' in length.	Between 15 and 60	A, B, D, F, G
Reflex Reflector (Rear) See Footnotes #5, 6, & 8.	2	Red	Rear	One on each side of vertical centerline, as far apart as practicable.	Both on same level, between 15 and 60.	A, B, C, D, E, F, G
Reflex Reflector (Rear Side) Footnote #4.	2	Red	One on each side (rear).	As far to the rear as practicable	Both on same level, between 15 and 60.	A, B, D, F, G
Reflex Reflector (Front Side)	2	Amber	One on each side (front).	As far to the front as practicable	Between 15 and 60	A, B, C, D, F, G
License Plate Lamp Rear See Footnote #11.	1	White	At rear license plate.	To illuminate the license plate from the top or sides.	No requirements	A, B, C, D, F, G
Side Marker Lamp (Front)	2	Amber	One on each side.	As far to the front as practicable	Not less than 15	A, B, C, D, F
Side Marker Lamp (Rear) See Footnotes #4 & 8.	2	Red	One on each side.	As far to the rear as practicable	Not less than 15 and on the rear of trailer, not more than 60.	A, B, D, F, G
Turn Signal (Rear) See Footnotes #5 & 12.	2	Amber or Red.	Rear	One lamp on each side of the vertical centerline as far apart as practicable.	Both on the same level, between 15 and 83.	A, B, C, D, E, F, G

TABLE 1—REQUIRED COMMERCIAL VEHICLE LIGHTING EQUIPMENT—Continued

Item on the vehicle	Quantity	Color	Location	Position	Height above road surface in inches measured from the center of the lamp at curb weight	Required lighting devices/vehicles
Identification Lamp (Rear) See Footnotes #3, 7 & 15.	3	Red	Rear	One as close as practicable to vertical centerline. One on each side with lamp centers spaced not less than 6" or more than 12" apart.	All three on same level as close as practicable to the top of the vehicle.	B, D, G
Vehicular Hazard Warning Lamps See Footnote #12.	2	Amber	Front	One lamp on each side of vertical centerline as far apart as practicable.	Both on same level, between 15 and 83.	A, B, C, D, E, F, G
Backup Lamp See Footnote #14	2	Amber or Red.	Rear			
Parking Lamp	1	White	Rear	Rear	No requirement	A, B, C
	2	Amber or white.	Front	One lamp on each side of vertical centerline as far apart as practicable.	Both on same level, between 15 and 72.	A

\* Lighting Required per Type of Commercial Vehicle as Shown Last Column of Table.

A. Small buses and trucks less than 80 inches in overall width.

B. Buses and trucks 80 inches or more in overall width.

C. Truck Tractors.

D. Large semitrailers and full trailers 80 inches or more in overall width except converter dollies.

E. Converter dolly.

F. Small semitrailers and full trailers less than 80 inches in overall width.

G. Pole Trailers.

H. Projecting loads.

Lamps and reflectors may be combined as permitted by Paragraphs 393.22 and S4.4 of 49 CFR 571.108, Equipment combinations.

## Footnote—1

Identification lamps may be mounted on the vertical centerline of the cab where different from the centerline of the vehicle, except where the cab is not more than 42 inches wide at the front roofline, then a single lamp at the center of the cab shall be deemed to comply with the requirements for identification lamps. No part of the identification lamps or their mountings may extend below the top of the vehicle windshield.

## Footnote—2

Unless the turn signals on the front are so constructed (double-faced) and located as to be visible to passing drivers, two turn signals are required on the rear of the truck tractor, one at each side as far apart as practicable.

## Footnote—3

The identification lamps need not be visible or lighted if obscured by a vehicle in the same combination.

## Footnote—4

Any semitrailer or full trailer vehicles manufactured on and after March 1, 1979, shall be equipped with rear side-marker lamps at a height of not less than 15 inches (381 mm) nor more than 60 inches (1524 mm) above the road surface, as measured from the center of the lamp on the vehicle at curb weight. The rear side marker lamps shall be visible in the vehicle's rearview mirrors when the trailer is tracking straight.

## Footnote—5

For purposes of these regulations, each converter dolly shall be equipped with one stop lamp, one tail lamp, and two reflectors on the rear at each side when towed singly by another vehicle. Each converter dolly shall be equipped with turn signals at the rear if the converter dolly obscures the turn signals at the rear of the towing vehicle when towed singly by another vehicle.

## Footnote—6

Pole trailers will have two reflectors, one on each side, placed to indicate extreme width of the trailer.

## Footnote—7

Pole trailers may have three identification lamps mounted on the vertical centerline of the rear of the cab of the truck tractor drawing the pole trailer, and higher than the load being transported, in lieu of the three identification lamps mounted on the rear vertical centerline of the trailer.

## Footnote—8

Pole trailers shall have on the rearmost support for the load, one combination marker lamp or two single lamps showing amber to the front and red to the rear and side, mounted on each side to indicate maximum width of the pole trailer; and one red reflector on each side of the rearmost support for the load.

## Footnote—9

Any motor vehicle transporting a load which extends more than 4 inches beyond the width of the motor vehicle, or having projections beyond the rear of such vehicles, shall be equipped with the following lamps in addition to other required lamps, have the loads marked

Loads projecting more than 4 inches beyond sides of motor vehicles:

(1) The foremost edge of the projecting load at its outermost extremity shall be marked with an amber lamp visible from the front and both sides.

(2) The rearmost edge of the projecting load at its outermost extremity shall be marked with a red lamp visible from the rear and side.

(3) If any portion of the projecting load extends beyond both the foremost and rearmost edge, it shall be marked with an amber lamp visible from the front, both sides, and rear.

(4) If the projecting load does not measure more than 3 feet from front to rear, it shall be marked with an amber lamp visible from the front, both sides, and rear, except that if the projection is located at or near the rear it shall be marked by a red lamp visible from front, side, and rear.

## Footnote—10

Projections beyond rear of motor vehicles. Motor vehicles transporting loads which extend more than 4 feet beyond the rear of the motor vehicle, or which have these tailboards or tailgates extending more than 4 feet beyond the body, shall have projections marked as follows:

(1) On each side of the projecting load, one red lamp, visible from the side, located so as to indicate maximum overhang.

(2) On the rear of the projecting load, two red lamps, visible from the rear, one at each side; and two red reflectors visible from the rear, one at each side, located so as to indicate maximum width.

## Footnote—11

To be illuminated when tractor headlamps are illuminated.

## Footnote—12

Every bus, truck, and truck tractor shall be equipped with a signaling system that, in addition to signaling turning movements, shall have a switch or combination of switches that will cause the two front turn signals and the two rear signals to flash simultaneously as a vehicular traffic signal warning, required by § 392-22(a). The system shall be capable of flashing simultaneously with the ignition of the vehicle on or off.

## Footnote—13

To be actuated upon application of service brakes.

## Footnote—14

Backup lamp required to operate when bus, truck, or truck tractor is in reverse.

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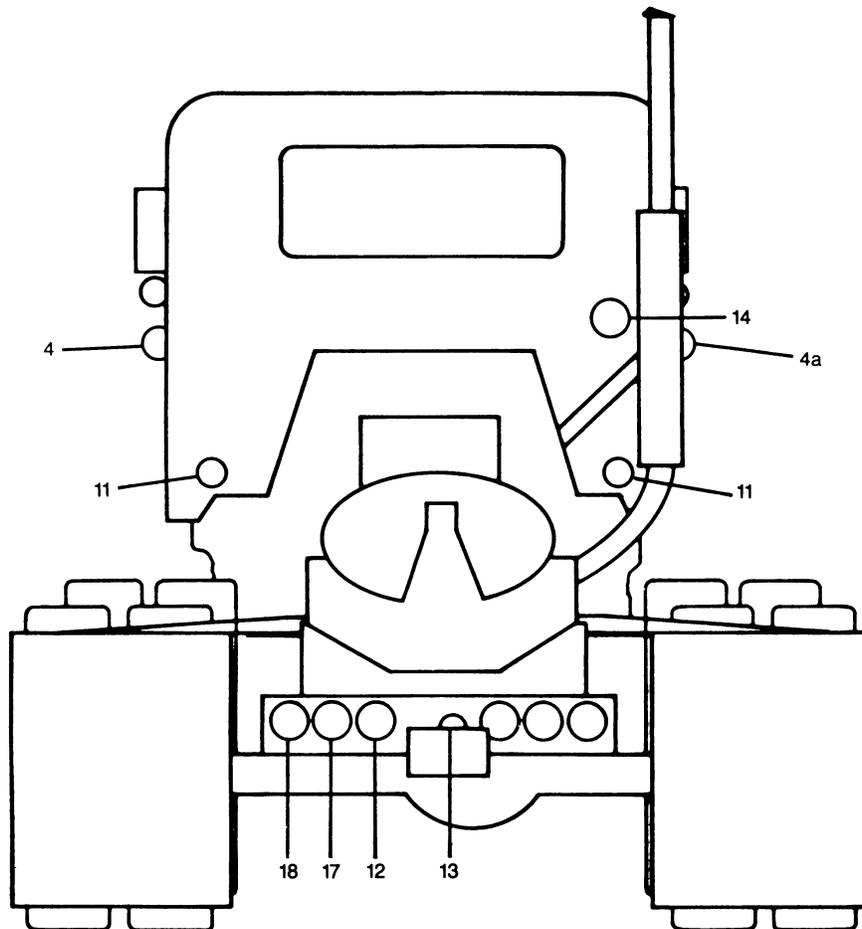
49 CFR Ch. III (10-1-04 Edition)

Footnote—15

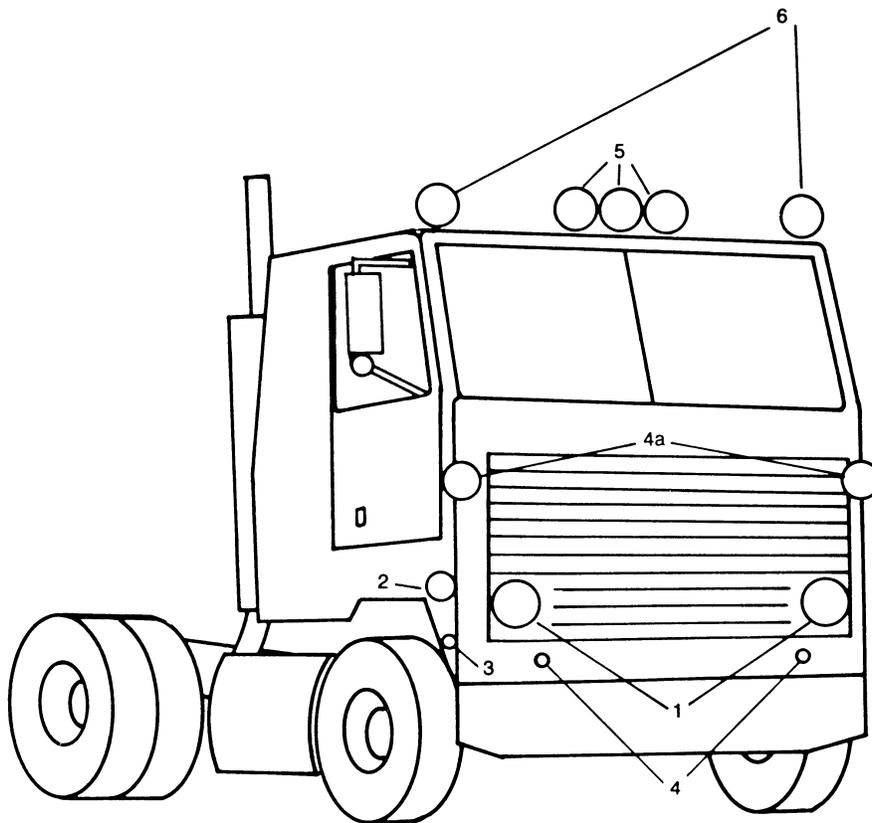
When the rear identification lamps are mounted at the extreme height of a vehicle,

rear clearance lamps need not meet the requirement that they be located as close as practicable to the top of the vehicle.

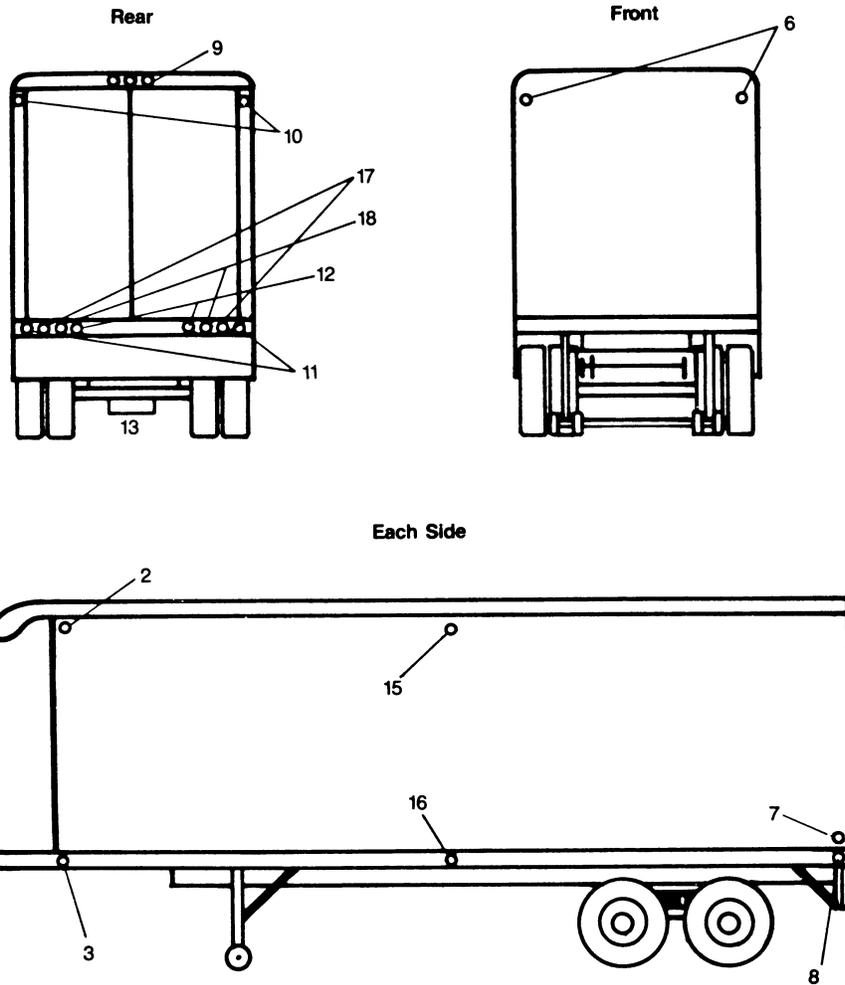
**Truck Tractor  
Rear View**



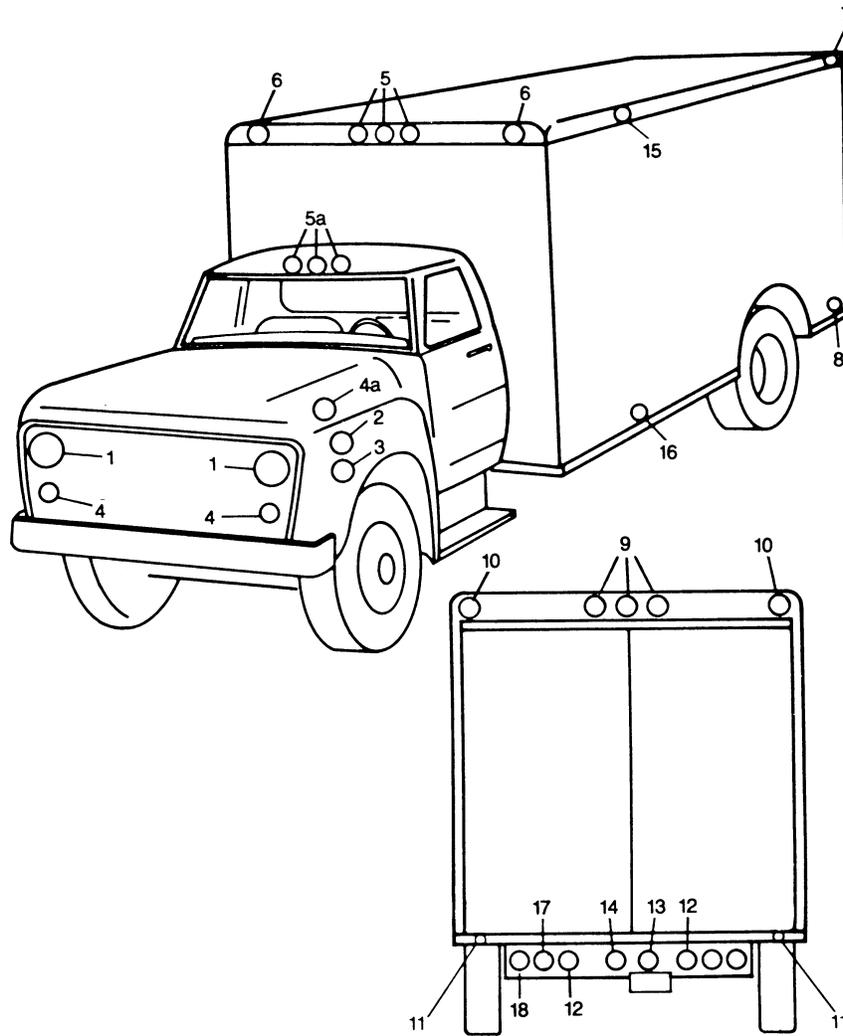
**Truck Tractor  
Front & Side View**



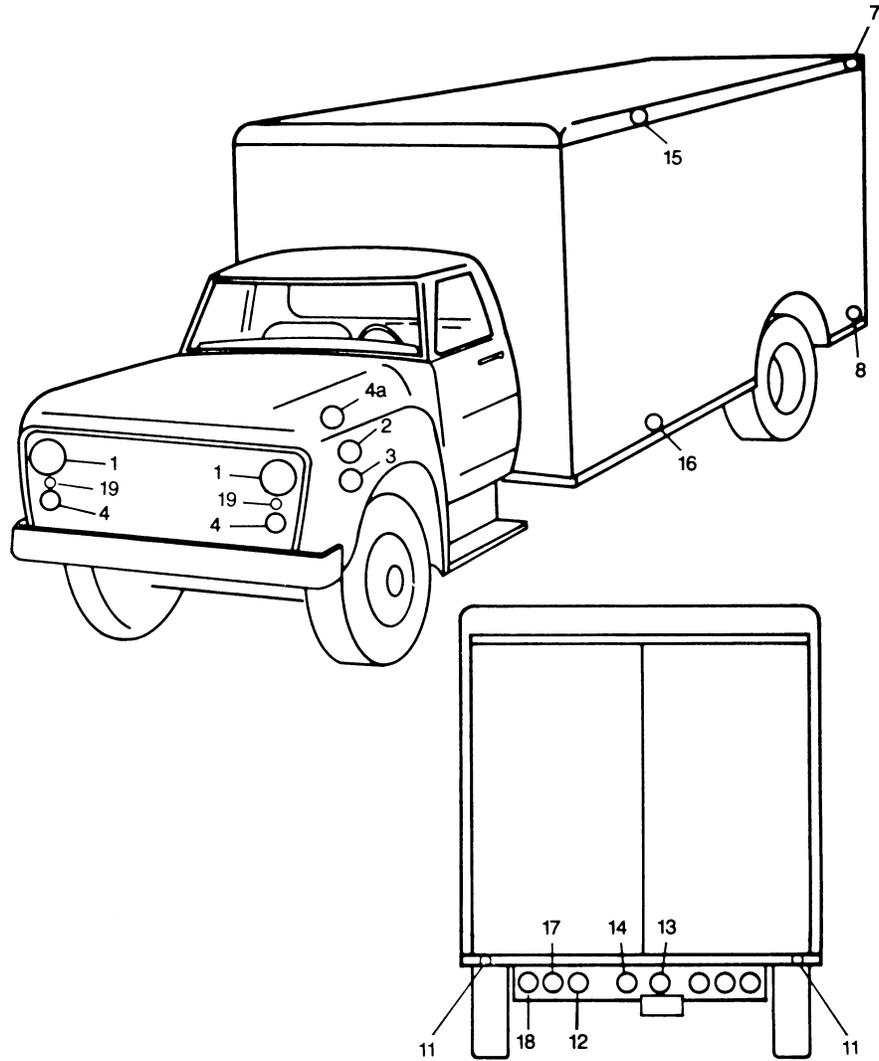
Large Trailers



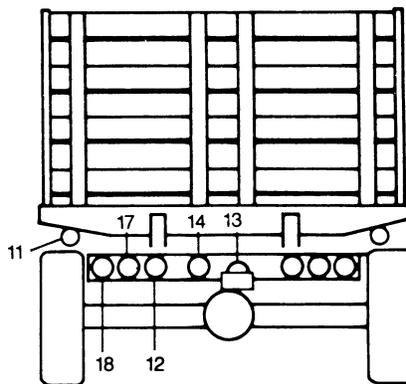
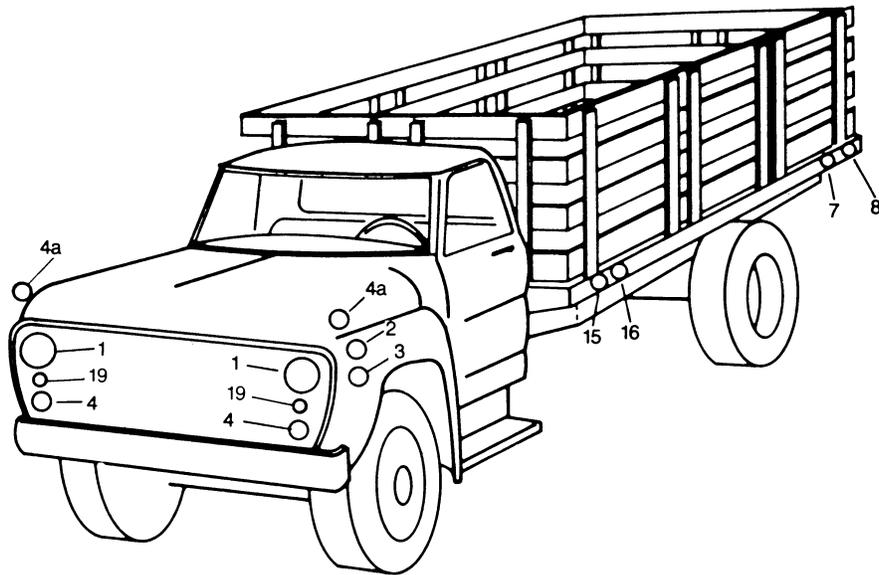
Over 80 Inches



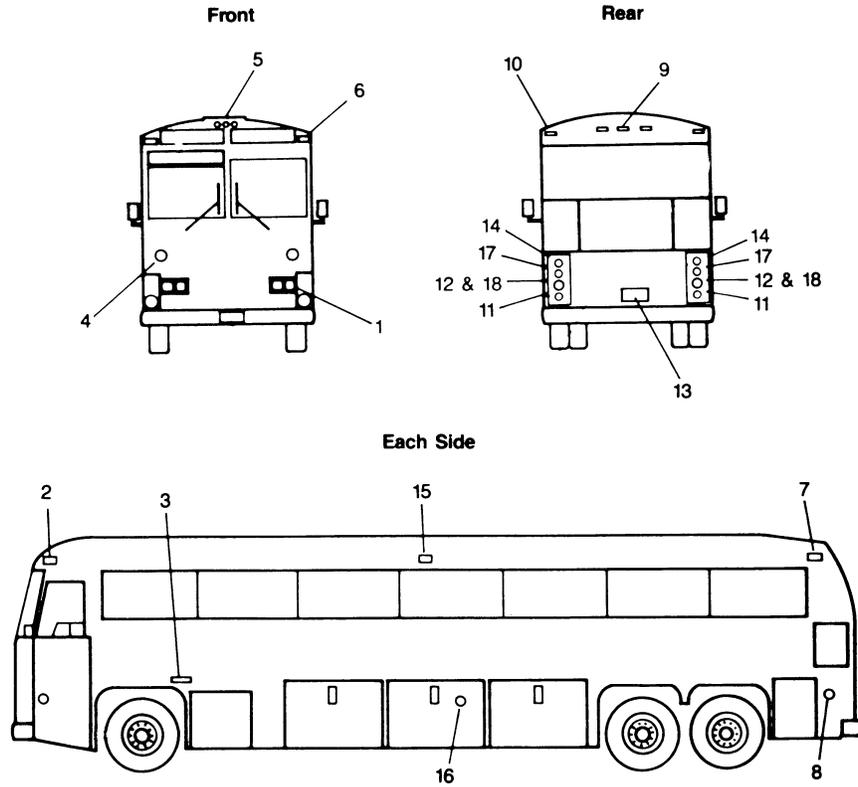
Under 80 Inches



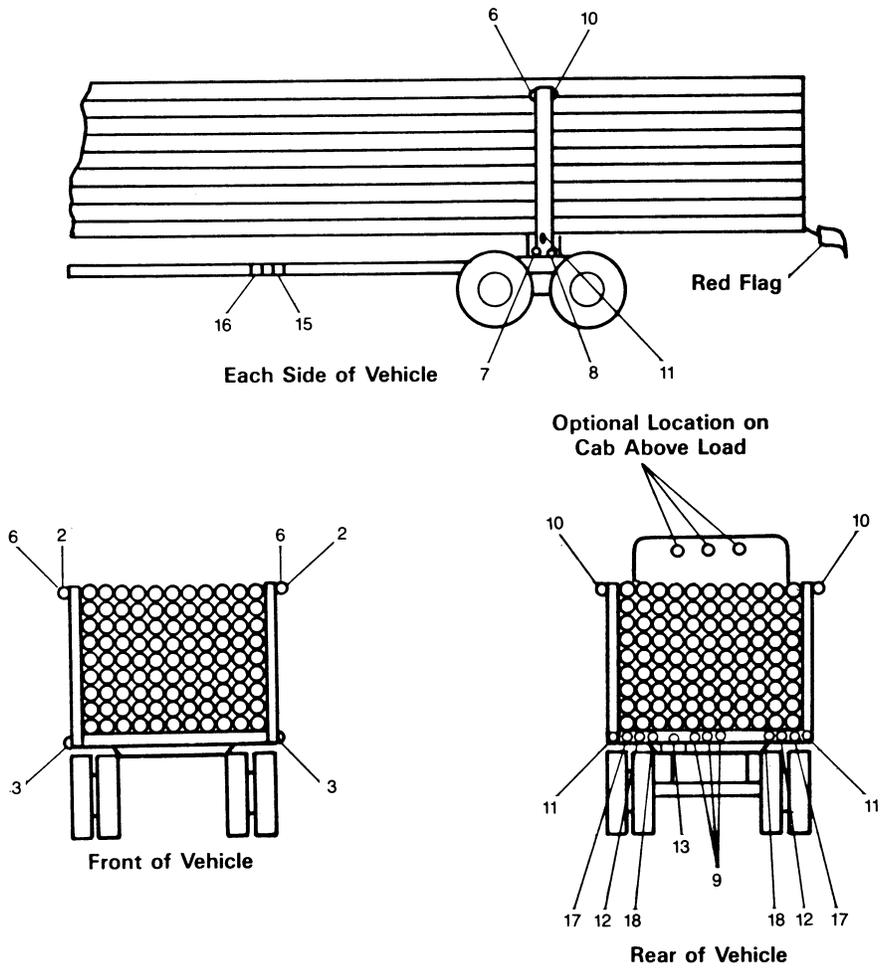
Under 80 Inches

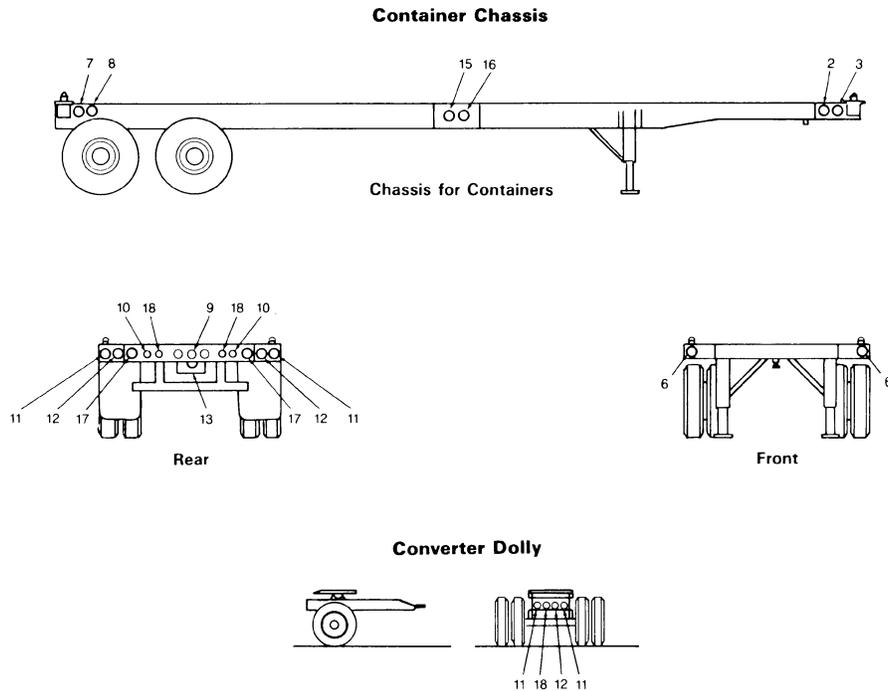


Large Bus



**Pole Trailers — All Vehicle Widths**





LEGEND (USED IN ILLUSTRATIONS)

1. Headlamps (2)-White (4 optional)
2. Side-marker lamps. Front (2)-Amber
3. Side reflectors. Front (2)-Amber
4. Turn-signal lamps. Front (2)-Amber
- 4a. Turn-signal lamps. Front (2)-Amber (Optional location)
5. Identification lamps. Front (3)-Amber
- 5a. Identification lamps. Front (3)-Amber (Optional location)
6. Clearance lamps. Front (2)-Amber
7. Side-marker lamps. Rear (2)-Red
8. Side-reflectors. Rear (2)-Red
9. Identification lamps. Rear (3)-Red
10. Clearance lamps. Rear (2)-Red
11. Reflectors Rear (2)-Red
12. Stop lamps. Rear (2)-Red
13. License plate lamp. Rear (1)-White
14. Backup lamp. Rear (1)-White (location optional provided optional requirements are met)
15. Side-marker lamps. Intermediate (2)-Amber (if vehicle is 30' or more overall length)
16. Side reflectors. Intermediate (2)-Amber (if vehicle is 30' or more overall length)
17. Turn signal lamps. Rear (2)-Amber or Red
18. Tail lamps. Rear (2)-Red

19. Parking lamps. Front 2-Amber or White
- [53 FR 49385, Dec. 7, 1988]

**§ 393.13 Retroreflective sheeting and reflex reflectors, requirements for semitrailers and trailers manufactured before December 1, 1993.**

(a) *Applicability.* All trailers and semitrailers manufactured prior to December 1, 1993, which have an overall width of 2,032 mm (80 inches) or more and a gross vehicle weight rating of 4,536 kg (10,001 pounds) or more, except trailers that are manufactured exclusively for use as offices or dwellings, pole trailers (as defined in § 390.5 of this subchapter), and trailers transported in a driveaway-towaway operation, must be equipped with retroreflective sheeting or an array of reflex reflectors that meet the requirements of this section. Motor carriers operating trailers, other than container chassis (as defined in

§ 393.5), have until June 1, 2001, to comply with the requirements of this section. Motor carriers operating container chassis have until December 1, 2001, to comply with the requirements of this section.

(b) *Retroreflective sheeting and reflex reflectors.* Motor carriers are encouraged to retrofit their trailers with a conspicuity system that meets all of the requirements applicable to trailers manufactured on or after December 1, 1993, including the use of retroreflective sheeting or reflex reflectors in a red and white pattern (see Federal Motor Vehicle Safety Standard No. 108 (49 CFR 571.108), S5.7, *Conspicuity systems*). Motor carriers which do not retrofit their trailers to meet the requirements of FMVSS No. 108, for example by using an alternative color pattern, must comply with the remainder of this paragraph and with paragraph (c) or (d) of this section. Retroreflective sheeting or reflex reflectors in colors or color combinations other than red and white may be used on the sides or lower rear area of the semitrailer or trailer until June 1, 2009. The alternate color or color combination must be uniform along the sides and lower rear area of the trailer. The retroreflective sheeting or reflex reflectors on the upper rear area of the trailer must be white and conform to the requirements of FMVSS No. 108 (S5.7). Red retroreflective sheeting or reflex reflectors shall not be used along the sides of the trailer unless it is used as part of a red and white pattern. Retroreflective sheeting shall have a width of at least 50 mm (2 inches).

(c) *Locations for retroreflective sheeting—(1) Sides.* Retroreflective sheeting shall be applied to each side of the trailer or semitrailer. Each strip of retroreflective sheeting shall be positioned as horizontally as practicable, beginning and ending as close to the front and rear as practicable. The strip need not be continuous but the sum of the length of all of the segments shall be at least half of the length of the trailer and the spaces between the segments of the strip shall be distributed as evenly as practicable. The centerline for each strip of retroreflective sheeting shall be between 375 mm (15 inches) and 1,525 mm (60 inches) above

the road surface when measured with the trailer empty or unladen, or as close as practicable to this area. If necessary to clear rivet heads or other similar obstructions, 50 mm (2 inches) wide retroreflective sheeting may be separated into two 25 mm (1 inch) wide strips of the same length and color, separated by a space of not more than 25 mm (1 inch).

(2) *Lower rear area.* The rear of each trailer and semitrailer must be equipped with retroreflective sheeting. Each strip of retroreflective sheeting shall be positioned as horizontally as practicable, extending across the full width of the trailer, beginning and ending as close to the extreme edges as practicable. The centerline for each of the strips of retroreflective sheeting shall be between 375 mm (15 inches) and 1,525 mm (60 inches) above the road surface when measured with the trailer empty or unladen, or as close as practicable to this area.

(3) *Upper rear area.* Two pairs of white strips of retroreflective sheeting, each pair consisting of strips 300 mm (12 inches) long, must be positioned horizontally and vertically on the right and left upper corners of the rear of the body of each trailer and semitrailer, as close as practicable to the top of the trailer and as far apart as practicable. If the perimeter of the body, as viewed from the rear, is not square or rectangular, the strips may be applied along the perimeter, as close as practicable to the uppermost and outermost areas of the rear of the body on the left and right sides.

(d) *Locations for reflex reflectors.—(1) Sides.* Reflex reflectors shall be applied to each side of the trailer or semitrailer. Each array of reflex reflectors shall be positioned as horizontally as practicable, beginning and ending as close to the front and rear as practicable. The array need not be continuous but the sum of the length of all of the array segments shall be at least half of the length of the trailer and the spaces between the segments of the strip shall be distributed as evenly as practicable. The centerline for each array of reflex reflectors shall be between 375 mm (15 inches) and 1,525 mm (60 inches) above the road surface when

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measured with the trailer empty or unladen, or as close as practicable to this area. The center of each reflector shall not be more than 100 mm (4 inches) from the center of each adjacent reflector in the segment of the array. If reflex reflectors are arranged in an alternating color pattern, the length of reflectors of the first color shall be as close as practicable to the length of the reflectors of the second color.

(2) *Lower rear area.* The rear of each trailer and semitrailer must be equipped with reflex reflectors. Each array of reflex reflectors shall be positioned as horizontally as practicable, extending across the full width of the trailer, beginning and ending as close to the extreme edges as practicable. The centerline for each array of reflex reflectors shall be between 375 mm (15 inches) and 1,525 mm (60 inches) above the road surface when measured with the trailer empty or unladen, or as close as practicable to this area. The center of each reflector shall not be more than 100 mm (4 inches) from the center of each adjacent reflector in the segment of the array.

(3) *Upper rear area.* Two pairs of white reflex reflector arrays, each pair at least 300 mm (12 inches) long, must be positioned horizontally and vertically on the right and left upper corners of the rear of the body of each trailer and semitrailer, as close as practicable to the top of the trailer and as far apart as practicable. If the perimeter of the body, as viewed from the rear, is not square or rectangular, the arrays may be applied along the perimeter, as close as practicable to the uppermost and outermost areas of the rear of the body on the left and right sides. The center of each reflector shall not be more than 100 mm (4 inches) from the center of each adjacent reflector in the segment of the array.

[64 FR 15605, Mar. 31, 1999, as amended at 66 FR 30339, June 6, 2001]

**§ 393.17 Lamps and reflectors—combinations in driveaway-towaway operation.**

A combination of motor vehicles engaged in driveaway-towaway operation must be equipped with operative lamps and reflectors conforming to the rules in this section.

(a) The towing vehicle must be equipped as follows:

(1) On the front, there must be at least two headlamps, an equal number at each side, two turn signals, one at each side, and two clearance lamps, one at each side.

(2) On each side, there must be at least one side-marker lamp, located near the front of the vehicle.

(3) On the rear, there must be at least two tail lamps, one at each side, and two stop lamps, one at each side.

(b) Except as provided in paragraph (c) of this section, the rearmost towed vehicle of the combination (including the towed vehicle or a tow-bar combination, the towed vehicle of a single saddle-mount combination, and the rearmost towed vehicle of a double or triple saddle-mount combination) or, in the case of a vehicle full-mounted on a saddle-mount vehicle, either the full-mounted vehicle or the rearmost saddle-mounted vehicle must be equipped as follows:

(1) On each side, there must be at least one side-marker lamp, located near the rear of the vehicle.

(2) On the rear, there must be at least two tail lamps, two stop lamps, two turn signals, two clearance lamps, and two reflectors, one of each type at each side. In addition, if any vehicle in the combination is 80 inches or more in overall width, there must be three identification lamps on the rear.

(c) If the towed vehicle in a combination is a mobile structure trailer, it must be equipped in accordance with the following lighting devices. For the purposes of this part, *mobile structure trailer* means a trailer that has a roof and walls, is at least 10 feet wide, and can be used off road for dwelling or commercial purposes.

(1) When the vehicle is operated in accordance with the terms of a special permit prohibiting operation during the times when lighted lamps are required under § 392.30, it must have on the rear—

(i) Two stop lamps, one on each side of the vertical centerline, at the same height, and as far apart as practicable;

(ii) Two tail lamps, one on each side of the vertical centerline, at the same height, and as far apart as practicable;

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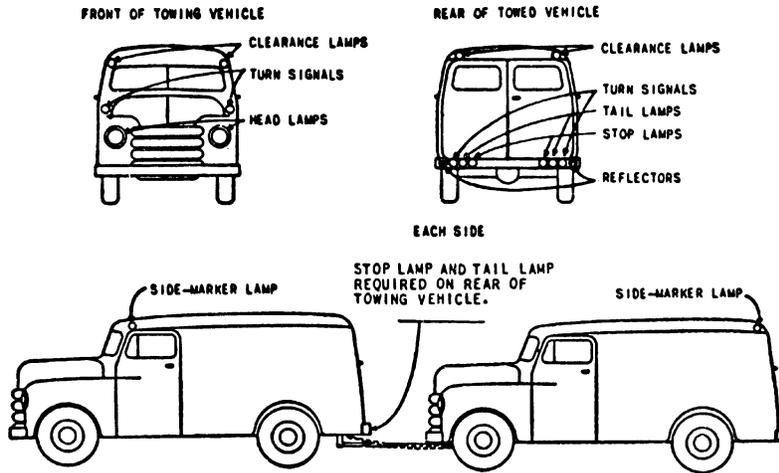
(iii) Two red reflex reflectors, one on each side of the vertical centerline, at the same height, and as far apart as practicable; and

(iv) Two turn signal lamps, one on each side of the vertical centerline, at the same height, and as far apart as practicable.

(2) At all other times, the vehicle must be equipped as specified in paragraph (b) of this section.

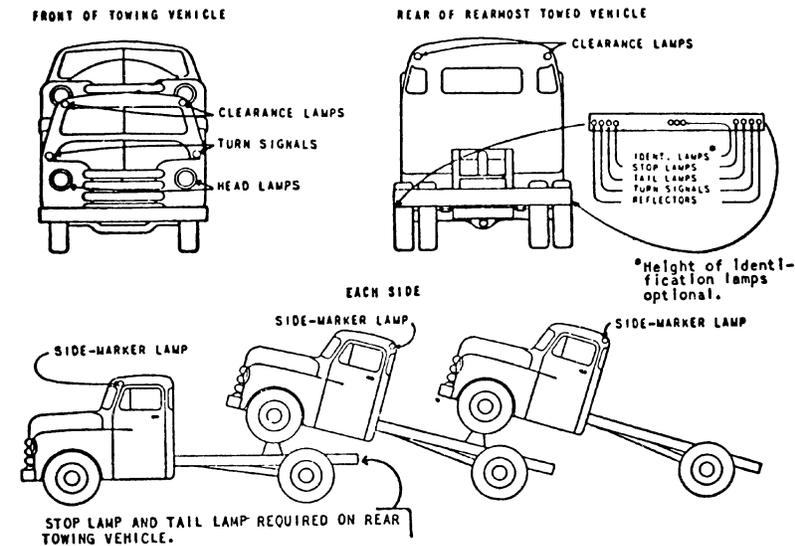
(d) An intermediate towed vehicle in a combination consisting of more than two vehicles (including the first saddle-mounted vehicle of a double saddle-mount combination and the first and second saddle-mount vehicles of a triple saddle-mount combination) must have one side-marker lamp on each side, located near the rear of the vehicle.

(Tow-bar diagram to illustrate § 393.17.)

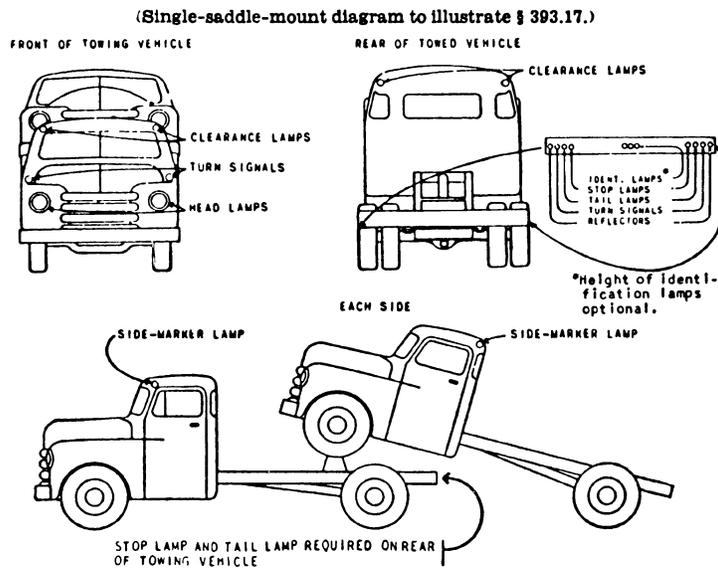


Lamps may be combined as permitted by § 393.22(e). Color of exterior lighting devices shall conform to requirements of § 393.25(e). Color of reflectors shall conform to requirements of § 393.26(d).

(Double-saddle-mount diagram to illustrate § 393.17.)



Lamps may be combined as permitted by § 393.22. Color of exterior lighting devices shall conform to requirements of § 393.25(e). Color of reflectors shall conform to requirements of § 393.26(d).



Lamps may be combined as permitted by § 393.22. Color of exterior lighting devices shall conform to requirements of § 393.25(e). Color of reflectors shall conform to requirements of § 393.26(d).

(49 U.S.C. 304, 1655; 49 CFR 1.48(b) and 301.60)

[40 FR 36126, Aug. 19, 1975, as amended at 47 FR 47837, Oct. 28, 1982]

**§ 393.19 Requirements for turn signaling systems.**

(a) Every bus, truck, or truck tractor shall be equipped with a signaling system that in addition to signaling turning movements shall have a switch or combination of switches that will cause the two front turn signals and the two rear turn signals to flash simultaneously as a vehicular traffic hazard warning as required by § 392.22 with the ignition on or off.

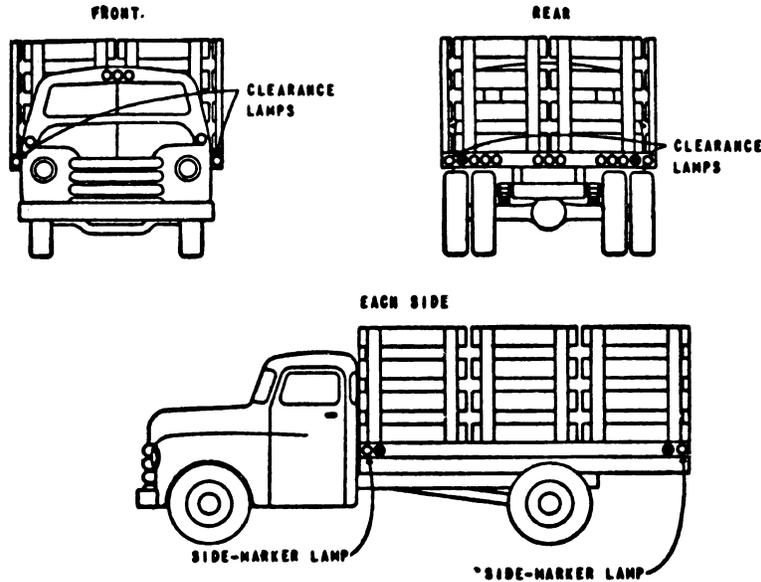
(b) Every semitrailer and full trailer shall be equipped so as to have the two rear turn signals to flash simultaneously with the two front turn signals of the towing vehicle as a vehicular traffic hazard warning as required by § 392.22(a).

[53 FR 49397, Dec. 7, 1988]

**§ 393.20 Clearance lamps to indicate extreme width and height.**

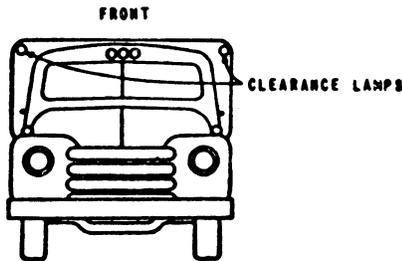
Clearance lamps shall be mounted so as to indicate the extreme width of the motor vehicle (not including mirrors) and as near the top thereof as practicable: *Provided*, That when rear identification lamps are mounted at the extreme height of the vehicle, rear clearance lamps may be mounted at optional height: *And provided further*, That when mounting of front clearance lamps at the highest point of a trailer results in such lamps failing to mark the extreme width of the trailer, such lamps may be mounted at optional height but must indicate the extreme width of the trailer. Clearance lamps on truck tractors shall be so located as to indicate the extreme width of the truck tractor cab.

(Diagram to illustrate § 393.20 for mounting of lamps on vehicles without permanent top or sides.)



Lamps may be combined as permitted by § 393.22. Color of exterior lighting devices shall conform to requirements of § 393.26(e). Color of reflectors shall conform to requirements of § 393.26(d).

Diagram to illustrate § 393.20 for mounting of front clearance lamps on truck tractors with sleeper cabs.)



[33 FR 19735, Dec. 25, 1968, as amended at 34 FR 6851, Apr. 24, 1969]

**§ 393.22 Combination of lighting devices and reflectors.**

(a) *Permitted combinations.* Except as provided in paragraph (b) of this section, two or more lighting devices and reflectors (whether or not required by the rules in this part) may be combined optically if—

(1) Each required lighting device and reflector conforms to the applicable rules in this part; and

(2) Neither the mounting nor the use of a nonrequired lighting device or reflector impairs the effectiveness of a required lighting device or reflector or causes that device or reflector to be inconsistent with the applicable rules in this part.

(b) *Prohibited combinations.* (1) A turn signal lamp must not be combined optically with either a head lamp or other lighting device or combination of lighting devices that produces a greater intensity of light than the turn signal lamp.

(2) A turn signal lamp must not be combined optically with a stop lamp unless the stop lamp function is always deactivated when the turn signal function is activated.

(3) A clearance lamp must not be combined optically with a tail lamp or identification lamp.

[39 FR 26908, July 24, 1974]

**§ 393.23 Lighting devices to be electric.**

Lighting devices shall be electric, except that red liquid-burning lanterns may be used on the end of loads in the nature of poles, pipes, and ladders projecting to the rear of the motor vehicle.

**§ 393.24 Requirements for head lamps and auxiliary road lighting lamps.**

(a) *Mounting.* Head lamps and auxiliary road lighting lamps shall be mounted so that the beams are readily adjustable, both vertically and horizontally, and the mounting shall be such that the aim is not readily disturbed by ordinary conditions of service.

(b) *Head lamps required.* Every bus, truck, and truck tractor shall be equipped with a headlighting system composed of at least two head lamps, not including fog or other auxiliary lamps, with an equal number on each side of the vehicle. The headlighting system shall provide an upper and lower distribution of light, selectable at the driver's will.

(c) *Fog, adverse-weather, and auxiliary road-lighting lamps.* For the purposes of this section, fog, adverse-weather, and auxiliary road lighting lamps, when installed, are considered to be a part of the headlighting system. Such lamps may be used in lieu of head lamps under conditions making their use advisable if there be at least one such lamp conforming to the appropriate SAE Standard<sup>1</sup> for such lamps on each side of the vehicle.

<sup>1</sup>Wherever reference is made in these regulations to SAE Standards or SAE Recommended Practices, they shall be:

(a) As found in the 1985 edition of the SAE Handbook with respect to parts and accessories other than lighting devices and reflectors.

(b) When reference is made in these regulations to SAE Standards or SAE Recommended Practices, they shall be as found in the 1985 edition of the SAE Handbook:

(1) With respect to parts and accessories other than lighting devices and reflectors:

(d) *Aiming and intensity.* Head lamps shall be constructed and installed so as to provide adequate and reliable illumination and shall conform to the appropriate specification set forth in the SAE Standards<sup>1</sup> for "Electric Head Lamps for Motor Vehicles" or "Sealed-Beam Head Lamp Units for Motor Vehicles."

[33 FR 19735, Dec. 25, 1968, as amended at 41 FR 53031, Dec. 3, 1976; 53 FR 49397, Dec. 7, 1988]

**§ 393.25 Requirements for lamps other than head lamps.**

(a) *Mounting.* All lamps shall be permanently and securely mounted in workmanlike manner on a permanent part of the motor vehicle, except that temporary lamps on motor vehicles being transported in driveaway-towaway operations and temporary electric lamps on projecting loads need not be permanently mounted nor mounted on a permanent part of the vehicle. The requirement for three identification lamps on the centerline of a vehicle will be met as to location by one lamp on the centerline, with the other two at right and left. All temporary lamps must be firmly attached.

(b) *Visibility.* All required exterior lamps shall be so mounted as to be capable of being seen at all distances between 500 feet and 50 feet under clear atmospheric conditions during the time lamps are required to be lighted. The light from front clearance and front identification lamps shall be visible to the front, that from sidemarker lamps to the side, that from rear clearance, rear identification, and tail lamps to the rear, and that from projecting loadmarker lamps from those directions required by § 393.11. This shall not be construed to apply to lamps on one unit which are obscured by another unit of a combination of vehicles.

(c) *Specifications.* All required lamps except those already installed on vehicles tendered for transportation in

(2) Lighting devices and reflectors on motor vehicles manufactured on and after March 7, 1990, shall conform to FMVSS 571.108 (49 CFR 571.108) in effect at the time of manufacture of the vehicle. Should a conflict arise between FMVSS 571.108 and a SAE Standard, FMVSS 571.108 will prevail.

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driveaway and towaway operations shall conform to appropriate requirements of the SAE Standards and/or Recommended Practices<sup>1</sup> as indicated below, except that the minimum required marking of lamps conforming to the 1985 requirements shall be as specified in paragraph (d) of this section. Projecting load marker lamps shall conform to the requirements for clearance, side-marker, and identification lamps. Turn signals shall conform to the requirements for class A, Type I turn signals, provided.

(1) Lamps on vehicles made before July 1, 1961, excepting replacement lamps as specified in paragraph (c)(2) of this section, shall conform to the 1952 requirements.

(2) Lamps on vehicles made on and after July 1, 1961, and replacement lamps installed on and after December 31, 1961, shall conform to the 1985 requirements.

(3) Lamps temporarily attached to vehicles transported in driveaway and towaway operations on and after December 31, 1961, shall conform to the 1985 requirements.

(d) *Certification and markings.* All lamps required to conform to the requirements of the SAE Standards<sup>1</sup> shall be certified by the manufacturer or supplier that they do so conform, by markings indicated below. The markings in each case shall be visible when the lamp is in place on the vehicle.

(1) Stop lamps shall be marked with the manufacturer's or supplier's name or trade name and shall be marked "SAE-S".

(2) Turn signal units shall be marked with the manufacturer's or supplier's name or trade name and shall be marked "SAE-AI" or "SAE-I".

(3) Tail lamps shall be marked with the manufacturer's or supplier's name or trade name and shall be marked "SAE-T".

(4) Clearance, side marker, identification, and projecting load-marker lamps, except combination lamps, shall be marked with the manufacturer's or supplier's name or trade name and shall be marked "SAE" or "SAE-P".

(5) Combination lamps shall be marked with the manufacturer's or supplier's name or trade name and shall be marked "SAE" followed by the appropriate letters indicating the individual lamps combined. The letter "A", as specified in §393.26(c), may be included to certify that a reflector in the combination conforms to the requirements appropriate to such marking. If the letter "I" follows the letter "A" immediately the two letters shall be deemed to refer to a turn signal unit, as specified in paragraph (d)(2) of this section. Combination clearance and side marker lamps may be marked "SAE-PC".

(e) *Lighting devices to be steady-burning.* All exterior lighting devices shall be of the steady-burning type except turn signals on any vehicle, stop lamps when used as turn signals, warning lamps on school buses when operating as such, and warning lamps on emergency and service vehicles authorized by State or local authorities, and except that lamps combined into the same shell or housing with any turn signal may be turned off by the same switch that turns the signal on for flashing and turned on again when the turn signal as such is turned off. This paragraph shall not be construed to prohibit the use of vehicular hazard warning signal flashers as required by §392.22 or permitted by §392.18.

(f) *Stop lamp operation.* All stop lamps on each motor vehicle or combination of motor vehicles shall be actuated upon application of any of the service brakes, except that such actuation is not required upon activation of the emergency feature of trailer brakes by means of either manual or automatic control on the towing vehicle, and except that stop lamps on a towing vehicle need not be actuated when service brakes are applied to the towed vehicles or vehicles only, and except that no stop lamp need be actuated as such when it is in use as a turn signal or when it is turned off by the turn signal switch as provided in paragraph (e) of this section.

[33 FR 19735, Dec. 25, 1968, as amended at 48 FR 57139, Dec. 28, 1983; 53 FR 49397, Dec. 7, 1988; 61 FR 1843, Jan. 24, 1996]

<sup>1</sup> See footnote 1 to §393.24(c).

<sup>1</sup> See footnote 1 to §393.24(c).

**§ 393.26 Requirements for reflectors.**

(a) *Mounting.* All required reflectors shall be mounted upon the motor vehicle at a height not less than 15 inches nor more than 60 inches above the ground on which the motor vehicle stands, except that reflectors shall be mounted as high as practicable on motor vehicles which are so constructed as to make compliance with the 15-inch requirement impractical. They shall be so installed as to perform their function adequately and reliably, and except for temporary reflectors required for vehicles in driveaway-towaway operations, or on projecting loads, all reflectors shall be permanently and securely mounted in workmanlike manner so as to provide the maximum of stability and the minimum likelihood of damage. Required reflectors otherwise properly mounted may be securely installed on flexible strapping or belting provided that under conditions of normal operation they reflect light in the required directions. Required temporary reflectors mounted on motor vehicles during the time they are in transit in any driveaway-towaway operation must be firmly attached.

(b) *Specifications.* All required reflectors except those installed on vehicles tendered for transportation in driveaway and towaway operations shall comply with FMVSS 571.108 (49 CFR 571.108) in effect at the time the vehicle was manufactured or the current FMVSS 571.108 requirements.

(c) *Certification and markings.* All reflectors required to conform to the specifications in paragraph (b) shall be certified by the manufacturer or supplier that they do so conform, by marking with the manufacturer's or supplier's name or trade name and the letters "SAE-A". The marking in each case shall be visible when the reflector is in place on the vehicle.

(d) *Retroreflective surfaces.* Retroreflective surfaces other than required reflectors may be used, provided:

(1) Designs do not resemble traffic control signs, lights, or devices, except that straight edge striping resembling a barricade pattern may be used.

(2) Designs do not tend to distort the length and/or width of the motor vehicle.

(3) Such surfaces shall be at least 3 inches from any required lamp or reflector unless of the same color as such lamp or reflector.

(4) No red color shall be used on the front of any motor vehicle, except for display of markings or placards required by § 177.823 of this title.

(5) Retroreflective license plates required by State or local authorities may be used.

[33 FR 19735, Dec. 25, 1968, as amended at 35 FR 3167, Feb. 19, 1970; 53 FR 49397, Dec. 7, 1988]

**§ 393.27 Wiring specifications.**

(a) Wiring for both low voltage (tension) and high voltage (tension) circuits shall be constructed and installed so as to meet design requirements. Wiring shall meet or exceed, both mechanically and electrically, the following SAE Standards as found in the 1985 edition of the SAE Handbook:

(1) Commercial vehicle engine ignition systems—SAE J557-High Tension Ignition Cable.

(2) Commercial vehicle battery cable—SAE J1127-Jan 80-Battery Cable.

(3) Other commercial vehicle wiring—SAE J1128-Low Tension Primary Cable.

(b) The source of power and the electrical wiring shall be of such size and characteristics as to provide the necessary voltage as the design requires to comply with FMVSS 571.108.

(c) Lamps shall be properly grounded.

NOTE: This shall not prohibit the use of the frame or other metal parts of a motor vehicle as a return ground system provided truck-tractor semitrailer/full trailer combinations are electrically connected.

[53 FR 49397, Dec. 7, 1988]

**§ 393.28 Wiring to be protected.**

(a) The wiring shall—

(1) Be so installed that connections are protected from weather, abrasion, road splash, grease, oil, fuel and chafing;

(2) Be grouped together, when possible, and protected by nonconductive tape, braid, or other covering capable of withstanding severe abrasion or shall be protected by being enclosed in a sheath or tube;

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(3) Be properly supported in a manner to prevent chafing;

(4) Not be so located as to be likely to be charred, overheated, or enmeshed in moving parts;

(5) Not have terminals or splices located above the fuel tank except for the fuel sender wiring and terminal; and

(6) Be protected when passing through holes in metal by a grommet, or other means, or the wiring shall be encased in a protective covering.

(b) The complete wiring system including lamps, junction boxes, receptacle boxes, conduit and fittings must be weather resistant.

(c) Harness connections shall be accomplished by a mechanical means.

[53 FR 49397, Dec. 7, 1988]

**§ 393.29 Grounds.**

The battery ground and trailer return ground connections on a grounded system shall be readily accessible. The contact surfaces of electrical connections shall be clean and free of oxide, paint, or other nonconductive coating.

**§ 393.30 Battery installation.**

Every storage battery on every vehicle, unless located in the engine compartment, shall be covered by a fixed part of the motor vehicle or protected by a removable cover or enclosure. Removable covers or enclosures shall be substantial and shall be securely latched or fastened. The storage battery compartment and adjacent metal parts which might corrode by reason of battery leakage shall be painted or coated with an acid-resisting paint or coating and shall have openings to provide ample battery ventilation and drainage. Wherever the cable to the starting motor passes through a metal compartment, the cable shall be protected against grounding by an acid and waterproof insulating bushing. Wherever a battery and a fuel tank are both placed under the driver's seat, they shall be partitioned from each other, and each compartment shall be provided with an independent cover, ventilation, and drainage.

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**§ 393.31 Overload protective devices.**

(a) The current to all low tension circuits shall pass through overload protective devices except that this requirement shall not be applicable to battery-to-starting motor or battery-to-generator circuits, ignition and engine control circuits, horn circuits, electrically-operated fuel pump circuits, or electric brake circuits.

(b) Trucks, truck-tractors, and buses meeting the definition of a commercial motor vehicle and manufactured after June 30, 1953 shall have protective devices for electrical circuits arranged so that:

(1) The headlamp circuit or circuits shall not be affected by a short circuit in any other lighting circuits on the motor vehicle; or

(2) The protective device shall be an automatic reset overload circuit breaker if the headlight circuit is protected in common with other circuits.

[33 FR 19735, Dec. 25, 1968, as amended at 53 FR 49397, Dec. 7, 1988]

**§ 393.32 Detachable electrical connections.**

Electrical wiring between towing and towed vehicles shall be contained in a cable or cables or entirely within another substantially constructed protective device. All such electrical wiring shall be mechanically and electrically adequate and free of short or open circuits. Suitable provision shall be made in every such detachable connection to afford reasonable assurance against connection in an incorrect manner or accidental disconnection. Detachable connections made by twisting together wires from the towed and towing units are prohibited. Precaution shall be taken to provide sufficient slack in the connecting wire or cable to accommodate without damage all normal motions of the parts to which they are attached.

**§ 393.33 Wiring, installation.**

Electrical wiring shall be systematically arranged and installed in a workmanlike manner. All detachable wiring, except temporary wiring connections for driveaway-towaway operations, shall be attached to posts or terminals by means of suitable cable

terminals which conform to the SAE Standard<sup>1</sup> for "Cable Terminals" or by cable terminals which are mechanically and electrically at least equal to such terminals. The number of wires attached to any post shall be limited to the number which such post was designed to accommodate. The presence of bare, loose, dangling, chafing, or poorly connected wires is prohibited.

### Subpart C—Brakes

#### § 393.40 Required brake systems.

(a) *General.* A bus, truck, truck tractor, or a combination of motor vehicles must have brakes adequate to control the movement of, and to stop and hold, the vehicle or combination of vehicles.

(b) *Specific systems required.* (1) A bus, truck, truck tractor, or combination of motor vehicles must have—

(i) A service brake system that conforms to the requirements of § 393.52; and

(ii) A parking brake system that conforms to the requirements of § 393.41.

(2) A bus, truck, truck tractor, or a combination of motor vehicles manufactured on or after July 1, 1973, must have an emergency brake system that conforms to the requirements of § 393.52(b) and consists of either—

(i) Emergency features of the service brake system; or

(ii) A system separate from the service brake system.

A control by which the driver applies the emergency brake system must be located so that the driver can readily operate it when he/she is properly restrained by any seat belt assembly provided for his/her use. The control for applying the emergency brake system may be combined with either the control for applying the service brake system or the control for applying the parking brake system. However, all three controls may not be combined.

(c) *Interconnected systems.* (1) If the brake systems specified in paragraph (b) of this section are interconnected in any way, they must be designed, constructed, and maintained so that, upon the failure of any part of the operating mechanism of one or more of the sys-

tems (except the service brake actuation pedal or valve)—

(i) The vehicle will have operative brakes; and

(ii) In the case of a vehicle manufactured on or after July 1, 1973, the vehicle will have operative brakes capable of performing as specified in § 393.52(b).

(2) A motor vehicle to which the emergency brake system requirements of Federal Motor Vehicle Safety Standard No. 105 (§ 571.105 of this title) applied at the time of its manufacture conforms to the requirements of paragraph (c)(1) of this section if—

(i) It is maintained in conformity with the emergency brake requirements of Standard No. 105 in effect on the date of its manufacture; and

(ii) It is capable of performing as specified in § 393.52(b), except upon structural failure of its brake master cylinder body or effectiveness indicator body.

(3) A bus conforms to the requirements of paragraph (c)(1) of this section if it meets the requirements of § 393.44 and is capable of performing as specified in § 393.52(b).

[36 FR 20297, Oct. 20, 1971, as amended at 37 FR 5251, Mar. 11, 1972]

#### § 393.41 Parking brake system.

(a) Every commercial motor vehicle manufactured on and after March 7, 1990, except an agricultural commodity trailer, converter dolly, heavy hauler or pulpwood trailer, shall at all times be equipped with a parking brake system adequate to hold the vehicle or combination under any condition of loading as required by FMVSS 571.121. An agricultural commodity trailer, heavy hauler or pulpwood trailer shall carry sufficient chocking blocks to prevent movement when parked.

(b) The parking brake system shall at all times be capable of being applied in conformance with the requirements of paragraph (a) of the section by either the driver's muscular effort, or by spring action, or by other energy, provided, that if such other energy is depended on for application of the parking brake, then an accumulation of such energy shall be isolated from any common source and used exclusively for the operation of the parking brake.

<sup>1</sup> See footnote 1 to § 393.24(c).

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(c) The parking brake system shall be held in the applied position by energy other than fluid pressure, air pressure, or electric energy. The parking brake system shall be such that it cannot be released unless adequate energy is available upon release of the parking brake to make immediate further application with the required effectiveness.

[34 FR 15418, Oct. 3, 1969, as amended at 53 FR 49398, Dec. 7, 1988]

**§ 393.42 Brakes required on all wheels.**

(a) Every commercial motor vehicle shall be equipped with brakes acting on all wheels.

(b) *Exception.* (1) Trucks or truck tractors having three or more axles—

(i) Need not have brakes on the front wheels if the vehicle was manufactured before July 25, 1980; or

(ii) Manufactured between July 24, 1980, and October 27, 1986, must be ret-

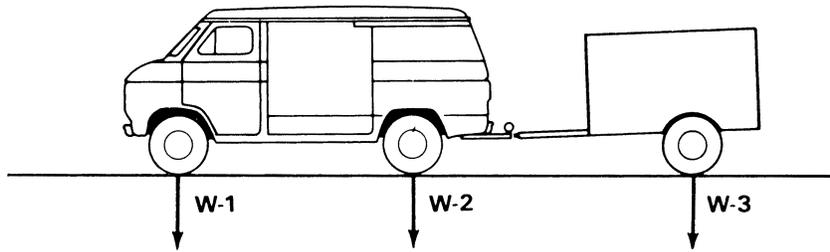
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rofitted to meet the requirements of this section within one year from February 26, 1987, if the brake components have been removed.

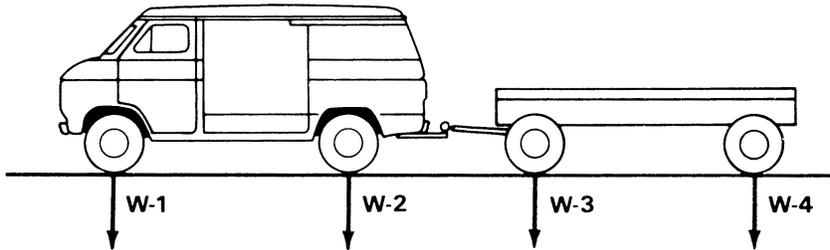
(2) Any motor vehicle being towed in a driveaway-towaway operation must have operative brakes as may be necessary to ensure compliance with the performance requirements of § 393.52. This paragraph is not applicable to any motor vehicle towed by means of a tow-bar when any other vehicle is full-mounted on such towed motor vehicle or any combination of motor vehicles utilizing three or more saddle-mounts. (See § 393.71(a)(3).)

(3) Any full trailer, any semitrailer, or any pole trailer having a GVWR of 3,000 pounds or less must be equipped with brakes if the weight of the towed vehicle resting on the towing vehicle exceeds 40 percent of the GVWR of the towing vehicle.

(Diagrams to illustrate § 393.42 for brake requirements for light trailers.)



(Semitrailer or 2-wheel pole trailer of 3,000 pounds gross weight or less must be equipped with brakes if W-3 is greater than 40 percent of the sum of W-1 and W-2.)



(Full trailer or 4-wheel pole trailer of 3,000 pounds gross weight or less must be equipped with brakes if the sum of W-3 and W-4 is greater than 40 percent of the sum of W-1 and W-2.)

[52 FR 2803, Jan. 27, 1987, as amended at 53 FR 49398, Dec. 7, 1988; 54 FR 48617, Nov. 24, 1989; 59 FR 25574, May 17, 1994; 61 FR 1843, Jan. 24, 1996]

**§ 393.43 Breakaway and emergency braking.**

(a) Every motor vehicle, if used to tow a trailer equipped with brakes, shall be equipped with means for providing that in case of breakaway of such trailer the service brakes on the towing vehicle will be sufficiently operative to stop the towing vehicle.

(b) Every truck or truck tractor equipped with air brakes, when used for towing other vehicles equipped with air brakes, shall be equipped with two means of activating the emergency features of the trailer brakes. One of these means shall operate automatically in the event of reduction of the towing vehicle air supply to a fixed pressure which shall not be lower than 20 pounds

per square inch nor higher than 45 pounds per square inch. The other means shall be a manually controlled device readily operable by a person seated in the driving seat. Its emergency position or method of operation shall be clearly indicated. In no instance may the manual means be so arranged as to permit its use to prevent operation of the automatic means. The automatic and manual means required by this section may be, but are not required to be, separate.

(c) Every truck tractor and truck when used for towing other vehicles equipped with vacuum brakes, shall have, in addition to the single control required by § 393.49 to operate all brakes of the combination, a second

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manual control device which can be used to operate the brakes on the towed vehicles in emergencies. Such second control shall be independent of brake air, hydraulic, and other pressure, and independent of other controls, unless the braking system be so arranged that failure of the pressure on which the second control depends will cause the towed vehicle brakes to be applied automatically. The second control is not required by this rule to provide modulated or graduated braking.

(d) Every trailer required to be equipped with brakes shall be equipped with brakes of such character as to be applied automatically and promptly upon breakaway from the towing vehicle, and means shall be provided to maintain application of the brakes on the trailer in such case for at least 15 minutes.

(e) Air brake systems installed on towed vehicles shall be so designed, by the use of "no-bleed-back" relay emergency valves or equivalent devices, that the supply reservoir used to provide air for brakes shall be safeguarded against backflow of air to the towing vehicle upon reduction of the towing vehicle air pressure.

(f) The requirements of paragraphs (b), (c), and (d) of this section shall not be applicable to motor vehicles in driveaway-towaway operations.

**§ 393.44 Front brake lines, protection.**

On every bus, if equipped with air brakes, the braking system shall be so constructed that in the event any brake line to any of the front wheels is broken, the driver can apply the brakes on the rear wheels despite such breakage. The means used to apply the brakes may be located forward of the driver's seat as long as it can be operated manually by the driver when the driver is properly restrained by any seat belt assembly provided for use. Every bus shall meet this requirement or comply with the regulations in effect at the time of its manufacture.

[53 FR 49400, Dec. 7, 1988]

**§ 393.45 Brake tubing and hose, adequacy.**

(a) *General requirements.* Brake tubing and brake hose must—

(1) Be designed and constructed in a manner that insures proper, adequate, and continued functioning of the tubing or hose;

(2) Be installed in a manner that insures proper continued functioning of the tubing or hose;

(3) Be long and flexible enough to accommodate without damage all normal motions of the parts to which it is attached;

(4) Be suitably secured against chafing, kinking, or other mechanical damage;

(5) Be installed in a manner that prevents it from contacting the vehicle's exhaust system or any other source of high temperatures; and

(6) Conform to the applicable requirements of paragraph (b) or (c) of this section. In addition, all hose installed on and after January 1, 1981, must conform to those applicable subsections of FMVSS 106 (49 CFR 571.106).

(b) *Special requirements for metallic brake tubing, nonmetallic brake tubing, coiled nonmetallic brake tubing and brake hose.* (1) Metallic brake tubing, nonmetallic brake tubing, coiled nonmetallic brake tubing, and brake hose installed on a commercial motor vehicle on and after March 7, 1989, must meet or exceed one of the following specifications set forth in the SAE Handbook, 1985 edition:

(i) Metallic Air Brake Tubing—SAE Recommended Practice J1149—Metallic Air Brake System Tubing and Pipe—July 76.

(ii) Nonmetallic Air Brake Tubing—SAE Recommended Practice J844—Nonmetallic Air Brake System Type B—OCT 80.

(iii) Air Brake Hose—SAE Recommended Practice J1402—Automotive Air Brake Hose and Hose Assemblies—JUN 85.

(iv) Hydraulic Brake Hose—SAE Recommended Practice J1401 Road Vehicle-Hydraulic Brake Hose Assemblies for Use with Non-Petroleum Base Hydraulic Fluid JUN 85.

(v) Vacuum Brake Hose—SAE Recommended Practice J1403 Vacuum Brake Hose JUN 85.

(2) Except as provided in paragraph (c) of this section, brake hose and brake tubing installed on a motor vehicle before March 7, 1989, must conform

to 49 CFR 393.45 effective October 31, 1983.

(c) *Nonmetallic brake tubing.* Coiled nonmetallic brake tubing may be used for connections between towed and towing vehicles or between the frame of a towed vehicle and the unsprung subframe of an adjustable axle of that vehicle if—

(1) The coiled tubing has a straight segment (pigtail) at each end that is at least 2 inches in length and is encased in a spring guard or similar device which prevents the tubing from kinking at the fitting at which it is attached to the vehicle; and

(2) The spring guard or similar device has at least 2 inches of closed coils or similar surface at its interface with the fitting and extends at least 1½ inches into the coiled segment of the tubing from its straight segment.

(d) *Brake tubing and brake hose, uses.* Metallic and nonmetallic brake tubing is intended for use in areas of the brake system where relative movement in the line is not anticipated. Brake hose and coiled nonmetallic brake tubing is intended for use in the brake system where substantial relative movement in the line is anticipated or the hose/coiled nonmetallic brake tubing is exposed to potential tension or impact such as between the frame and axle in a conventional type suspension system (axle attached to frame by suspension system). Nonmetallic brake tubing may be used through an articulation point provided movement is less than 4.5 degrees in a vertical plane, and 7.4 degrees in a transverse horizontal plane.

(49 U.S.C. 304, 1655; 49 CFR 1.48(b) and 301.60)

[38 FR 4333, Feb. 13, 1973, as amended at 44 FR 25457, May 1, 1979; 45 FR 46424, July 10, 1980; 47 FR 47837, Oct. 28, 1982; 53 FR 49400, Dec. 7, 1988]

#### § 393.46 Brake tubing and hose connections.

All connections for air, vacuum, or hydraulic braking systems shall:

(a) Be adequate in material and construction to insure proper continued functioning;

(b) Be designed, constructed, and installed so as to insure, when properly connected, an attachment free of leaks, constrictions, or other defects;

(c) Have suitable provision in every detachable connection to afford reasonable assurance against accidental disconnection;

(d) Have the vacuum brake engine manifold connection at least three-eighths inch in diameter.

(e) If installed on a vehicle on or after January 1, 1981, meet requirements under applicable subsections of FMVSS 106 (49 CFR 571.106).

(f) Splices in tubing if installed on a vehicle after March 7, 1989, must use fittings that meet the requirements of SAE Standard J512—OCT 80 Automotive Tube Fittings or for air brake systems SAE J246—March 81 Spherical and Flanged Sleeve (Compression) Tube Fittings as found in the SAE Handbook 1985 edition.

[33 FR 19735, Dec. 28, 1968, as amended at 44 FR 25457, May 1, 1979; 53 FR 49400, Dec. 7, 1988]

#### § 393.47 Brake lining.

The brake lining in every motor vehicle shall be so constructed and installed as not to be subject to excessive fading and grabbing and shall be adequate in thickness, means of attachment, and physical characteristics to provide for safe and reliable stopping of the motor vehicle.

#### § 393.48 Brakes to be operative.

(a) *General rule.* Except as provided in paragraphs (b) and (c) of this section, all brakes with which a motor vehicle is equipped must at all times be capable of operating.

(b) *Devices to reduce or remove front-wheel braking effort.* A motor vehicle may be equipped with a device to reduce the braking effort upon its front wheels or, in the case of a three-axle truck or truck tractor manufactured before March 1, 1975, to remove the braking effort upon its front wheels, if that device conforms to, and is used in compliance with, the rules in paragraph (b) (1) or (2) of this section.

(1) *Manually operated devices.* A manually operated device to reduce or remove the front-wheel braking effort must not be—

(i) Installed in a motor vehicle other than a bus, truck, or truck tractor; or

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(ii) Installed in a bus, truck, or truck tractor manufactured after February 28, 1975; or

(iii) Used in the reduced mode except when the vehicle is operating under adverse conditions such as wet, snowy, or icy roads.

(2) *Automatic devices.* An automatic device to reduce the front-wheel braking effort by up to 50 percent of the normal braking force, regardless of whether or not antilock system failure has occurred on any axle, must not—

(i) Be operable by the driver except upon application of the control that activates the braking system; and

(ii) Be operable when the pressure that transmits brake control application force exceeds—

(A) 85 psig on air-mechanical braking systems; or

(B) 85 percent of the maximum system pressure in the case of vehicles utilizing other than compressed air.

(c) *Towed vehicle.* Paragraph (a) of this section does not apply to—

(1) A disabled vehicle being towed; or

(2) A vehicle being towed in a driveway-towaway operation which is exempt from the general rule of § 393.42 under paragraph (b) of that section.

[39 FR 26907, July 24, 1974, as amended at 41 FR 29130, July 15, 1976; 41 FR 53031, Dec. 3, 1976; 67 FR 61824, Oct. 2, 2002]

**§ 393.49 Single valve to operate all brakes.**

Every motor vehicle, the date of manufacture of which is subsequent to June 30, 1953, which is equipped with power brakes, shall have the braking system so arranged that one application valve shall when applied operate all the service brakes on the motor vehicle or combination of motor vehicles. This requirement shall not be construed to prohibit motor vehicles from being equipped with an additional valve to be used to operate the brakes on a trailer or trailers or as provided in § 393.44. This section shall not be applicable to driveway-towaway operations unless the brakes on such operations are designed to be operated by a single valve.

**§ 393.50 Reservoirs required.**

(a) *General.* Every commercial motor vehicle using air or vacuum for break-

ing shall be equipped with reserve capacity or a reservoir sufficient to ensure a full service brake application with the engine stopped without depleting the air pressure or vacuum below 70 percent of that pressure or degree of vacuum indicated by the gauge immediately before the brake application is made. For purposes of this section, a full service brake application is considered to be made when the service brake pedal is pushed to the limit of its travel.

(b) *Safeguarding of air and vacuum.* (1) Every bus, truck, and truck tractor, when equipped with air or vacuum reservoirs and regardless of date of manufacture, shall have such reservoirs so safeguarded by a check valve or equivalent device that in the event of failure or leakage in its connection to the source of compressed air or vacuum the air or vacuum supply in the reservoir shall not be depleted by the leak or failure.

(2) Means shall be provided to establish the check valve to be in working order. On and after May 1, 1966, means other than loosening or disconnection of any connection between the source of compressed air or vacuum and the check valve, and necessary tools for operation of such means, shall be provided to prove that the check valve is in working order. The means shall be readily accessible either from the front, side, or rear of the vehicle, or from the driver's compartment.

(i) In air brake systems with one reservoir, the means shall be a cock, valve, plug, or equivalent device arranged to vent a cavity having free communication with the connection between the check valve and the source of compressed air or vacuum.

(ii) Where air is delivered by a compressor into one tank or compartment (wet tank), and air for braking is taken directly from another tank or compartment (dry tank) only, with the required check valve between the tanks or compartments, a manually operated drain cock on the first (wet) tank or compartment will serve as a means herein required if it conforms to the requirements herein.

(iii) In vacuum systems stopping the engine will serve as the required

means, the system remaining evacuated as indicated by the vacuum gauge.

[33 FR 19735, Dec. 25, 1968, as amended at 53 FR 49400, Dec. 7, 1988]

**§ 393.51 Warning devices and gauges.**

(a) *General.* In the manner and to the extent specified in paragraphs (b), (c), (d), and (e) of this section, a bus, truck, or truck tractor must be equipped with a signal that provides a warning to the driver when a failure occurs in the vehicle's service brake system.

(b) *Hydraulic brakes.* A vehicle manufactured on or after July 1, 1973, and having service brakes activated by hydraulic fluid must be equipped with a warning signal that performs as follows:

(1) If Federal Motor Vehicle Safety Standard No. 105 (§571.105 of this title) was applicable to the vehicle at the time it was manufactured, the warning signal must conform to the requirements of that standard.

(2) If Federal Motor Vehicle Safety Standard No. 105 (§571.105) was not applicable to the vehicle at the time it was manufactured, the warning signal must become operative, before or upon application of the brakes in the event of a hydraulic-type complete failure of a partial system. The signal must be readily audible or visible to the driver.

(c) *Air brakes.* A vehicle (regardless of the date it was manufactured) having service brakes activated by compressed air (air-mechanical brakes) or a vehicle towing a vehicle having service brakes activated by compressed air (air-mechanical brakes) must be equipped, and perform, as follows:

(1) The vehicle must have a low air pressure warning device that conforms to the requirements of either paragraph (c)(1) (i) or (ii) of this section.

(i) If Federal Motor Vehicle Safety Standard No. 121 (§571.121 of this title) was applicable to the vehicle at the time it was manufactured, the warning device must conform to the requirements of that standard.

(ii) If Federal Motor Vehicle Safety Standard No. 121 (§571.121) was not applicable to the vehicle at the time it was manufactured, the vehicle must have a device that provides a readily audible or visible continuous warning to the driver whenever the pressure of

the compressed air in the braking system is below a specified pressure, which must be at least one-half of the compressor governor cutout pressure.

(2) The vehicle must have a pressure gauge which indicates to the driver the pressure in pounds per square inch available for braking.

(d) *Vacuum brakes.* A vehicle (regardless of the date it was manufactured) having service brakes activated by vacuum or a vehicle towing a vehicle having service brakes activated by vacuum must be equipped with—

(1) A device that provides a readily audible or visible continuous warning to the driver whenever the vacuum in the vehicle's supply reservoir is less than 8 inches of mercury; and

(2) A vacuum gauge which indicates to the driver the vacuum in inches of mercury available for braking.

(e) *Hydraulic brakes applied or assisted by air or vacuum.* A vehicle having a braking system in which hydraulically activated service brakes are applied or assisted by compressed air or vacuum must be equipped with both a warning signal that conforms to the requirements of paragraph (b) of this section and a warning device that conforms to the requirements of either paragraph (c) or paragraph (d) of this section.

(f) *Maintenance.* The warning signals, devices, and gauges required by this section must be maintained in operative condition.

[37 FR 5251, Mar. 11, 1972, as amended at 53 FR 49400, Dec. 7, 1988]

**§ 393.52 Brake performance.**

(a) Upon application of its service brakes, a motor vehicle or combination of motor vehicles must under any condition of loading in which it is found on a public highway, be capable of—

(1) Developing a braking force at least equal to the percentage of its gross weight specified in the table in paragraph (d) of this section;

(2) Decelerating to a stop from 20 miles per hour at not less than the rate specified in the table in paragraph (d) of this section; and

(3) Stopping from 20 miles per hour in a distance, measured from the point at which movement of the service brake pedal or control begins, that is not greater than the distance specified in

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the table in paragraph (d) of this section; or, for motor vehicles or motor vehicle combinations that have a GVWR or GVW greater than 4,536 kg (10,000 pounds),

(4) Developing only the braking force specified in paragraph (a)(1) of this section and the stopping distance specified in paragraph (a)(3) of this section, if braking force is measured by a performance-based brake tester which meets the requirements of functional specifications for performance-based brake testers for commercial motor vehicles, where braking force is the sum of the braking force at each wheel of the vehicle or vehicle combination as a percentage of gross vehicle or combination weight.

(b) Upon application of its emergency brake system and with no other brake system applied, a motor vehicle or combination of motor vehicles must,

under any condition of loading in which it is found on a public highway, be capable of stopping from 20 miles per hour in a distance, measured from the point at which movement of the emergency brake control begins, that is not greater than the distance specified in the table in paragraph (d) of this section.

(c) Conformity to the stopping-distance requirements of paragraphs (a) and (b) of this section shall be determined under the following conditions:

(1) Any test must be made with the vehicle on a hard surface that is substantially level, dry, smooth, and free of loose material.

(2) The vehicle must be in the center of a 12-foot-wide lane when the test begins and must not deviate from that lane during the test.

(d) Vehicle brake performance table:

Type of motor vehicle	Service brake systems			Emergency brake systems
	Braking force as a percentage of gross vehicle or combination weight	Deceleration in feet per second per second	Application and braking distance in feet from initial speed at 20 mph	
A. Passenger-carrying vehicles:				
(1) Vehicles with a seating capacity of 10 persons or less, including driver, and built on a passenger car chassis .....	65.2	21	20	54
(2) Vehicles with a seating capacity of more than 10 persons, including driver, and built on a passenger car chassis; vehicles built on a truck or bus chassis and having a manufacturer's GVWR of 10,000 pounds or less .....	52.8 43.5	17 14	25 35	66 85
(3) All other passenger-carrying vehicles .....	52.8	17	25	66
B. Property-carrying vehicles:				
(1) Single unit vehicles having a manufacturer's GVWR of 10,000 pounds or less .....	43.5	14	35	85
(2) Single unit vehicles having a manufacturer's GVWR of more than 10,000 pounds, except truck tractors; combinations of a 2-axle towing vehicle and trailer having a GVWR of 3,000 pounds or less. All combinations of 2 or less vehicles in drive-away or tow-away operation .....	43.5	14	40	90
(3) All other property-carrying vehicles and combinations of property-carrying vehicles .....				

Notes: (a) There is a definite mathematical relationship between the figures in columns 2 and 3. If the decelerations set forth in column 3 are divided by 32.2 feet per-second per-second, the figures in column 2 will be obtained. (For example, 21 divided by 32.2 equals 65.2 percent.) Column 2 is included in the tabulation because certain brake testing devices utilize this factor.

(b) The decelerations specified in column 3 are an indication of the effectiveness of the basic brakes, and as measured in practical brake testing are the maximum decelerations attained at some time during the stop. These decelerations as measured in brake tests cannot be used to compute the values in column 4 because the deceleration is not sustained at the same rate over the entire period of the stop. The deceleration increases from zero to a maximum during a period of brake system application and brake-force buildup. Also, other factors may cause the deceleration to decrease after reaching a maximum. The added distance that results because maximum deceleration is not sustained is included in the figures in column 4 but is not indicated by the usual brake-testing devices for checking deceleration.

(c) The distances in column 4 and the decelerations in column 3 are not directly related. "Brake-system application and braking distance in feet" (column 4) is a definite measure of the overall effectiveness of the braking system, being the distance traveled between the point at which the driver starts to move the braking controls and the point at which the vehicle comes to rest. It includes distance traveled while the brakes are being applied and distance traveled while the brakes are retarding the vehicle.

(d) The distance traveled during the period of brake-system application and brake-force buildup varies with vehicle type, being negligible for many passenger cars and greatest for combinations of commercial vehicles. This fact accounts for the variation from 20 to 40 feet in the values in column 4 for the various classes of vehicles.

(e) The terms "GVWR" and "GVW" refer to the manufacturer's gross vehicle weight rating and the actual gross vehicle weight, respectively.

[36 FR 20298, Oct. 20, 1971, as amended at 37 FR 5251, Mar. 11, 1972; 37 FR 11336, June 7, 1972; 68 FR 51777, Aug. 9, 2002]

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**§ 393.53 Automatic brake adjusters and brake adjustment indicators.**

(a) *Automatic brake adjusters (hydraulic brake systems)*. Each commercial motor vehicle manufactured on or after October 20, 1993, and equipped with a hydraulic brake system, shall meet the automatic brake adjustment system requirements of Federal Motor Vehicle Safety Standard No. 105 (49 CFR 571.105, S5.1) applicable to the vehicle at the time it was manufactured.

(b) *Automatic brake adjusters (air brake systems)*. Each commercial motor vehicle manufactured on or after October 20, 1994, and equipped with an air brake system shall meet the automatic brake adjustment system requirements of Federal Motor Vehicle Safety Standard No. 121 (49 CFR 571.121, S5.1.8) applicable to the vehicle at the time it was manufactured.

(c) *Brake adjustment indicator (air brake systems)*. On each commercial motor vehicle manufactured on or after October 20, 1994, and equipped with an air brake system which contains an external automatic adjustment mechanism and an exposed pushrod, the condition of service brake under-adjustment shall be displayed by a brake adjustment indicator conforming to the requirements of Federal Motor Vehicle Safety Standard No. 121 (49 CFR 571.121, S5.1.8) applicable to the vehicle at the time it was manufactured.

[60 FR 46245, Sept. 6, 1995]

**§ 393.55 Antilock brake systems.**

(a) *Hydraulic brake systems*. Each truck and bus manufactured on or after March 1, 1999 (except trucks and buses engaged in driveaway-towaway operations), and equipped with a hydraulic brake system, shall be equipped with an antilock brake system that meets the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 105 (49 CFR 571.105, S5.5).

(b) *ABS malfunction indicators for hydraulic braked vehicles*. Each hydraulic braked vehicle subject to the requirements of paragraph (a) of this section shall be equipped with an ABS malfunction indicator system that meets the requirements of FMVSS No. 105 (49 CFR 571.105, S5.3).

(c) *Air brake systems*. (1) Each truck tractor manufactured on or after March 1, 1997 (except truck tractors engaged in driveaway-towaway operations), shall be equipped with an antilock brake system that meets the requirements of FMVSS No. 121 (49 CFR 571.121, S5.1.6.1(b)).

(2) Each air braked commercial motor vehicle other than a truck tractor, manufactured on or after March 1, 1998 (except commercial motor vehicles engaged in driveaway-towaway operations), shall be equipped with an antilock brake system that meets the requirements of FMVSS No. 121 (49 CFR 571.121, S5.1.6.1(a) for trucks and buses, S5.2.3 for semitrailers, converter dollies and full trailers).

(d) *ABS malfunction circuits and signals for air braked vehicles*. (1) Each truck tractor manufactured on or after March 1, 1997, and each single-unit air braked vehicle manufactured on or after March 1, 1998, subject to the requirements of paragraph (c) of this section, shall be equipped with an electrical circuit that is capable of signaling a malfunction that affects the generation or transmission of response or control signals to the vehicle's antilock brake system (49 CFR 571.121, S5.1.6.2(a)).

(2) Each truck tractor manufactured on or after March 1, 2001, and each single-unit vehicle that is equipped to tow another air-braked vehicle, subject to the requirements of paragraph (c) of this section, shall be equipped with an electrical circuit that is capable of transmitting a malfunction signal from the antilock brake system(s) on the towed vehicle(s) to the trailer ABS malfunction lamp in the cab of the towing vehicle, and shall have the means for connection of the electrical circuit to the towed vehicle. The ABS malfunction circuit and signal shall meet the requirements of FMVSS No. 121 (49 CFR 571.121, S5.1.6.2(b)).

(3) Each semitrailer, trailer converter dolly, and full trailer manufactured on or after March 1, 2001, and subject to the requirements of paragraph (c)(2) of this section, shall be equipped with an electrical circuit that is capable of signaling a malfunction in the trailer's antilock brake system,

and shall have the means for connection of this ABS malfunction circuit to the towing vehicle. In addition, each trailer manufactured on or after March 1, 2001, subject to the requirements of paragraph (c)(2) of this section, that is designed to tow another air-brake equipped trailer shall be capable of transmitting a malfunction signal from the antilock brake system(s) of the trailer(s) it tows to the vehicle in front of the trailer. The ABS malfunction circuit and signal shall meet the requirements of FMVSS No. 121 (49 CFR 571.121, S5.2.3.2).

(e) *Exterior ABS malfunction indicator lamps for trailers.* Each trailer (including a trailer converter dolly) manufactured on or after March 1, 1998 and before March 1, 2009, and subject to the requirements of paragraph (c)(2) of this section, shall be equipped with an ABS malfunction indicator lamp which meets the requirements of FMVSS No. 121 (49 CFR 571.121, S5.2.3.3).

[63 FR 24465, May 4, 1998]

### Subpart D—Glazing and Window Construction

#### § 393.60 Glazing in specified openings.

(a) *Glazing material.* Glazing material used in windshields, windows, and doors on a motor vehicle manufactured on or after December 25, 1968, shall at a minimum meet the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 205 in effect on the date of manufacture of the motor vehicle. The glazing material shall be marked in accordance with FMVSS No. 205 (49 CFR 571.205, S6).

(b) *Windshields required.* Each bus, truck and truck-tractor shall be equipped with a windshield. Each windshield or portion of a multi-piece windshield shall be mounted using the full periphery of the glazing material.

(c) *Windshield condition.* With the exception of the conditions listed in paragraphs (c)(1), (c)(2), and (c)(3) of this section, each windshield shall be free of discoloration or damage in the area extending upward from the height of the top of the steering wheel (excluding a 51 mm (2 inch) border at the top of the windshield) and extending from a 25 mm (1 inch) border at each side of the

windshield or windshield panel. *Exceptions:*

(1) Coloring or tinting which meets the requirements of paragraph (d) of this section;

(2) Any crack that is not intersected by any other cracks;

(3) Any damaged area which can be covered by a disc 19 mm ( $\frac{3}{4}$  inch) in diameter if not closer than 76 mm (3 inches) to any other similarly damaged area.

(d) *Coloring or tinting of windshields and windows.* Coloring or tinting of windshields and the windows to the immediate right and left of the driver is allowed, provided the parallel luminous transmittance through the colored or tinted glazing is not less than 70 percent of the light at normal incidence in those portions of the windshield or windows which are marked as having a parallel luminous transmittance of not less than 70 percent. The transmittance restriction does not apply to other windows on the commercial motor vehicle.

(e) *Prohibition on obstructions to the driver's field of view—(1) Devices mounted at the top of the windshield.* Antennas, transponders, and similar devices must not be mounted more than 152 mm (6 inches) below the upper edge of the windshield. These devices must be located outside the area swept by the windshield wipers, and outside the driver's sight lines to the road and highway signs and signals.

(2) *Decals and stickers mounted on the windshield.* Commercial Vehicle Safety Alliance (CVSA) inspection decals, and stickers and/or decals required under Federal or State laws may be placed at the bottom or sides of the windshield provided such decals or stickers do not extend more than 115 mm ( $4\frac{1}{2}$  inches) from the bottom of the windshield and are located outside the area swept by the windshield wipers, and outside the driver's sight lines to the road and highway signs or signals.

[63 FR 1387, Jan. 9, 1998]

#### § 393.61 Window construction.

(a) *Windows in trucks and truck tractors.* Every truck and truck tractor, except vehicles engaged in armored car service, shall have, in addition to the area provided by the windshield, at least one window on each side of the

driver's compartment, which window shall have sufficient area to contain either an ellipse having a major axis of 18 inches and a minor axis of 13 inches or an opening containing 200 square inches formed by a rectangle 13 inches by 17¾ inches with corner arcs of 6-inch maximum radius. The major axis of the ellipse and the long axis of the rectangle shall not make an angle of more than 45 degrees with the surface on which the unladen vehicle stands; however, if the cab is designed with a folding door or doors or with clear openings where doors or windows are customarily located, then no windows shall be required in such locations.

(b) *Bus windows.* (1) Except as provided in paragraph (b)(3) of this section a bus manufactured before September 1, 1973, having a seating capacity of more than eight persons shall have, in addition to the area provided by the windshield, adequate means of escape for passengers through windows. The adequacy of such means shall be determined in accordance with the following standards: For each seated passenger space provided, inclusive of the driver there shall be at least 67 square inches of glazing if such glazing is not contained in a push-out window; or at least 67 square inches of free opening resulting from opening of a push-out type window. No area shall be included in this minimum prescribed area unless it will provide an unobstructed opening sufficient to contain an ellipse having a major axis of 18 inches and a minor axis of 13 inches or an opening containing 200 square inches formed by a rectangle 13 inches by 17¾ inches with corner arcs of 6-inch maximum radius. The major axis of the ellipse and the long axis of the rectangle shall make an angle of not more than 45° with the surface on which the unladen vehicle stands. The area shall be measured either by removal of the glazing if not of the push-out type or of the movable sash if of the push-out type, and it shall be either glazed with laminated safety glass or comply with paragraph (c) of this section. No less than 40 percent of such prescribed glazing or opening shall be on one side of any bus.

(2) A bus, including a school bus, manufactured on and after September 1, 1973, having a seating capacity of

more than 10 persons shall have emergency exits in conformity with Federal Motor Vehicle Safety Standard No. 217, part 571 of this title.

(3) A bus manufactured before September 1, 1973, may conform to Federal Motor Vehicle Safety Standard No. 217, part 571 of this title, in lieu of conforming to paragraph (b)(1) of this section.

(c) *Push-out window requirements.* (1) Except as provided in paragraph (c)(3) of this section, every glazed opening in a bus manufactured before September 1, 1973, and having a seating capacity of more than eight persons, used to satisfy the requirements of paragraph (b)(1) of this section, if not glazed with laminated safety glass, shall have a frame or sash so designed, constructed, and maintained that it will yield outwardly to provide the required free opening when subjected to the drop test specified in Test 25 of the American Standard Safety Code referred to in § 393.60. The height of drop required to open such push-out windows shall not exceed the height of drop required to break the glass in the same window when glazed with the type of laminated glass specified in Test 25 of the Code. The sash for such windows shall be constructed of such material and be of such design and construction as to be continuously capable of complying with the above requirement.

(2) On a bus manufactured on and after September 1, 1973, having a seating capacity of more than 10 persons, each push-out window shall conform to Federal Motor Vehicle Safety Standard No. 217, (§ 571.217) of this title.

(3) A bus manufactured before September 1, 1973, may conform to Federal Motor Vehicle Safety Standard No. 217 (§ 571.217) of this title, in lieu of conforming to paragraph (c)(1) of this section.

[33 FR 19735, Dec. 25, 1968, as amended at 37 FR 11677, June 10, 1972]

#### § 393.62 Window obstructions.

Windows, if otherwise capable of complying with § 393.61 (a) and (b), shall not be obstructed by bars or other such means located either inside or outside such windows such as would hinder the escape of occupants unless such bars or other such means are so constructed as

to provide a clear opening, at least equal to the opening provided by the window to which it is adjacent, when subjected to the same test specified in § 393.61(c). The point of application of such test force shall be such as will be most likely to result in the removal of the obstruction.

**§ 393.63 Windows, markings.**

(a) On a bus manufactured before September 1, 1973, each bus push-out window and any other bus escape window glazed with laminated safety glass required in § 393.61 shall be identified as such by clearly legible and visible signs, lettering, or decalcomania. Such marking shall include appropriate wording to indicate that it is an escape window and also the method to be used for obtaining emergency exit.

(b) On a bus manufactured on and after September 1, 1973, emergency exits required in § 393.61 shall be marked to conform to Federal Motor Vehicle Safety Standard No. 217 (§ 571.217), of this title.

(c) A bus manufactured before September 1, 1973, may mark emergency exits to conform to Federal Motor Vehicle Safety Standard No. 217 (§ 571.217), of this title in lieu of conforming to paragraph (a) of this section.

[37 FR 11678, June 10, 1972]

**Subpart E—Fuel Systems**

AUTHORITY: Sec. 204, Interstate Commerce Act, as amended, 49 U.S.C. 304; sec. 6, Department of Transportation Act, 49 U.S.C. 1655; delegation of authority at 49 CFR 1.48 and 389.4.

**§ 393.65 All fuel systems.**

(a) *Application of the rules in this section.* The rules in this section apply to systems for containing and supplying fuel for the operation of motor vehicles or for the operation of auxiliary equipment installed on, or used in connection with, motor vehicles.

(b) *Location.* Each fuel system must be located on the motor vehicle so that—

(1) No part of the system extends beyond the widest part of the vehicle;

(2) No part of a fuel tank is forward of the front axle of a power unit;

(3) Fuel spilled vertically from a fuel tank while it is being filled will not contact any part of the exhaust or electrical systems of the vehicle, except the fuel level indicator assembly;

(4) Fill pipe openings are located outside the vehicle's passenger compartment and its cargo compartment;

(5) A fuel line does not extend between a towed vehicle and the vehicle that is towing it while the combination of vehicles is in motion; and

(6) No part of the fuel system of a bus manufactured on or after January 1, 1973, is located within or above the passenger compartment.

(c) *Fuel tank installation.* Each fuel tank must be securely attached to the motor vehicle in a workmanlike manner.

(d) *Gravity or syphon feed prohibited.* A fuel system must not supply fuel by gravity or syphon feed directly to the carburetor or injector.

(e) *Selection control valve location.* If a fuel system includes a selection control valve which is operable by the driver to regulate the flow of fuel from two or more fuel tanks, the valve must be installed so that either—

(1) The driver may operate it while watching the roadway and without leaving his/her driving position; or

(2) The driver must stop the vehicle and leave his/her seat in order to operate the valve.

(f) *Fuel lines.* A fuel line which is not completely enclosed in a protective housing must not extend more than 2 inches below the fuel tank or its sump. Diesel fuel crossover, return, and withdrawal lines which extend below the bottom of the tank or sump must be protected against damage from impact. Every fuel line must be—

(1) Long enough and flexible enough to accommodate normal movements of the parts to which it is attached without incurring damage; and

(2) Secured against chafing, kinking, or other causes of mechanical damage.

(g) *Excess flow valve.* When pressure devices are used to force fuel from a fuel tank, a device which prevents the flow of fuel from the fuel tank if the

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fuel feed line is broken must be installed in the fuel system.

[36 FR 15445, Aug. 14, 1971, as amended at 37 FR 4341, Mar. 2, 1972; 37 FR 28752, Dec. 29, 1972]

§ 393.67 **Liquid fuel tanks.**

(a) *Application of the rules in this section.* (1) A liquid fuel tank manufactured on or after January 1, 1973, and a side-mounted gasoline tank must conform to all the rules in this section.

(2) A diesel fuel tank manufactured before January 1, 1973, and mounted on a bus must conform to the rules in paragraphs (c)(7)(iii) and (d)(2) of this section.

(3) A diesel fuel tank manufactured before January 1, 1973, and mounted on a vehicle other than a bus must conform to the rules in paragraph (c)(7)(iii) of this section.

(4) A gasoline tank, other than a side-mounted gasoline tank, manufactured before January 1, 1973, and mounted on a bus must conform to the rules in paragraphs (c) (1) through (10) and (d)(2) of this section.

(5) A gasoline tank, other than a side-mounted gasoline tank, manufactured before January 1, 1973, and mounted on a vehicle other than a bus must conform to the rules in paragraphs (c) (1) through (10), inclusive, of this section.

(6) Private motor carrier of passengers. Motor carriers engaged in the private transportation of passengers may continue to operate a commercial motor vehicle which was not subject to this section or 49 CFR 571.301 at the time of its manufacture, provided the fuel tank of such vehicle is maintained to the original manufacturer's standards.

(7) Motor vehicles that meet the fuel system integrity requirements of 49 CFR 571.301 are exempt from the requirements of this subpart, as they apply to the vehicle's fueling system.

(b) *Definitions.* As used in this section—

(1) The term *liquid fuel tank* means a fuel tank designed to contain a fuel that is liquid at normal atmospheric pressures and temperatures.

(2) A *side-mounted* fuel tank is a liquid fuel tank which—

(i) If mounted on a truck tractor, extends outboard of the vehicle frame and outside of the plan view outline of the cab; or

(ii) If mounted on a truck, extends outboard of a line parallel to the longitudinal centerline of the truck and tangent to the outboard side of a front tire in a straight ahead position. In determining whether a fuel tank on a truck or truck tractor is side-mounted, the fill pipe is not considered a part of the tank.

(c) *Construction of liquid fuel tanks—*

(1) *Joints.* Joints of a fuel tank body must be closed by arc-, gas-, seam-, or spot-welding, by brazing, by silver soldering, or by techniques which provide heat resistance and mechanical securement at least equal to those specifically named. Joints must not be closed solely by crimping or by soldering with a lead-based or other soft solder.

(2) *Fittings.* The fuel tank body must have flanges or spuds suitable for the installation of all fittings.

(3) *Threads.* The threads of all fittings must be Dryseal American Standard Taper Pipe Thread or Dryseal SAE Short Taper Pipe Thread, specified in Society of Automotive Engineers Standard J476, as contained in the 1971 edition of the "SAE Handbook," except that straight (nontapered) threads may be used on fittings having integral flanges and using gaskets for sealing. At least four full threads must be in engagement in each fitting.

(4) *Drains and bottom fittings.* (i) Drains or other bottom fittings must not extend more than three-fourths of an inch below the lowest part of the fuel tank or sump.

(ii) Drains or other bottom fittings must be protected against damage from impact.

(iii) If a fuel tank has drains the drain fittings must permit substantially complete drainage of the tank.

(iv) Drains or other bottom fittings must be installed in a flange or spud designed to accommodate it.

(5) *Fuel withdrawal fittings.* Except for diesel fuel tanks, the fittings through which fuel is withdrawn from a fuel tank must be located above the normal level of fuel in the tank when the tank is full.

(6) [Reserved]

(7) *Fill pipe.* (i) Each fill pipe must be designed and constructed to minimize the risk of fuel spillage during fueling operations and when the vehicle is involved in a crash.

(ii) For diesel-fueled vehicles, the fill pipe and vents of a fuel tank having a capacity of more than 94.75 L (25 gallons) of fuel must permit filling the tank with fuel at a rate of at least 75.8 L/m (20 gallons per minute) without fuel spillage.

(iii) For gasoline- and methanol-fueled vehicles with a GVWR of 3,744 kg (8,500 pounds) or less, the vehicle must permit filling the tank with fuel dispensed at the applicable fill rate required by the regulations of the Environmental Protection Agency under 40 CFR 80.22.

(iv) For gasoline- and methanol-fueled vehicles with a GVWR of 14,000 pounds (6,400 kg) or less, the vehicle must comply with the applicable fuel-spitback prevention and onboard refueling vapor recovery regulations of the Environmental Protection Agency under 40 CFR part 86.

(v) Each fill pipe must be fitted with a cap that can be fastened securely over the opening in the fill pipe. Screw threads or a bayonet-type point are methods of conforming to the requirements of paragraph (c) of this section.

(8) *Safety venting system.* A liquid fuel tank with a capacity of more than 25 gallons of fuel must have a venting system which, in the event the tank is subjected to fire, will prevent internal tank pressure from rupturing the tank's body, seams, or bottom opening (if any).

(9) *Pressure resistance.* The body and fittings of a liquid fuel tank with a capacity of more than 25 gallons of fuel must be capable of withstanding an internal hydrostatic pressure equal to 150 percent of the maximum internal pressure reached in the tank during the safety venting systems test specified in paragraph (d)(1) of this section.

(10) *Air vent.* Each fuel tank must be equipped with a nonspill air vent (such as a ball check). The air vent may be combined with the fill-pipe cap or safety vent, or it may be a separate unit installed on the fuel tank.

(11) *Markings.* If the body of a fuel tank is readily visible when the tank is

installed on the vehicle, the tank must be plainly marked with its liquid capacity. The tank must also be plainly marked with a warning against filling it to more than 95 percent of its liquid capacity.

(12) *Overflow restriction.* A liquid fuel tank manufactured on or after January 1, 1973, must be designed and constructed so that—

(i) The tank cannot be filled, in a normal filling operation, with a quantity of fuel that exceeds 95 percent of the tank's liquid capacity; and

(ii) When the tank is filled, normal expansion of the fuel will not cause fuel spillage.

(d) *Liquid fuel tank tests.* Each liquid fuel tank must be capable of passing the tests specified in paragraphs (d) (1) and (2) of this section.<sup>1</sup>

(1) *Safety venting system test—(i) Procedure.* Fill the tank three-fourths full with fuel, seal the fuel feed outlet, and invert the tank. When the fuel temperature is between 50 °F. and 80 °F., apply an enveloping flame to the tank so that the temperature of the fuel rises at a rate of not less than 6 °F. and not more than 8 °F. per minute.

(ii) *Required performance.* The safety venting system required by paragraph (c)(8) of this section must activate before the internal pressure in the tank exceeds 50 pounds per square inch, gauge, and the internal pressure must not thereafter exceed the pressure at which the system activated by more than five pounds per square inch despite any further increase in the temperature of the fuel.

(2) *Leakage test—(i) Procedure.* Fill the tank to capacity with fuel having a temperature between 50 °F. and 80 °F. With the fill-pipe cap installed, turn the tank through an angle of 150° in any direction about any axis from its normal position.

(ii) *Required performance.* Neither the tank nor any fitting may leak more than a total of one ounce by weight of fuel per minute in any position the tank assumes during the test.

(e) *Side-mounted liquid fuel tank tests.* Each side-mounted liquid fuel tank must be capable of passing the tests specified in paragraphs (e) (1) and (2) of this section and the tests specified in

paragraphs (d) (1) and (2) of this section.<sup>1</sup>

(1) *Drop test*—(i) *Procedure*. Fill the tank with a quantity of water having a weight equal to the weight of the maximum fuel load of the tank and drop the tank 30 feet onto an unyielding surface so that it lands squarely on one corner.

(ii) *Required performance*. Neither the tank nor any fitting may leak more than a total of 1 ounce by weight of water per minute.

(2) *Fill-pipe test*—(i) *Procedure*. Fill the tank with a quantity of water having a weight equal to the weight of the maximum fuel load of the tank and drop the tank 10 feet onto an unyielding surface so that it lands squarely on its fill-pipe.

(ii) *Required performance*. Neither the tank nor any fitting may leak more than a total of 1 ounce by weight of water per minute.

(f) *Certification and markings*. Each liquid fuel tank shall be legibly and permanently marked by the manufacturer with the following minimum information:

(1) The month and year of manufacture,

(2) The manufacturer's name on tanks manufactured on and after July 1, 1988, and means of identifying the facility at which the tank was manufactured, and

(3) A certificate that it conforms to the rules in this section applicable to the tank. The certificate must be in the form set forth in either of the following:

(i) If a tank conforms to all rules in this section pertaining to side-mounted fuel tanks: "Meets all FMCSA side-mounted tank requirements."

(ii) If a tank conforms to all rules in this section pertaining to tanks which are not side-mounted fuel tanks: "Meets all FMCSA requirements for non-side-mounted fuel tanks."

(iii) The form of certificate specified in paragraph (f)(3) (i) or (ii) of this section may be used on a liquid fuel tank manufactured before July 11, 1973, but

<sup>1</sup>The specified tests are a measure of performance only. Manufacturers and carriers may use any alternative procedures which assure that their equipment meets the required performance criteria.

it is not mandatory for liquid fuel tanks manufactured before March 7, 1989. The form of certification manufactured on or before March 7, 1989, must meet the requirements in effect at the time of manufacture.

(4) *Exception*. The following previously exempted vehicles are *not* required to carry the certification and marking specified in paragraphs (f)(1) through (3) of this section:

(i) Ford vehicles with GVWR over 10,000 pounds identified as follows: The vehicle identification numbers (VINS) contain A, K, L, M, N, W, or X in the fourth position.

(ii) GM G-Vans (Chevrolet Express and GMC Savanna) and full-sized C/K trucks (Chevrolet Silverado and GMC Sierra) with GVWR over 10,000 pounds identified as follows: The VINs contain either a "J" or a "K" in the fourth position. In addition, the seventh position of the VINs on the G-Van will contain a "1."

[36 FR 15445, Aug. 14, 1971, as amended at 37 FR 4341, Mar. 2, 1972; 37 FR 28753, Dec. 29, 1972; 45 FR 46424, July 10, 1980; 53 FR 49400, Dec. 7, 1988; 59 FR 8753, Feb. 23, 1994; 69 FR 31305, June 3, 2004]

**§ 393.69 Liquefied petroleum gas systems.**

(a) A fuel system that uses liquefied petroleum gas as a fuel for the operation of a motor vehicle or for the operation of auxiliary equipment installed on, or used in connection with, a motor vehicle must conform to the "Standards for the Storage and Handling of Liquefied Petroleum Gases" of the National Fire Protection Association, Battery March Park, Quincy, MA 02269, as follows:

(1) A fuel system installed before December 31, 1962, must conform to the 1951 edition of the Standards.

(2) A fuel system installed on or after December 31, 1962, and before January 1, 1973, must conform to Division IV of the June 1959 edition of the Standards.

(3) A fuel system installed on or after January 1, 1973, and providing fuel for propulsion of the motor vehicle must conform to Division IV of the 1969 edition of the Standards.

(4) A fuel system installed on or after January 1, 1973, and providing fuel for the operation of auxiliary equipment

must conform to Division VII of the 1969 edition of the Standards.

(b) When the rules in this section require a fuel system to conform to a specific edition of the Standards, the fuel system may conform to the applicable provisions in a later edition of the Standards specified in this section.

(c) The tank of a fuel system must be marked to indicate that the system conforms to the Standards.

[36 FR 15445, Aug. 14, 1971, as amended at 37 FR 4342, Mar. 2, 1972; 41 FR 53031, Dec. 3, 1976; 53 FR 49400, Dec. 7, 1988]

### Subpart F—Coupling Devices and Towing Methods

#### § 393.70 Coupling devices and towing methods, except for driveaway-towaway operations.

(a) *Tracking.* When two or more vehicles are operated in combination, the coupling devices connecting the vehicles shall be designed, constructed, and installed, and the vehicles shall be designed and constructed, so that when the combination is operated in a straight line on a level, smooth, paved surface, the path of the towed vehicle will not deviate more than 3 inches to either side of the path of the vehicle that tows it.

(b) *Fifth wheel assemblies*—(1) *Mounting*—(i) *Lower half.* The lower half of a fifth wheel mounted on a truck tractor or converter dolly must be secured to the frame of that vehicle with properly designed brackets, mounting plates or angles and properly tightened bolts of adequate size and grade, or devices that provide equivalent security. The installation shall not cause cracking, warping, or deformation of the frame. The installation must include a device for positively preventing the lower half of the fifth wheel from shifting on the frame to which it is attached.

(ii) *Upper half.* The upper half of a fifth wheel must be fastened to the motor vehicle with at least the same security required for the installation of the lower half on a truck tractor or converter dolly.

(2) *Locking.* Every fifth wheel assembly must have a locking mechanism. The locking mechanism, and any adapter used in conjunction with it, must prevent separation of the upper

and lower halves of the fifth wheel assembly unless a positive manual release is activated. The release may be located so that the driver can operate it from the cab. If a motor vehicle has a fifth wheel designed and constructed to be readily separable, the fifth wheel locking devices shall apply automatically on coupling.

(3) *Location.* The lower half of a fifth wheel shall be located so that, regardless of the condition of loading, the relationship between the kingpin and the rear axle or axles of the towing motor vehicle will properly distribute the gross weight of both the towed and towing vehicles on the axles of those vehicles, will not unduly interfere with the steering, braking, and other maneuvering of the towing vehicle, and will not otherwise contribute to unsafe operation of the vehicles comprising the combination. The upper half of a fifth wheel shall be located so that the weight of the vehicles is properly distributed on their axles and the combination of vehicles will operate safely during normal operation.

(c) *Towing of full trailers.* A full trailer must be equipped with a tow-bar and a means of attaching the tow-bar to the towing and towed vehicles. The tow-bar and the means of attaching it must—

(1) Be structurally adequate for the weight being drawn;

(2) Be properly and securely mounted;

(3) Provide for adequate articulation at the connection without excessive slack at that location; and

(4) Be provided with a locking device that prevents accidental separation of the towed and towing vehicles. The mounting of the trailer hitch (pintle hook or equivalent mechanism) on the towing vehicle must include reinforcement or bracing of the frame sufficient to produce strength and rigidity of the frame to prevent its undue distortion.

(d) *Safety devices in case of tow-bar failure or disconnection.* Every full trailer and every converter dolly used to convert a semitrailer to a full trailer must be coupled to the frame, or an extension of the frame, of the motor vehicle which tows it with one or more safety devices to prevent the towed vehicle from breaking loose in the event

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the tow-bar fails or becomes disconnected. The safety device must meet the following requirements:

(1) The safety device must not be attached to the pintle hook or any other device on the towing vehicle to which the tow-bar is attached. However, if the pintle hook or other device was manufactured prior to July 1, 1973, the safety device may be attached to the towing vehicle at a place on a pintle hook forging or casting if that place is independent of the pintle hook.

(2) The safety device must have no more slack than is necessary to permit the vehicles to be turned properly.

(3) The safety device, and the means of attaching it to the vehicles, must have an ultimate strength of not less than the gross weight of the vehicle or vehicles being towed.

(4) The safety device must be connected to the towed and towing vehicles and to the tow-bar in a manner which prevents the tow-bar from dropping to the ground in the event it fails or becomes disconnected.

(5) Except as provided in paragraph (d)(6) of this section, if the safety device consists of safety chains or cables, the towed vehicle must be equipped with either two safety chains or cables or with a bridle arrangement of a single chain or cable attached to its frame or axle at two points as far apart as the configuration of the frame or axle permits. The safety chains or cables shall be either two separate pieces, each equipped with a hook or other means for attachment to the towing vehicle, or a single piece leading along each side of the tow-bar from the two points of attachment on the towed vehicle and arranged into a bridle with a single means of attachment to be connected to the towing vehicle. When a single length of cable is used, a thimble and twin-base cable clamps shall be used to form the forward bridle eye. The hook or other means of attachment to the towing vehicle shall be secured to the chains or cables in a fixed position.

(6) If the towed vehicle is a converter dolly with a solid tongue and without a hinged tow-bar or other swivel between the fifth wheel mounting and the attachment point of the tongue eye or other hitch device—

(i) Safety chains or cables, when used as the safety device for that vehicle, may consist of either two chains or cables or a single chain or cable used alone;

(ii) A single safety device, including a single chain or cable used alone as the safety device, must be in line with the centerline of the trailer tongue; and

(iii) The device may be attached to the converter dolly at any point to the rear of the attachment point of the tongue eye or other hitch device.

(7) Safety devices other than safety chains or cables must provide strength, security of attachment, and directional stability equal to, or greater than, safety chains or cables installed in accordance with paragraphs (d) (5) and (6) of this section.

(8) When two safety devices, including two safety chains or cables, are used and are attached to the towing vehicle at separate points, the points of attachment on the towing vehicle shall be located equally distant from, and on opposite sides of, the centerline of the towing vehicle. Where two chains or cables are attached to the same point on the towing vehicle, and where a bridle or a single chain or cable is used, the point of attachment must be on the longitudinal centerline of the towing vehicle. A single safety device, other than a chain or cable, must also be attached to the towing vehicle at a point on its longitudinal centerline.

[37 FR 21439, Oct. 11, 1972]

**§ 393.71 Coupling devices and towing methods, driveaway-towaway operations.**

(a) *Number in combination.* (1) No more than three saddle-mounts may be used in any combination.

(2) No more than one tow-bar may be used in any combination.

(3) When motor vehicles are towed by means of triple saddle-mounts, the towed vehicles shall have brakes acting on all wheels which are in contact with the roadway.

(b) *Carrying vehicles on towing vehicle.*

(1) When adequately and securely attached by means equivalent in security to that provided in paragraph (j)(2) of this section, a motor vehicle or motor vehicles may be full-mounted on the

structure of a towing vehicle engaged in any driveaway-towaway operation.

(2) No motor vehicle or motor vehicles may be full-mounted on a towing vehicle unless the relationship of such full-mounted vehicles to the rear axle or axles results in proper distribution of the total gross weight of the vehicles and does not unduly interfere with the steering, braking, or maneuvering of the towing vehicle, or otherwise contribute to the unsafe operation of the vehicles comprising the combination.

(c) *Carrying vehicles on towed vehicles.*

(1) When adequately and securely attached by means equivalent in security to that provided in paragraph (j)(2) of this section, a motor vehicle or motor vehicles may be full-mounted on the structure of towed vehicles engaged in any driveaway-towaway operation.

(2) No motor vehicle shall be full-mounted on a motor vehicle towed by means of a tow-bar unless the towed vehicle is equipped with brakes and is provided with means for effective application of brakes acting on all wheels and is towed on its own wheels.

(3) No motor vehicle or motor vehicles shall be full-mounted on a motor vehicle towed by means of a saddle-mount unless the center line of the kingpin or equivalent means of attachment of such towed vehicle shall be so located on the towing vehicle that the relationship to the rear axle or axles results in proper distribution of the total gross weight of the vehicles and does not unduly interfere with the steering, braking, or maneuvering of the towing vehicle or otherwise contribute to the unsafe operation of vehicles comprising the combination; and unless a perpendicular to the ground from the center of gravity of the full-mounted vehicles lies forward of the center line of the rear axle of the saddle-mounted vehicle.

(4) If a motor vehicle towed by means of a double saddle-mount has any vehicle full-mounted on it, such saddle-mounted vehicle shall at all times while so loaded have effective brakes acting on those wheels which are in contact with the roadway.

(d) *Bumper tow-bars on heavy vehicles prohibited.* Tow-bars of the type which depend upon the bumpers as a means of transmitting forces between the vehi-

cles shall not be used to tow a motor vehicle weighing more than 5,000 pounds.

(e) *Front wheels of saddle-mounted vehicles restrained.* A motor vehicle towed by means of a saddle-mount shall have the motion of the front wheels restrained if under any condition of turning of such wheels they will project beyond the widest part of either the towed or towing vehicle.

(f) *Vehicles to be towed in forward position.* Unless the steering mechanism is adequately locked in a straight-forward position, all motor vehicles towed by means of a saddle-mount shall be towed with the front end mounted on the towing vehicle.

(g) *Means required for towing.* (1) No motor vehicle or motor vehicles shall be towed in driveaway-towaway operations by means other than tow-bar or saddle-mount connections which shall meet the requirements of this section.

(2) For the purpose of the regulations of this part:

(i) Coupling devices such as those used for towing house trailers and employing ball and socket connections shall be considered as tow-bars.

(ii) Motor vehicles or parts of motor vehicles adequately, securely, and rigidly attached by devices meeting the requirements of paragraph (n) of this section shall be considered as one vehicle in any position in any combination.

(h) *Requirements for tow-bars.* Tow-bars shall comply with the following requirements:

(1) *Tow-bars, structural adequacy and mounting.* Every tow-bar shall be structurally adequate and properly installed and maintained. To insure that it is structurally adequate, it must, at least, meet the requirements of the following table:

Gross weight of towed vehicle (pounds) <sup>1</sup>	Longitudinal strength in tension and compression <sup>2</sup>		
	All tow-bars	New tow-bars acquired and used by a motor carrier after Sept. 30, 1948	Strength as a beam (in any direction concentrated load at center) <sup>2,3</sup>
	Pounds		
Less than 5,000 .....	3,000	6,500	3,000
5,000 and over .....	.....	.....	.....
Less than 10,000 .....	6,000	(1)	(1)

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Gross weight of towed vehicle (pounds) <sup>1</sup>	Longitudinal strength in tension and compression <sup>2</sup>		
	All tow-bars	New tow-bars acquired and used by a motor carrier after Sept. 30, 1948	Strength as a beam (in any direction concentrated load at center) <sup>2, 3</sup>
10,000 and over .....	.....	.....	.....
Less than 15,000 .....	9,000	(1)	(1)

<sup>1</sup>The required strength of tow-bars for towed vehicles of 15,000 pounds and over gross weight and of new tow-bars acquired and used after Sept. 30, 1948, for towed vehicles of 5,000 pounds and over gross weight shall be computed by means of the following formulae: Longitudinal strength=gross weight of towed vehicle × 1.3. Strength as a beam=gross weight of towed vehicle × 0.6.

<sup>2</sup>In testing, the whole unit shall be tested with all clamps, joints, and pins so mounted and fastened as to approximate conditions of actual operation.

<sup>3</sup>This test shall be applicable only to tow-bars which are, in normal operation, subjected to a bending movement such as tow-bars for house trailers.

(2) *Tow-bars, jointed.* The tow-bar shall be so constructed as to freely permit motion in both horizontal and vertical planes between the towed and towing vehicles. The means used to provide the motion shall be such as to prohibit the transmission of stresses under normal operation between the towed and towing vehicles, except along the longitudinal axis of the tongue or tongues.

(3) *Tow-bar fastenings.* The means used to transmit the stresses to the chassis or frames of the towed and towing vehicles may be either temporary structures or bumpers or other integral parts of the vehicles: *Provided, however,* That the means used shall be so constructed, installed, and maintained that when tested as an assembly, failure in such members shall not occur when the weakest new tow-bar which is permissible under paragraph (h)(1) of this section is subjected to the tests given therein.

(4) *Means of adjusting length.* On tow-bars, adjustable as to length, the means used to make such adjustment shall fit tightly and not result in any slackness or permit the tow-bar to bend. With the tow-bar supported rigidly at both ends and with a load of 50 pounds at the center, the sag, measured at the center, in any direction shall not exceed 0.25 inch under any condition of adjustment as to length.

(5) *Method of clamping.* Adequate means shall be provided for securely

fastening the tow-bar to the towed and towing vehicles.

(6) *Tow-bar connection to steering mechanism.* The tow-bar shall be provided with suitable means of attachment to and actuation of the steering mechanism, if any, of the towed vehicle. The attachment shall provide for sufficient angularity of movement of the front wheels of the towed vehicle so that it may follow substantially in the path of the towing vehicle without cramping the tow-bar. The tow-bar shall be provided with suitable joints to permit such movement.

(7) *Tracking.* The tow-bar shall be so designed, constructed, maintained, and mounted as to cause the towed vehicle to follow substantially in the path of the towing vehicle. Tow-bars of such design on in our condition as to permit the towed vehicle to deviate more than 3 inches to either side of the path of a towing vehicle moving in a straight line as measured from the center of the towing vehicle are prohibited.

(8) *Passenger car-trailer type couplings.* Trailer couplings used for driveaway-towaway operations of passenger car trailers shall conform to Society of Automotive Engineers Standard No. J684c, "Trailer Couplings and Hitches—Automotive Type," July 1970.<sup>1</sup>

(9) *Marking tow-bars.* Every tow-bar acquired and used in driveaway-towaway operations by a motor carrier shall be plainly marked with the following certification of the manufacturer thereof (or words of equivalent meaning):

This tow-bar complies with the requirements of the Federal Motor Carrier Safety Administration for (maximum gross weight for which tow-bar is manufactured) vehicles.  
Allowable Maximum Gross Weight \_\_\_\_\_

Manufactured \_\_\_\_\_  
(month and year)

by \_\_\_\_\_  
(name of manufacturer)

Tow-bar certification manufactured before the effective date of this regulation must meet requirements in effect at the time of manufacture.

(10) *Safety devices in case of tow-bar failure or disconnection.* (i) The towed

<sup>1</sup>See footnote 1 to § 393.24(c).

vehicle shall be connected to the towing vehicle by a safety device to prevent the towed vehicle from breaking loose in the event the tow-bar fails or becomes disconnected. When safety chains or cables are used as the safety device for that vehicle, at least two safety chains or cables meeting the requirements of paragraph (h)(10)(ii) of this section shall be used. The tensile strength of the safety device and the means of attachment to the vehicles shall be at least equivalent to the corresponding longitudinal strength for tow-bars required in the table of paragraph (h)(1) of this section. If safety chains or cables are used as the safety device, the required strength shall be the combined strength of the combination of chains and cables.

(ii) If chains or cables are used as the safety device, they shall be crossed and attached to the vehicles near the points of bumper attachments to the chassis of the vehicles. The length of chain used shall be no more than necessary to permit free turning of the vehicles. The chains shall be attached to the tow-bar at the point of crossing or as close to that point as is practicable.

(iii) A safety device other than safety chains or cables must provide strength, security of attachment, and directional stability equal to, or greater than, that provided by safety chains or cables installed in accordance with paragraph (h)(10)(ii) of this section. A safety device other than safety chains or cables must be designed, constructed, and installed so that, if the tow-bar fails or becomes disconnected, the tow-bar will not drop to the ground.

(i) [Reserved]

(j) *Requirements for upper-half of saddle-mounts.* The upper-half of any saddle-mount shall comply with the following requirements:

(1) *Upper-half connection to towed vehicle.* The upper-half shall be securely attached to the frame or axle of the towed vehicle by means of U-bolts or other means providing at least equivalent security.

(2) *U-bolts or other attachments.* U-bolts used to attach the upper half to the towed vehicle shall be made of steel rod, free of defects, so shaped as to avoid at any point a radius of less than 1 inch: *Provided, however,* That a

lesser radius may be utilized if the U-bolt is so fabricated as not to cause more than 5 percent reduction in cross-sectional area at points of curvature, in which latter event the minimum radius shall be one-sixteenth inch. U-bolts shall have a diameter not less than required by the following table:

DIAMETER OF U-BOLTS IN INCHES

Weight in pounds of heaviest towed vehicle	Double or triple saddle-mount			
	Front mount	Middle or front mount	Rear mount	Single saddle-mount <sup>1</sup>
Up to 5,000 .....	0.625	0.5625	0.500	0.500
5,000 and over .....	0.6875	0.625	0.5625	0.5625

<sup>1</sup>The total weight of all the vehicles being towed shall govern. If other devices are used to accomplish the same purposes as U-bolts they shall have at least equivalent strength of U-bolts made of mild steel. Cast iron shall not be used for clamps or any other holding devices.

(3) *U-bolts and points of support, location.* The distance between the most widely separated U-bolts shall not be less than 9 inches. The distance between the widely separated points where the upper-half supports the towed vehicle shall not be less than 9 inches, except that saddle-mounts employing ball and socket joints shall employ a device which clamps the axle of the towed vehicle throughout a length of not less than 5 inches.

(4) *Cradle-type upper-halves, specifications.* Upper-halves of the cradle-type using vertical members to restrain the towed vehicle from relative movement in the direction of motion of the vehicles shall be substantially constructed and adequate for the purpose. Such cradle-mounts shall be equipped with at least one bolt or equivalent means to provide against relative vertical movement between the upper-half and the towed vehicle. Bolts, if used, shall be at least one-half inch in diameter. Devices using equivalent means shall have at least equivalent strength. The means used to provide against relative vertical motion between the upper-half and the towed vehicle shall be such as not to permit a relative motion of over one-half inch. The distance between the most widely separated points of support between the upper-half and the towed vehicle shall be at least 9 inches.

(5) *Lateral movement of towed vehicle.*  
 (i) Towed vehicles having a straight axle or an axle having a drop of less than 3 inches, unless the saddle-mount

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is constructed in accordance with paragraph (m)(2) of this section, shall be securely fastened by means of chains or cables to the upper-half so as to insure against relative lateral motion between the towed vehicle and the upper-half. The chains or cables shall be at least 3/16-inch diameter and secured by bolts of at least equal diameter.

(ii) Towed vehicles with an axle with a drop of 3 inches or more, or connected by a saddle-mount constructed in accordance with paragraph (m)(2) of this section, need not be restrained by chains or cables provided that the upper-half is so designed as to provide against such relative motion.

(iii) Chains or cables shall not be required if the upper-half is so designed as positively to provide against lateral movement of the axle.

(k) *Requirements for lower half of saddle-mounts.* The lower half of any saddle-mount shall comply with the following requirements:

(1) *U-bolts or other attachments.* U-bolts used to attach the lower half to the towing vehicle shall be made of steel rod, free of defects, so shaped as to avoid at any point a radius of less than 1 inch: *Provided, however,* That a lesser radius may be utilized if the U-bolt is so fabricated as not to cause more than 5 percent reduction in cross-sectional area at points of curvature, in which latter event the minimum radius shall be one-sixteenth inch. U-bolts shall have a total cross-sectional area not less than as required by the following table:

TOTAL CROSS-SECTIONAL AREA OF U-BOLTS IN SQUARE INCHES

Weight in pounds of heaviest towed vehicle	Double or triple saddle-mount			
	Front mount	Middle or front mount	Rear mount	Single saddle-mount <sup>1</sup>
Up to 5,000 .....	1.2	1.0	0.8	0.8
5,000 and over .....	1.4	1.2	1.0	1.0

<sup>1</sup>The total weight of all the vehicles being towed shall govern. If other devices are used to accomplish the same purposes as U-bolts they shall have at least equivalent strength of U-bolts made of mild steel. Cast iron shall not be used for clamps or any other holding devices.

(2) *Shifting.* Adequate provision shall be made by design and installation to provide against relative movement between the lower-half and the towing vehicle especially during periods of rapid acceleration and deceleration. To

insure against shifting, designs of the tripod type shall be equipped with adequate and securely fastened hold-back chains or similar devices.

(3) *Swaying.* (i) Adequate provision shall be made by design and installation to provide against swaying or lateral movement of the towed vehicle relative to the towing vehicle. To insure against swaying, lower-halves designed with cross-members attached to but separable from vertical members shall have such cross-members fastened to the vertical members by at least two bolts on each side. Such bolts shall be of at least equivalent cross-sectional area as those required for U-bolts for the corresponding saddle-mount as given in the table in paragraph (k)(1) of this section. The minimum distance between the most widely separated points of support of the cross-member by the vertical member shall be three inches as measured in a direction parallel to the longitudinal axis of the towing vehicle.

(ii) The lower-half shall have a bearing surface on the frame of the towing vehicle of such dimensions that the pressure exerted by the lower-half upon the frame of the towing vehicle shall not exceed 200 pounds per square inch under any conditions of static loading. Hardwood blocks or blocks of other suitable material, such as hard rubber, aluminum or brakelining, if used between the lower half and the frame of the towing vehicle shall be at least 1/2 inch thick, 3 inches wide, and a combined length of 6 inches.

(iii) Under no condition shall the highest point of support of the towed vehicle by the upper-half be more than 24 inches, measured vertically, above the top of the frame of the towing vehicle, measured at the point where the lower-half rests on the towing vehicle.

(4) *Wood blocks.* (i) Hardwood blocks of good quality may be used to build up the height of the front end of the towed vehicle, provided that the total height of such wood blocks shall not exceed 8 inches and not over two separate pieces are placed upon each other to obtain such height; however, hardwood blocks, not over 4 in number, to a total height not to exceed 14 inches, may be used if the total cross-sectional area of the U-bolts used to attach the lower-half of

the towing vehicle is at least 50 percent greater than that required by the table contained in paragraph (k)(1) of this section, or, if other devices are used in lieu of U-bolts, they shall provide for as great a resistance to bending as is provided by the larger U-bolts above prescribed.

(ii) Hardwood blocks must be at least 4 inches in width and the surfaces between blocks or block and lower-half or block and upper-half shall be planed and so installed and maintained as to minimize any tendency of the towed vehicle to sway or rock.

(5) *Cross-member, general requirements.* The cross-member, which is that part of the lower-half used to distribute the weight of the towed vehicle equally to each member of the frame of the towing vehicle, if used, shall be structurally adequate and properly installed and maintained adequately to perform this function.

(6) *Cross-member, use of wood.* No materials, other than suitable metals, shall be used as the cross-member, and wood may not be used structurally in any manner that will result in its being subject to tensile stresses. Wood

may be used in cross-members if supported throughout its length by suitable metal cross-members.

(7) *Lower half strength.* The lower half shall be capable of supporting the loads given in the following table. For the purpose of test, the saddle-mount shall be mounted as normally operated and the load applied through the upper half:

MINIMUM TEST LOAD IN POUNDS

Weight in pounds of heaviest towed vehicle	Double or triple saddle-mount			
	Front mount	Middle or front mount	Rear mount	Single saddle-mount <sup>1</sup>
Up to 5,000 .....	15,000	10,000	5,000	5,000
5,000 and over .....	30,000	20,000	10,000	10,000

<sup>1</sup>The total weight of all the vehicles being towed shall govern.

(1) *Requirements for kingpins of saddle-mounts.* The kingpin of any saddle-mount shall comply with the following requirements:

(1) *Kingpin size.* (i) Kingpins shall be constructed of steel suitable for the purpose, free of defects, and having a diameter not less than required by the following table:

DIAMETER OF SOLID KINGPIN IN INCHES

Weight in pounds of heaviest towed vehicle	Double or triple saddle-mount							
	Front mount		Middle or front mount		Rear mount		Single saddle-mount <sup>1</sup>	
	Mild steel	H.T.S. <sup>2</sup>	Mild steel	H.T.S. <sup>2</sup>	Mild steel	H.T.S. <sup>2</sup>	Mild steel	H.T.S.
Up to 5,000 .....	1.125	1.000	1.000	0.875	0.875	0.750	0.875	0.750
5,000 and over .....	1.500	1.125	1.250	1.000	1.000	0.875	1.000	0.875

<sup>1</sup> The total weight of all the vehicles being towed shall govern.

<sup>2</sup> High-tensile steel is steel having a minimum ultimate strength of 65,000 pounds per square inch.

(ii) If a ball and socket joint is used in place of a kingpin, the diameter of the neck of the ball shall be at least equal to the diameter of the corresponding solid kingpin given in the above table. If hollow kingpins are used, the metallic cross-sectional area shall be at least equal to the cross-sectional area of the corresponding solid kingpin.

(2) *Kingpin fit.* If a kingpin bushing is not used, the king-pin shall fit snugly into the upper and lower-halves but shall not bind. Those portions of the upper or lower-halves in moving contact with the kingpin shall be smooth-

ly machined with no rough or sharp edges. The bearing surface thus provided shall not be less in depth than the radius of the kingpin.

(3) *Kingpin bushing on saddle-mounts.* The kingpin of all new saddle-mounts acquired and used shall be snugly enclosed in a bushing at least along such length of the kingpin as may be in moving contact with either the upper or lower-halves. The bearing surface thus provided shall not be less in depth than the radius of the kingpin.

(4) *Kingpin to restrain vertical motion.* The kingpin shall be so designed and installed as to restrain the upper-half

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from moving in a vertical direction relative to the lower-half.

(m) *Additional requirements for saddle-mounts.* Saddle-mounts shall comply with the following requirements:

(1) *Bearing surface between upper and lower-halves.* The upper and lower-halves shall be so constructed and connected that the bearing surface between the two halves shall not be less than 16 square inches under any conditions of angularity between the towing and towed vehicles: *Provided, however,* That saddle-mounts using a ball and socket joint shall have a ball of such dimension that the static bearing load shall not exceed 800 pounds per square inch, based on the projected cross-sectional area of the ball: *And further provided,* That saddle-mounts having the upper-half supported by ball, taper, or roller-bearings shall not have such bearings loaded beyond the limits prescribed for such bearings by the manufacturer thereof. The upper-half shall rest evenly and smoothly upon the lower-half and the contact surfaces shall be lubricated and maintained so that there shall be a minimum of frictional resistance between the parts.

(2) *Saddle-mounts, angularity.* All saddle-mounts acquired and used shall provide for angularity between the towing and towed vehicles due to vertical curvatures of the highway. Such means shall not depend upon either the looseness or deformation of the parts of either the saddle-mount or the vehicles to provide for such angularity.

(3) *Tracking.* The saddle-mount shall be so designed, constructed, maintained, and installed that the towed vehicle or vehicles will follow substantially in the path of the towing vehicle without swerving. Towed vehicles shall not deviate more than 3 inches to either side of the path of the towing vehicle when moving in a straight line.

(4) *Prevention of frame bending.* Where necessary, provision shall be made to prevent the bending of the frame of the towing vehicle by insertion of suitable blocks inside the frame channel to prevent kinking. The saddle-mount shall not be so located as to cause deformation of the frame by reason of cantilever action.

(5) *Extension of frame.* No saddle-mount shall be located at a point to the rear of the frame of a towing vehicle.

(6) *Nuts, secured.* All nuts used on bolts, U-bolts, king-pins, or in any other part of the saddle-mount shall be secured against accidental disconnection by means of cotter-keys, lock-washers, double nuts, safety nuts, or equivalent means. Parts shall be so designed and installed that nuts shall be fully engaged.

(7) *Inspection of all parts.* The saddle-mount shall be so designed that it may be disassembled and each separate part inspected for worn, bent, cracked, broken, or missing parts.

(8) *Saddle-mounts, marking.* Every new saddle-mount acquired and used in driveaway-towaway operations by a motor carrier shall have the upper-half and the lower-half separately marked with the following certification of the manufacturer thereof (or words of equivalent meaning).

This saddle-mount complies with the requirements of the Federal Motor Carrier Safety Administration for vehicles up to 5,000 pounds (or over 5,000 pounds):

Manufactured \_\_\_\_\_  
(Month and year)  
by \_\_\_\_\_  
(Name of manufacturer)

(n) *Requirements for devices used to connect motor vehicles or parts of motor vehicles together to form one vehicle—(1) Front axle attachment.* The front axle of one motor vehicle intended to be coupled with another vehicle as defined in paragraph (g)(2)(ii) of this section shall be attached with U-bolts meeting the requirements of paragraph (j)(2) of this section.

(2) *Rear axle attachment.* The rear axle of one vehicle shall be coupled to the frame of the other vehicle by means of a connecting device which when in place forms a rectangle. The device shall be composed of two pieces, top and bottom. The device shall be made of 4-inch by 1/2-inch steel bar bent to shape and shall have the corners reinforced with a plate at least 3 inches by 1/2 inch by 8 inches long. The device shall be bolted together with 3/4-inch bolts and at least three shall be used on each side. Wood may be used as

spacers to keep the frames apart and it shall be at least 4 inches square.

(Sec. 12, 80 Stat. 931; 49 U.S.C. 1651 note; section 6 of the Department of Transportation Act, 49 U.S.C. 1655, and the delegations of authority at 49 CFR 1.48 and 389.4)

[33 FR 19735, Dec. 25, 1968, as amended at 35 FR 10907, July 7, 1970; 37 FR 21440, Oct. 11, 1972; 53 FR 49400, Dec. 7, 1988]

### Subpart G—Miscellaneous Parts and Accessories

#### § 393.75 Tires.

(a) No motor vehicle shall be operated on any tire that (1) has body ply or belt material exposed through the tread or sidewall, (2) has any tread or sidewall separation, (3) is flat or has an audible leak, or (4) has a cut to the extent that the ply or belt material is exposed.

(b) Any tire on the front wheels of a bus, truck, or truck tractor shall have a tread groove pattern depth of at least  $\frac{1}{32}$  of an inch when measured at any point on a major tread groove. The measurements shall not be made where tie bars, humps, or fillets are located.

(c) Except as provided in paragraph (b) of this section, tires shall have a tread groove pattern depth of at least  $\frac{2}{32}$  of an inch when measured in a major tread groove. The measurement shall not be made where tie bars, humps or fillets are located.

(d) No bus shall be operated with regrooved, recapped or retreaded tires on the front wheels.

(e) No truck or truck tractor shall be operated with regrooved tires on the front wheels which have a load carrying capacity equal to or greater than that of 8.25-20 8 ply-rating tires.

(f) *Tire loading restrictions (except on manufactured homes)*. No motor vehicle (except manufactured homes, which are governed by paragraph (g) of this section) shall be operated with tires that carry a weight greater than that marked on the sidewall of the tire or, in the absence of such a marking, a weight greater than that specified for the tires in any of the publications of any of the organizations listed in Federal Motor Vehicle Safety Standard No. 119 (49 CFR 571.119, S5.1(b)) unless:

(1) The vehicle is being operated under the terms of a special permit issued by the State; and

(2) The vehicle is being operated at a reduced speed to compensate for the tire loading in excess of the manufacturer's rated capacity for the tire. In no case shall the speed exceed 80 km/hr (50 mph).

(g)(1) *Tire loading restrictions for manufactured homes built before January 1, 2002*. Manufactured homes that are labeled pursuant to 24 CFR 3282.362(c)(2)(i) before January 1, 2002, must not be transported on tires that are loaded more than 18 percent over the load rating marked on the sidewall of the tire or, in the absence of such a marking, more than 18 percent over the load rating specified in any of the publications of any of the organizations listed in FMVSS No. 119 (49 CFR 571.119, S5.1(b)). Manufactured homes labeled before January 1, 2002, transported on tires overloaded by 9 percent or more must not be operated at speeds exceeding 80 km/hr (50 mph).

(2) *Tire loading restrictions for manufactured homes built on or after January 1, 2002*. Manufactured homes that are labeled pursuant to 24 CFR 3282.362(c)(2)(i) on or after January 1, 2002, must not be transported on tires loaded beyond the load rating marked on the sidewall of the tire or, in the absence of such a marking, the load rating specified in any of the publications of any of the organizations listed in FMVSS No. 119 (49 CFR 571.119, S5.1(b)).

(h) *Tire inflation pressure*. (1) No motor vehicle shall be operated on a tire which has a cold inflation pressure less than that specified for the load being carried.

(2) If the inflation pressure of the tire has been increased by heat because of the recent operation of the vehicle, the cold inflation pressure shall be estimated by subtracting the inflation buildup factor shown in Table 1 from the measured inflation pressure.

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TABLE 1—INFLATION PRESSURE MEASUREMENT CORRECTION FOR HEAT

Average speed of vehicle in the previous hour	Minimum inflation pressure buildup	
	Tires with 1,814 kg (4,000 lbs.) maximum load rating or less	Tires with over 1,814 kg (4,000 lbs.) load rating
66–88.5 km/hr (41–55 mph).	34.5 kPa (5 psi) ...	103.4 kPa (15 psi).

[34 FR 9344, June 13, 1969, as amended at 40 FR 44557, Sept. 29, 1975; 41 FR 36657, Aug. 31, 1976; 44 FR 25455, May 1, 1979; 44 FR 47938, Aug. 16, 1979; 53 FR 18057, May 19, 1988; 53 FR 49401, Dec. 7, 1988; 63 FR 8339, Feb. 18, 1998; 65 FR 70220, Nov. 21, 2000; 66 FR 67694, Dec. 31, 2001]

§ 393.76 **Sleeper berths.**

(a) *Dimensions*—(1) *Size.* A sleeper berth must be at least the following size:

Date of installation on motor vehicle	Length measured on center-line of longitudinal axis (inches)	Width measured on center-line of transverse axis (inches)	Height measured from highest point of top of mattress (inches) <sup>1</sup>
Before January 1, 1953 .....	72	18	18
After December 31, 1952, and before October 1, 1975 ...	75	21	21
After September 30, 1975 .....	75	24	24

<sup>1</sup> In the case of a sleeper berth which utilizes an adjustable mechanical suspension system, the required clearance can be measured when the suspension system is adjusted to the height to which it would settle when occupied by a driver.

(2) *Shape.* A sleeper berth installed on a motor vehicle on or after January 1, 1953 must be of generally rectangular shape, except that the horizontal corners and the roof corners may be rounded to radii not exceeding 10½ inches.

(3) *Access.* A sleeper berth must be constructed so that an occupant's ready entrance to, and exit from, the sleeper berth is not unduly hindered.

(b) *Location.* (1) A sleeper berth must not be installed in or on a semitrailer or a full trailer other than a house trailer.

(2) A sleeper berth located within the cargo space of a motor vehicle must be securely compartmentalized from the remainder of the cargo space. A sleeper berth installed on or after January 1, 1953 must be located in the cab or immediately adjacent to the cab and

must be securely fixed with relation to the cab.

(c) *Exit from the berth.* (1) Except as provided in paragraph (c)(2) of this section, there must be a direct and ready means of exit from a sleeper berth into the driver's seat or compartment. If the sleeper berth was installed on or after January 1, 1963, the exit must be a doorway or opening at least 18 inches high and 36 inches wide. If the sleeper berth was installed before January 1, 1963, the exit must have sufficient area to contain an ellipse having a major axis of 24 inches and a minor axis of 16 inches.

(2) A sleeper berth installed before January 1, 1953 must either:

(i) Conform to the requirements of paragraph (c)(1) of this section; or

(ii) Have at least two exits, each of which is at least 18 inches high and 21 inches wide, located at opposite ends of the vehicle and useable by the occupant without the assistance of any other person.

(d) *Communication with the driver.* A sleeper berth which is not located within the driver's compartment and has no direct entrance into the driver's compartment must be equipped with a means of communication between the occupant and the driver. The means of communication may consist of a telephone, speaker tube, buzzer, pull cord, or other mechanical or electrical device.

(e) *Equipment.* A sleeper berth must be properly equipped for sleeping. Its equipment must include:

(1) Adequate bedclothing and blankets; and

(2) Either:

(i) Springs and a mattress; or

(ii) An innerspring mattress; or

(iii) A cellular rubber or flexible foam mattress at least four inches thick; or

(iv) A mattress filled with a fluid and of sufficient thickness when filled to prevent "bottoming-out" when occupied while the vehicle is in motion.

(f) *Ventilation.* A sleeper berth must have louvers or other means of providing adequate ventilation. A sleeper berth must be reasonably tight against dust and rain.

(g) *Protection against exhaust and fuel leaks and exhaust heat.* A sleeper berth

must be located so that leaks in the vehicle's exhaust system or fuel system do not permit fuel, fuel system gases, or exhaust gases to enter the sleeper berth. A sleeper berth must be located so that it will not be overheated or damaged by reason of its proximity to the vehicle's exhaust system.

(h) *Occupant restraint.* A motor vehicle manufactured on or after July 1, 1971, and equipped with a sleeper berth must be equipped with a means of preventing ejection of the occupant of the sleeper berth during deceleration of the vehicle. The restraint system must be designed, installed, and maintained to withstand a minimum total force of 6,000 pounds applied toward the front of the vehicle and parallel to the longitudinal axis of the vehicle.

[39 FR 14711, Apr. 26, 1974; 39 FR 17233, May 14, 1974, as amended at 53 FR 49401, Dec. 7, 1988]

### § 393.77 Heaters.

On every motor vehicle, every heater shall comply with the following requirements:

(a) *Prohibited types of heaters.* The installation or use of the following types of heaters is prohibited:

(1) *Exhaust heaters.* Any type of exhaust heater in which the engine exhaust gases are conducted into or through any space occupied by persons or any heater which conducts engine compartment air into any such space.

(2) *Unenclosed flame heaters.* Any type of heater employing a flame which is not fully enclosed, except that such heaters are not prohibited when used for heating the cargo of tank motor vehicles.

(3) *Heaters permitting fuel leakage.* Any type of heater from the burner of which there could be spillage or leakage of fuel upon the tilting or overturning of the vehicle in which it is mounted.

(4) *Heaters permitting air contamination.* Any heater taking air, heated or to be heated, from the engine compartment or from direct contact with any portion of the exhaust system; or any heater taking air in ducts from the outside atmosphere to be conveyed through the engine compartment, unless said ducts are so constructed and installed as to prevent contamination

of the air so conveyed by exhaust or engine compartment gases.

(5) *Solid fuel heaters except wood charcoal.* Any stove or other heater employing solid fuel except wood charcoal.

(6) *Portable heaters.* Portable heaters shall not be used in any space occupied by persons except the cargo space of motor vehicles which are being loaded or unloaded.

(b) *Heater specifications.* All heaters shall comply with the following specifications:

(1) *Heating elements, protection.* Every heater shall be so located or protected as to prevent contact therewith by occupants, unless the surface temperature of the protecting grilles or of any exposed portions of the heaters, inclusive of exhaust stacks, pipes, or conduits shall be lower than would cause contact burns. Adequate protection shall be afforded against igniting parts of the vehicle or burning occupants by direct radiation. Wood charcoal heaters shall be enclosed within a metal barrel, drum, or similar protective enclosure which enclosure shall be provided with a securely fastened cover.

(2) *Moving parts, guards.* Effective guards shall be provided for the protection of passengers or occupants against injury by fans, belts, or any other moving parts.

(3) *Heaters, secured.* Every heater and every heater enclosure shall be securely fastened to the vehicle in a substantial manner so as to provide against relative motion within the vehicle during normal usage or in the event the vehicle overturns. Every heater shall be so designed, constructed, and mounted as to minimize the likelihood of disassembly of any of its parts, including exhaust stacks, pipes, or conduits, upon overturn of the vehicle in or on which it is mounted. Wood charcoal heaters shall be secured against relative motion within the enclosure required by paragraph (c)(1) of this section, and the enclosure shall be securely fastened to the motor vehicle.

(4) *Relative motion between fuel tank and heater.* When either in normal operation or in the event of overturn, there is or is likely to be relative motion between the fuel tank for a heater and the heater, or between either of such units and the fuel lines between them,

a suitable means shall be provided at the point of greatest relative motion so as to allow this motion without causing failure of the fuel lines.

(5) *Operating controls to be protected.* On every bus designed to transport more than 15 passengers, including the driver, means shall be provided to prevent unauthorized persons from tampering with the operating controls. Such means may include remote control by the driver; installation of controls at inaccessible places; control of adjustments by key or keys; enclosure of controls in a locked space, locking of controls, or other means of accomplishing this purpose.

(6) *Heater hoses.* Hoses for all hot water and steam heater systems shall be specifically designed and constructed for that purpose.

(7) *Electrical apparatus.* Every heater employing any electrical apparatus shall be equipped with electrical conductors, switches, connectors, and other electrical parts of ample current-carrying capacity to provide against overheating; any electric motor employed in any heater shall be of adequate size and so located that it will not be overheated; electrical circuits shall be provided with fuses and/or circuit breakers to provide against electrical overloading; and all electrical conductors employed in or leading to any heater shall be secured against dangling, chafing, and rubbing and shall have suitable protection against any other condition likely to produce short or open circuits.

NOTE: Electrical parts certified as proper for use by Underwriters' Laboratories, Inc., shall be deemed to comply with the foregoing requirements.

(8) *Storage battery caps.* If a separate storage battery is located within the personnel or cargo space, such battery shall be securely mounted and equipped with nonspill filler caps.

(9) *Combustion heater exhaust construction.* Every heater employing the combustion of oil, gas, liquefied petroleum gas, or any other combustible material shall be provided with substantial means of conducting the products of combustion to the outside of the vehicle: *Provided, however,* That this requirement shall not apply to heaters used solely to heat the cargo space of

motor vehicles where such motor vehicles or heaters are equipped with means specifically designed and maintained so that the carbon monoxide concentration will never exceed 0.2 percent in the cargo space. The exhaust pipe, stack, or conduit if required shall be sufficiently substantial and so secured as to provide reasonable assurance against leakage or discharge of products of combustion within the vehicle and, if necessary, shall be so insulated as to make unlikely the burning or charring of parts of the vehicle by radiation or by direct contact. The place of discharge of the products of combustion to the atmosphere and the means of discharge of such products shall be such as to minimize the likelihood of their reentry into the vehicle under all operating conditions.

(10) *Combustion chamber construction.* The design and construction of any combustion-type heater except cargo space heaters permitted by the proviso of paragraph (c)(9) of this section and unenclosed flame heaters used for heating cargo of tank motor vehicles shall be such as to provide against the leakage of products of combustion into air to be heated and circulated. The material employed in combustion chambers shall be such as to provide against leakage because of corrosion, oxidation, or other deterioration. Joints between combustion chambers and the air chambers with which they are in thermal and mechanical contact shall be so designed and constructed as to prevent leakage between the chambers and the materials employed in such joints shall have melting points substantially higher than the maximum temperatures likely to be attained at the points of jointure.

(11) *Heater fuel tank location.* Every bus designed to transport more than 15 passengers, including the driver, with heaters of the combustion type shall have fuel tanks therefor located outside of and lower than the passenger space. When necessary, suitable protection shall be afforded by shielding or other means against the puncturing of any such tank or its connections by flying stones or other objects.

(12) *Heater, automatic fuel control.* Gravity or siphon feed shall not be permitted for heaters using liquid fuels.

Heaters using liquid fuels shall be equipped with automatic means for shutting off the fuel or for reducing such flow of fuel to the smallest practicable magnitude, in the event of overturn of the vehicle. Heaters using liquefied petroleum gas as fuel shall have the fuel line equipped with automatic means at the source of supply for shutting off the fuel in the event of separation, breakage, or disconnection of any of the fuel lines between the supply source and the heater.

(13) *"Tell-tale" indicators.* Heaters subject to paragraph (c)(14) of this section and not provided with automatic controls shall be provided with "tell-tale" means to indicate to the driver that the heater is properly functioning. This requirement shall not apply to heaters used solely for the cargo space in semitrailers or full trailers.

(14) *Shut-off control.* Automatic means, or manual means if the control is readily accessible to the driver without moving from the driver's seat, shall be provided to shut off the fuel and electrical supply in case of failure of the heater to function for any reason, or in case the heater should function improperly or overheat. This requirement shall not apply to wood charcoal heaters or to heaters used solely to heat the contents of cargo tank motor vehicles, but wood charcoal heaters must be provided with a controlled method of regulating the flow of combustion air.

(15) *Certification required.* Every combustion-type heater, except wood charcoal heaters, the date of manufacture of which is subsequent to December 31, 1952, and every wood charcoal heater, the date of manufacture of which is subsequent to September 1, 1953, shall be marked plainly to indicate the type of service for which such heater is designed and with a certification by the manufacturer that the heater meets the applicable requirements for such use. For example, "Meets I.C.C. Bus Heater Requirements," "Meets I.C.C. Flue-Vented Cargo Space Heater Requirements," and after December 31, 1967, such certification shall read "Meets FMCSA Bus Heater Requirements," "Meets FMCSA Flue-Vented Cargo Space Heater Requirements," etc.

(i) *Exception.* The certification for a catalytic heater which is used in transporting flammable liquid or gas shall be as prescribed under §177.834(1) of this title.

[33 FR 19735, Dec. 25, 1968, as amended at 40 FR 51198, Nov. 4, 1975; 53 FR 49401, Dec. 7, 1988]

#### § 393.78 Windshield wipers.

(a) Every bus, truck, and truck tractor, having a windshield, shall be equipped with at least two automatically-operating windshield wiper blades, one on each side of the centerline of the windshield, for cleaning rain, snow, or other moisture from the windshield and which shall be in such condition as to provide clear vision for the driver, unless one such blade be so arranged as to clean an area of the windshield extending to within 1 inch of the limit of vision through the windshield at each side: *Provided, however,* That in driveaway-towaway operations this section shall apply only to the driven vehicle; *And provided further,* That one windshield wiper blade will suffice under this section when such driven vehicle in driveaway-towaway operation constitutes part or all of the property being transported and has no provision for two such blades.

(b) Every bus, truck, and truck tractor, the date of manufacture of which is subsequent to June 30, 1953, which depends upon vacuum to operate the windshield wipers, shall be so constructed that the operation of the wipers will not be materially impaired by change in the intake manifold pressure.

#### § 393.79 Defrosting device.

Every bus, truck, and truck tractor having a windshield, when operating under conditions such that ice, snow, or frost would be likely to collect on the outside of the windshield or condensation on the inside of the windshield, shall be equipped with a device or other means, not manually operated, for preventing or removing such obstructions to the driver's view: *Provided, however,* That this section shall not apply in driveaway-towaway operations when the driven vehicle is a part of the shipment being delivered.

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**§ 393.80 Rear-vision mirrors.**

(a) Every bus, truck, and truck tractor shall be equipped with two rear-vision mirrors, one at each side, firmly attached to the outside of the motor vehicle, and so located as to reflect to the driver a view of the highway to the rear, along both sides of the vehicle. All such regulated rear-vision mirrors and their replacements shall meet, as a minimum, the requirements of FMVSS No. 111 (49 CFR 571.111) in force at the time the vehicle was manufactured.

(b) *Exceptions.* (1) Mirrors installed on a vehicle manufactured prior to January 1, 1981, may be continued in service, provided that if the mirrors are replaced they shall be replaced with mirrors meeting, as a minimum, the requirements of FMVSS No. 111 (49 CFR 571.111) in force at the time the vehicle was manufactured.

(2) Only one outside mirror shall be required, which shall be on the driver's side, on trucks which are so constructed that the driver has a view to the rear by means of an interior mirror.

(3) In driveway-towaway operations, the driven vehicle shall have at least one mirror furnishing a clear view to the rear.

[48 FR 57139, Dec. 28, 1983]

**§ 393.81 Horn.**

Every bus, truck, truck-tractor, and every driven motor vehicle in driveway-towaway operations shall be equipped with a horn and actuating elements which shall be in such condition as to give an adequate and reliable warning signal.

**§ 393.82 Speedometer.**

Every bus, truck, and truck-tractor shall be equipped with a speedometer indicating vehicle speed in miles per hour, which shall be operative with reasonable accuracy; however, this requirement shall not apply to any driven vehicle which is part of a shipment being delivered in a driveway-towaway operation if such driven vehicle is equipped with an effective means of limiting its maximum speed to 45 miles per hour, nor to any towed vehicle.

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**§ 393.83 Exhaust systems.**

(a) Every motor vehicle having a device (other than as part of its cargo) capable of expelling harmful combustion fumes shall have a system to direct the discharge of such fumes. No part shall be located where its location would likely result in burning, charring, or damaging the electrical wiring, the fuel supply, or any combustible part of the motor vehicle.

(b) No exhaust system shall discharge to the atmosphere at a location immediately below the fuel tank or the fuel tank filler pipe.

(c) The exhaust system of a bus powered by a gasoline engine shall discharge to the atmosphere at or within 6 inches forward of the rearmost part of the bus.

(d) The exhaust system of a bus using fuels other than gasoline shall discharge to the atmosphere either:

(1) At or within 15 inches forward of the rearmost part of the vehicle; or

(2) To the rear of all doors or windows designed to be open, except windows designed to be opened solely as emergency exits.

(e) The exhaust system of every truck and truck tractor shall discharge to the atmosphere at a location to the rear of the cab or, if the exhaust projects above the cab, at a location near the rear of the cab.

(f) No part of the exhaust system shall be temporarily repaired with wrap or patches.

(g) No part of the exhaust system shall leak or discharge at a point forward of or directly below the driver/sleeper compartment. The exhaust outlet may discharge above the cab/sleeper roofline.

(h) The exhaust system must be securely fastened to the vehicle.

(i) Exhaust systems may use hangers which permit required movement due to expansion and contraction caused by heat of the exhaust and relative motion between engine and chassis of a vehicle.

[53 FR 49401, Dec. 7, 1988]

**§ 393.84 Floors.**

The flooring in all motor vehicles shall be substantially constructed, free of unnecessary holes and openings, and

shall be maintained so as to minimize the entrance of fumes, exhaust gases, or fire. Floors shall not be permeated with oil or other substances likely to cause injury to persons using the floor as a traction surface.

[53 FR 49401, Dec. 7, 1988]

**§ 393.85 [Reserved]**

**§ 393.86 Rear impact guards and rear end protection.**

(a)(1) *General requirements for trailers and semitrailers manufactured on or after January 26, 1998.* Each trailer and semitrailer with a gross vehicle weight rating of 4,536 kg (10,000 pounds) or more, and manufactured on or after January 26, 1998, must be equipped with a rear impact guard that meets the requirements of Federal Motor Vehicle Safety Standard No. 223 (49 CFR 571.223) in effect at the time the vehicle was manufactured. When the rear impact guard is installed on the trailer or semitrailer, the vehicle must, at a minimum, meet the requirements of FMVSS No. 224 (49 CFR 571.224) in effect at the time the vehicle was manufactured. The requirements of paragraph (a) of this section do not apply to pole trailers (as defined in § 390.5 of this chapter); pulpwood trailers, low chassis vehicles, special purpose vehicles, wheels back vehicles (as defined in § 393.5); and trailers towed in driveaway-towaway operations (as defined in § 390.5).

(2) *Impact guard width.* The outermost surfaces of the horizontal member of the guard must extend to within 100 mm (4 inches) of the side extremities of the vehicle. The outermost surface of the horizontal member shall not extend beyond the side extremity of the vehicle.

(3) *Guard height.* The vertical distance between the bottom edge of the horizontal member of the guard and the ground shall not exceed 560 mm (22 inches) at any point across the full width of the member. Guards with rounded corners may curve upward within 255 mm (10 inches) of the longitudinal vertical planes that are tangent to the side extremities of the vehicle.

(4) *Guard rear surface.* At any height 560 mm (22 inches) or more above the

ground, the rearmost surface of the horizontal member of the guard must be within 305 mm (12 inches) of the rear extremity of the vehicle. This paragraph shall not be construed to prohibit the rear surface of the guard from extending beyond the rear extremity of the vehicle. Guards with rounded corners may curve forward within 255 mm (10 inches) of the side extremity.

(5) *Cross-sectional vertical height.* The horizontal member of each guard must have a cross sectional vertical height of at least 100 mm (3.94 inches) at any point across the guard width.

(6) *Certification and labeling requirements for rear impact protection guards.* Each rear impact guard used to satisfy the requirements of paragraph (a)(1) of this section must be permanently marked or labeled as required by FMVSS No. 223 (49 CFR 571.223, S5.3). The label must be on the forward-facing surface of the horizontal member of the guard, 305 mm (12 inches) inboard of the right end of the guard. The certification label must contain the following information:

(i) The impact guard manufacturer's name and address;

(ii) The statement "Manufactured in \_\_\_" (inserting the month and year that the guard was manufactured); and,

(iii) The letters "DOT", constituting a certification by the guard manufacturer that the guard conforms to all requirements of FMVSS No. 223.

(b)(1) *Requirements for motor vehicles manufactured after December 31, 1952 (except trailers or semitrailers manufactured on or after January 26, 1998).* Each motor vehicle manufactured after December 31, 1952, (except truck tractors, pole trailers, pulpwood trailers, or vehicles in driveaway-towaway operations) in which the vertical distance between the rear bottom edge of the body (or the chassis assembly if the chassis is the rearmost part of the vehicle) and the ground is greater than 76.2 cm (30 inches) when the motor vehicle is empty, shall be equipped with a rear impact guard(s). The rear impact guard(s) must be installed and maintained in such a manner that:

(i) The vertical distance between the bottom of the guard(s) and the ground does not exceed 76.2 cm (30 inches) when the motor vehicle is empty;

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(ii) The maximum lateral distance between the closest points between guards, if more than one is used, does not exceed 61 cm (24 inches);

(iii) The outermost surfaces of the horizontal member of the guard are no more than 45.7 cm (18 inches) from each side extremity of the motor vehicle;

(iv) The impact guard(s) are no more than 61 cm (24 inches) forward of the rear extremity of the motor vehicle.

(2) *Construction and attachment.* The rear impact guard(s) must be substantially constructed and attached by means of bolts, welding, or other comparable means.

(3) *Vehicle components and structures that may be used to satisfy the requirements of paragraph (b) of this section.* Low chassis vehicles, special purpose vehicles, or wheels back vehicles constructed and maintained so that the body, chassis, or other parts of the vehicle provide the rear end protection comparable to impact guard(s) conforming to the requirements of paragraph (b)(1) of this section shall be considered to be in compliance with those requirements.

[64 FR 47708, Sept. 1, 1999, as amended at 67 FR 61824, Oct. 2, 2002]

**§ 393.87 Flags on projecting loads.**

Any motor vehicle having a load or vehicle component which extends beyond the sides more than 4 inches or more than 4 feet beyond the rear shall have the extremities of the load marked with a red flag, not less than 12 inches square, at each point where a lamp is required by Table 1, § 393.11.

[53 FR 49401, Dec. 7, 1988]

**§ 393.88 Television receivers.**

Any motor vehicle equipped with a television viewer, screen or other means of visually receiving a television broadcast shall have the viewer or screen located in the motor vehicle at a point to the rear of the back of the driver's seat if such viewer or screen is in the same compartment as the driver and the viewer or screen shall be so located as not to be visible to the driver, while he/she is driving the motor vehicle. The operating controls for the television receiver shall be so located that

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the driver cannot operate them without leaving the driver's seat.

**§ 393.89 Buses, driveshaft protection.**

Any driveshaft extending lengthways under the floor of the passenger compartment of a bus shall be protected by means of at least one guard or bracket at that end of the shaft which is provided with a sliding connection (spline or other such device) to prevent the whipping of the shaft in the event of failure thereof or of any of its component parts. A shaft contained within a torque tube shall not require any such device.

[33 FR 19735, Dec. 25, 1968, as amended at 53 FR 49402, Dec. 7, 1988]

**§ 393.90 Buses, standee line or bar.**

Except as provided below, every bus, which is designed and constructed so as to allow standees, shall be plainly marked with a line of contrasting color at least 2 inches wide or equipped with some other means so as to indicate to any person that he/she is prohibited from occupying a space forward of a perpendicular plane drawn through the rear of the driver's seat and perpendicular to the longitudinal axis of the bus. Every bus shall have clearly posted at or near the front, a sign with letters at least one-half inch high stating that it is a violation of the Federal Motor Carrier Safety Administration's regulations for a bus to be operated with persons occupying the prohibited area. The requirements of this section shall not apply to any bus being transported in driveaway-towaway operation or to any level of the bus other than the level in which the driver is located nor shall they be construed to prohibit any seated person from occupying permanent seats located in the prohibited area provided such seats are so located that persons sitting therein will not interfere with the driver's safe operation of the bus.

**§ 393.91 Buses, aisle seats prohibited.**

No bus shall be equipped with aisle seats unless such seats are so designed and installed as to automatically fold and leave a clear aisle when they are unoccupied. No bus shall be operated if

any seat therein is not securely fastened to the vehicle.

[53 FR 49402, Dec. 7, 1988]

**§ 393.92 Buses, marking emergency doors.**

Any bus equipped with an emergency door shall have such door clearly marked in letters at least 1 inch in height with the words "Emergency Door" or "Emergency Exit." Emergency doors shall also be identified by a red electric lamp readily visible to passengers which lamp shall be lighted at all times when lamps are required to be lighted by § 392.30.

**§ 393.93 Seats, seat belt assemblies, and seat belt assembly anchorages.**

(a) *Buses*—(1) *Buses manufactured on or after January 1, 1965, and before July 1, 1971.* After June 30, 1972, every bus manufactured on or after January 1, 1965, and before July 1, 1971, must be equipped with a Type 1 or Type 2 seat belt assembly that conforms to Federal Motor Vehicle Safety Standard No. 209<sup>1</sup> (§571.209) installed at the driver's seat and seat belt assembly anchorages that conform to the location and geometric requirements of Federal Motor Vehicle Safety Standard No. 210<sup>1</sup> (§571.210) for that seat belt assembly.

(2) *Buses manufactured on or after July 1, 1971.* Every bus manufactured on or after July 1, 1971, must conform to the requirements of Federal Motor Vehicle Safety Standard No. 208<sup>1</sup> (§571.208) (relating to installation of seat belt assemblies) and Federal Motor Vehicle Safety Standard No. 210<sup>1</sup> (§571.210) (relating to installation of seat belt assembly anchorages).

(3) *Buses manufactured on or after January 1, 1972.* Every bus manufactured on or after January 1, 1972, must conform to the requirements of Federal Motor Vehicle Safety Standard No. 207<sup>1</sup> (§571.207) (relating to seating systems).

(b) *Trucks and truck tractors*—(1) *Trucks and truck tractors manufactured on and after January 1, 1965, and before*

*July 1, 1971.* Except as provided in paragraph (d) of this section, after June 30, 1972, every truck and truck tractor manufactured on or after January 1, 1965, and before July 1, 1971, must be equipped with a Type 1 or Type 2 seat belt assembly that conforms to Federal Motor Vehicle Safety Standard No. 209 (§571.209) installed at the driver's seat and at the right front outboard seat, if the vehicle has one, and seat belt assembly anchorages that conform to the location and geometric requirements of Federal Motor Vehicle Safety Standard No. 210 (§571.210) for each seat belt assembly that is required by this subparagraph.

(2) *Trucks and truck tractors manufactured on or after July 1, 1971.* Every truck and truck tractor manufactured on or after July 1, 1971, except a truck or truck tractor being transported in driveaway-towaway operation and having an incomplete vehicle seating and cab configuration, must conform to the requirements of Federal Motor Vehicle Safety Standard No. 208<sup>1</sup> (§571.208) (relating to installation of seat belt assemblies) and Federal Motor Vehicle Safety Standard No. 210<sup>1</sup> (§571.210) (relating to installation of seat belt assembly anchorages).

(3) *Trucks and truck tractors manufactured on or after January 1, 1972.* Every truck and truck tractor manufactured on or after January 1, 1972, except a truck or truck tractor being transported in driveaway-towaway operation and having an incomplete vehicle seating and cab configuration, must conform to the requirements of Federal Motor Vehicle Safety Standard No. 207<sup>1</sup> (§571.207) (relating to seating systems).

(c) *Effective date of standards.* Whenever paragraph (a) or (b) of this section requires conformity to a Federal Motor Vehicle Safety Standard, the vehicle or equipment must conform to the version of the Standard that is in effect on the date the vehicle is manufactured or on the date the vehicle is modified to conform to the requirements of paragraph (a) or (b) of this section, whichever is later.

(d) *Trucks and truck tractors manufactured on or after January 1, 1965,*

<sup>1</sup>Individual copies of Federal Motor Vehicle Safety Standards may be obtained from the National Highway Traffic Safety Administration, Nassif Building, 400 Seventh Street SW., Washington, D.C. 20590.

<sup>1</sup>See footnote to § 393.93(a).

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and before July 1, 1971, and operated in the State of Hawaii, must comply with the provisions of paragraph (b) of this section on and after January 1, 1976.

[35 FR 16839, Oct. 30, 1970, as amended at 39 FR 32561, Sept. 9, 1974; 40 FR 32336, Aug. 1, 1975]

#### § 393.94 Vehicle interior noise levels.

(a) *Application of the rule in this section.* Except as provided in paragraph (d) of this section, this section applies to all motor vehicles manufactured on and after October 1, 1974. On and after April 1, 1975, this section applies to all motor vehicles manufactured before October 1, 1974.

(b) *General rule.* The interior sound level at the driver's seating position of a motor vehicle must not exceed 90 dB(A) when measured in accordance with paragraph (c) of this section.

(c) *Test procedure.*<sup>2</sup> (1) Park the vehicle at a location so that no large reflecting surfaces, such as other vehicles, signboards, buildings, or hills, are within 50 feet of the driver's seating position.

(2) Close all vehicle doors, windows, and vents. Turn off all power-operated accessories.

(3) Place the driver in his/her normal seated position at the vehicle's controls. Evacuate all occupants except the driver and the person conducting the test.

(4) Use a sound level meter which meets the requirements of the American National Standards Institute Standard ANSI S1.4-1971 Specification for Sound Level Meters, for Type 2 Meters. Set the meter to the A-weighting network, "fast" meter response.

(5) Locate the microphone, oriented vertically upward, 6 inches to the right of, in the same plane as, and directly in line with, the driver's right ear.

(6) With the vehicle's transmission in neutral gear, accelerate its engine to either its maximum governed engine speed, if it is equipped with an engine governor, or its speed at its maximum

<sup>2</sup>Standards of the American National Standards Institute are published by the American National Standards Institute. Information and copies may be obtained by writing to the Institute at 1430 Broadway, New York, N.Y. 10018.

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rated horsepower, if it is not equipped with an engine governor. Stabilize the engine at that speed.

(7) Observe the A-weighted sound level reading on the meter for the stabilized engine speed condition. Record that reading, if the reading has not been influenced by extraneous noise sources such as motor vehicles operating on adjacent roadways.

(8) Return the vehicle's engine speed to idle and repeat the procedures specified in paragraphs (c) (6) and (7) of this section until two maximum sound levels within 2 dB of each other are recorded. Numerically average those two maximum sound level readings.

(9) The average obtained in accordance with paragraph (c)(8) of this section is the vehicle's interior sound level at the driver's seating position for the purpose of determining whether the vehicle conforms to the rule in paragraph (b) of this section. However, a 2 dB tolerance over the sound level limitation specified in that paragraph is permitted to allow for variations in test conditions and variations in the capabilities of meters.

(10) If the motor vehicle's engine radiator fan drive is equipped with a clutch or similar device that automatically either reduces the rotational speed of the fan or completely disengages the fan from its power source in response to reduced engine cooling loads the vehicle may be parked before testing with its engine running at high idle or any other speed the operator may choose, for sufficient time but not more than 10 minutes, to permit the engine radiator fan to automatically disengage.

(d) Vehicles manufactured before October 1, 1974, and operated wholly within the State of Hawaii, need not comply with this section until April 1, 1976.

[38 FR 30881, Nov. 8, 1973, as amended at 40 FR 32336, Aug. 1, 1975; 41 FR 28268, July 9, 1976]

#### Subpart H—Emergency Equipment

##### § 393.95 Emergency equipment on all power units.

Except for a lightweight vehicle, every bus, truck, truck-tractor, and every driven vehicle in driveway-

towaway operation must be equipped as follows:

(a) *Fire extinguisher.* (1) Except as provided in paragraph (a)(4) of this section, every power unit must be equipped with a fire extinguisher that is properly filled and located so that it is readily accessible for use. The fire extinguisher must be securely mounted on the vehicle. The fire extinguisher must be designed, constructed, and maintained to permit visual determination of whether it is fully charged. The fire extinguisher must have an extinguishing agent that does not need protection from freezing. The fire extinguisher must not use a vaporizing liquid that gives off vapors more toxic than those produced by the substances shown as having a toxicity rating of 5 or 6 in the Underwriters' Laboratories "Classification of Comparative Life Hazard of Gases and Vapors."<sup>1</sup>

(2)(i) Before July 1, 1971, a power unit that is used to transport hazardous materials must be equipped with a fire extinguisher having an Underwriters' Laboratories rating<sup>2</sup> of 4 B:C or more. On and after July 1, 1971, a power unit that is used to transport hazardous materials must be equipped with a fire extinguisher having an Underwriters' Laboratories rating<sup>2</sup> of 10 B:C or more.

(ii) Before January 1, 1973, a power unit that is not used to transport hazardous materials must be equipped with a fire extinguisher having an Underwriters' Laboratories rating<sup>2</sup> of 4 B:C or more. On and after January 1, 1973, a power unit that is not used to transport hazardous materials must be equipped with either—

(A) A fire extinguisher having an Underwriters' Laboratories rating<sup>2</sup> of 5 B:C or more; or

(B) Two fire extinguishers, each of which has an Underwriters' Laboratories rating<sup>2</sup> of 4 B:C or more.

<sup>1</sup>Copies of the Classification can be obtained by writing to Underwriters' Laboratories, Inc., 205 East Ohio Street, Chicago, Ill. 60611.

<sup>2</sup>Underwriters' Laboratories ratings are given to fire extinguishers under the standards of Underwriters' Laboratories, Inc., 205 East Ohio Street, Chicago, Ill. 60611. Extinguishers must conform to the standards in effect on the date of manufacture or on Jan. 1, 1969, whichever is earlier.

(iii) Each fire extinguisher required by this subparagraph must be labeled or marked with its Underwriters' Laboratories rating<sup>2</sup> and must meet the requirements of paragraph (a)(1) of this section.

(3) For purposes of this paragraph, a power unit is used to transport hazardous materials only if the power unit or a motor vehicle towed by the power unit must be marked or placarded in accordance with § 177.823 of this title.

(4) This paragraph does not apply to the driven unit in a driveaway-towaway operation.

(b) [Reserved]

(c) *Spare fuses.* At least one spare fuse or other overload protective device, if the devices used are not of a reset type, for each kind and size used. In driveaway-towaway operations, spares located on any one of the vehicles will be deemed adequate.

(d)-(e) [Reserved]

(f) *Warning devices for stopped vehicles.* Except as provided in paragraph (g) of this section, one of the following combinations of warning devices:

(1) *Vehicles equipped with warning devices before January 1, 1974.* Warning devices specified below may be used until replacements are necessary:

(i) Three liquid-burning emergency flares which satisfy the requirements of SAE Standard J597, "Liquid Burning Emergency Flares," and three fuses and two red flags; or

(ii) Three electric emergency lanterns which satisfy the requirements of SAE Standard J596, "Electric Emergency Lanterns," and two red flags; or

(iii) Three red emergency reflectors which satisfy the requirements of paragraph (i) of this section, and two red flags; or

(iv) Three red emergency reflective triangles which satisfy the requirements of paragraph (h) of this section; or

(v) Three bidirectional emergency reflective triangles that conform to the requirements of Federal Motor Vehicle Safety Standard No. 125, § 571.125 of this title.

(2) *Vehicles equipped with warning devices on and after January 1, 1974.* (i) Three bidirectional emergency reflective triangles that conform to the requirements of Federal Motor Vehicle

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Safety Standard No. 125, § 571.125 of this title; or

(ii) At least 6 fusees or 3 liquid-burning flares. The vehicle must have as many additional fusees or liquid-burning flares as are necessary to satisfy the requirements of § 392.22.

(3) *Supplemental warning devices.* Other warning devices may be used in addition to, but not in lieu of, the required warning devices, provided those warning devices do not decrease the effectiveness of the required warning devices.

(g) *Restrictions on the use of flame-producing devices.* Liquid-burning flares, fusees, oil lanterns, or any signal produced by a flame shall not be carried on any commercial motor vehicle transporting Division 1.1, 1.2, 1.3 (explosives) hazardous materials; any cargo tank motor vehicle used for the transportation of Division 2.1 (flammable gas) or Class 3 (flammable liquid) hazardous materials whether loaded or empty; or any commercial motor vehicle using compressed gas as a motor fuel.

(h) *Requirements for emergency reflective triangles manufactured before January 1, 1974.* (1) Each reflector shall be a collapsible equilateral triangle, with legs not less than 17 inches long and not less than 2 inches wide. The front and back of the exposed leg surfaces shall be covered with red reflective material not less than one half inch in width. The reflective surface, front and back, shall be approximately parallel. When placed in position, one point of the triangle shall be upward. The area within the sides of the triangle shall be open.

(2) *Reflective material:* The reflecting material covering the leg of the equilateral triangle shall comply either with:

(i) The requirements for reflex-reflector elements made of red methyl-methacrylate plastic material, meeting the color, sealing, minimum candle-power, wind test, vibration test, and corrosion resistance test of section 3 and 4 of Federal Specification RR-R-1185, dated November 17, 1966, or

(ii) The requirements for red reflective sheeting of Federal Specification L-S-300, dated September 7, 1965, except that the aggregate candlepower of

the assembled triangle, in one direction, shall be not less than eight when measured at 0.2° divergence angle and -4° incidence angle, and not less than 80 percent of the candlepower specified for 1 square foot of material at all other angles shown in Table II, Reflective Intensity Values, of L-S-300.

(3) *Reflective surfaces alignment:* Every reflective triangle shall be so constructed that, when the triangle is properly placed, the reflective surfaces shall be in a plane perpendicular to the plane of the roadway surface with a permissible tolerance of ±10°. Reflective triangles which are collapsible shall be provided with means for holding the reflective surfaces within the required tolerance. Such holding means shall be readily capable of adjustment without the use of tools or special equipment.

(4) *Reflectors mechanical adequacy:* Every reflective triangle shall be of such weight and dimensions as to remain stationary when subjected to a 40 mile per hour wind when properly placed on any clean, dry paved road surface. The reflective triangle shall be so constructed as to withstand reasonable shocks without breakage.

(5) *Reflectors, incorporation in holding device:* Each set of reflective triangles shall be adequately protected by enclosure in a box, rack, or other adequate container specially designed and constructed so that the reflectors may be readily extracted for use.

(6) *Certification:* Every red emergency reflective triangle designed and constructed to comply with these requirements shall be plainly marked with the certification of the manufacturer that it complies therewith.

(i) *Requirements for red emergency reflectors.* Each red emergency reflector shall conform in all respects to the following requirements:

(1) *Reflecting elements required.* Each reflector shall be composed of at least two reflecting elements or surfaces on each side, front and back. The reflecting elements, front and back, shall be approximately parallel.

(2) *Reflecting elements to be Class A.* Each reflecting element or surface shall meet the requirement for a red Class A reflector contained in the SAE

Recommended Practice<sup>1</sup> “Reflex Reflectors.” The aggregate candlepower output of all the reflecting elements or surface in one direction shall not be less than 12 when tested in a perpendicular position with observation at one-third degree as specified in the Photometric Test contained in the above-mentioned Recommended Practice.

(3) *Reflecting surfaces, protection.* If the reflector or the reflecting elements are so designed or constructed that the reflecting surfaces would be adversely affected by dust, soot, or other foreign matter or contacts with other parts of the reflector or its container, then such reflecting surfaces shall be adequately sealed within the body of the reflector.

(4) *Reflecting surfaces to be perpendicular.* Every reflector shall be so constructed that, when the reflector is properly placed, every reflecting element or surface is in a plane perpendicular to the plane of the roadway surface. Reflectors which are collapsible shall be provided with means for locking the reflector elements or surfaces in the required position; such locking means shall be readily capable of adjustment without the use of tools or special equipment.

(5) *Reflectors, mechanical adequacy.* Every reflector shall be of such weight and dimensions as to remain stationary when subjected to a 40 mile per hour wind when properly placed on any clean, dry, paved road surface. The reflector shall be so constructed as to withstand reasonable shocks without breakage.

(6) *Reflectors, incorporation on holding device.* Each set of reflectors and the reflecting elements or surfaces incorporated therein shall be adequately protected by enclosure in a box, rack, or other adequate container specially designed and constructed so that the reflectors may be readily extracted for use.

(7) *Certification.* Every red emergency reflector designed and constructed to comply with these requirements shall be plainly marked with the certification of the manufacturer that it complies therewith.

<sup>1</sup>See footnote 1 to § 393.24(c).

(j) *Requirements for fusees and liquid-burning flares.* Each fusee shall be capable of burning for 30 minutes, and each liquid-burning flare shall contain enough fuel to burn continuously for at least 60 minutes. Fusees and liquid-burning flares shall conform to the requirements of Underwriters Laboratories, Inc., UL No. 912, Highway Emergency Signals, Fourth Edition, July 30, 1979, (with an amendment dated November 9, 1981). (See § 393.7(c) for information on the incorporation by reference and availability of this document.) Each fusee and liquid-burning flare shall be marked with the UL symbol in accordance with the requirements of UL 912.

(k) *Requirements for red flags.* Red flags shall be not less than 12 inches square, with standards adequate to maintain the flags in an upright position.

(49 U.S.C. 304, 1655; 49 CFR 1.48(b) and 301.60) [33 FR 19735, Dec. 25, 1968, as amended at 35 FR 13019, Aug. 15, 1970; 35 FR 14619, Sept. 18, 1970; 37 FR 17176, Aug. 25, 1972; 40 FR 10685, Mar. 7, 1975; 41 FR 53031, Dec. 3, 1976; 47 FR 47837, Oct. 28, 1982; 59 FR 34712, July 6, 1994; 67 FR 61225, Sept. 27, 2002]

### Subpart I—Protection Against Shifting and Falling Cargo

SOURCE: 67 FR 61225, Sept. 27, 2002, unless otherwise noted.

#### § 393.100 Which types of commercial motor vehicles are subject to the cargo securement standards of this subpart, and what general requirements apply?

(a) *Applicability.* The rules in this subpart are applicable to trucks, truck tractors, semitrailers, full trailers, and pole trailers.

(b) *Prevention against loss of load.* Each commercial motor vehicle must, when transporting cargo on public roads, be loaded and equipped, and the cargo secured, in accordance with this subpart to prevent the cargo from leaking, spilling, blowing or falling from the motor vehicle.

(c) *Prevention against shifting of load.* Cargo must be contained, immobilized or secured in accordance with this subpart to prevent shifting upon or within the vehicle to such an extent that the

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vehicle's stability or maneuverability is adversely affected.

**§ 393.102 What are the minimum performance criteria for cargo securement devices and systems?**

(a) *Performance criteria.* Cargo securement devices and systems must be capable of withstanding the following three forces, applied separately:

(1) 0.8 g deceleration in the forward direction;

(2) 0.5 g acceleration in the rearward direction; and

(3) 0.5 g acceleration in a lateral direction.

(b) *Performance criteria for devices to prevent vertical movement of loads that are not contained within the structure of the vehicle.* Securement systems must provide a downward force equivalent to at least 20 percent of the weight of the article of cargo if the article is not fully contained within the structure of the vehicle. If the article is fully contained within the structure of the vehicle, it may be secured in accordance with § 393.106(b).

(c) *Prohibition on exceeding working load limits.* Cargo securement devices and systems must be designed, installed, and maintained to ensure that the maximum forces acting on the devices or systems do not exceed the working load limit for the devices under the conditions listed in paragraphs (a) and (b) of this section.

(d) *Equivalent means of securement.* Cargo that is immobilized, or secured in accordance with the applicable requirements of §§ 393.104 through 393.136, is considered as meeting the performance criteria of this section.

**§ 393.104 What standards must cargo securement devices and systems meet in order to satisfy the requirements of this subpart?**

(a) *General.* All devices and systems used to secure cargo to or within a ve-

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hicle must be capable of meeting the requirements of § 393.102.

(b) *Prohibition on the use of damaged securement devices.* All vehicle structures, systems, parts, and components used to secure cargo must be in proper working order when used to perform that function with no damaged or weakened components that will adversely effect their performance for cargo securement purposes, including reducing the working load limit, and must not have any cracks or cuts.

(c) *Vehicle structures and anchor points.* Vehicle structures, floors, walls, decks, tiedown anchor points, headerboards, bulkheads, stakes, posts and associated mounting pockets used to contain or secure articles of cargo must be strong enough to meet the performance criteria of § 393.102, with no damaged or weakened components that will adversely effect their performance for cargo securement purposes, including reducing the working load limit, and must not have any cracks or cuts.

(d) *Material for dunnage, chocks, cradles, shoring bars, blocking and bracing.* Material used as dunnage or dunnage bags, chocks, cradles, shoring bars, or used for blocking and bracing, must not have damage or defects which would compromise the effectiveness of the securement system.

(e) *Manufacturing standards for tiedown assemblies.* Tiedown assemblies (including chains, wire rope, steel strapping, synthetic webbing, and cordage) and other attachment or fastening devices used to secure articles of cargo to, or in, commercial motor vehicles must conform to the following applicable standards:

An assembly component of . . .	Must conform to . . .
(1) Steel strapping <sup>1,2</sup> .....	Standard Specification for Strapping, Flat Steel and Seals, American Society for Testing and Materials (ASTM) D3953-97, February 1998. <sup>4</sup>
(2) Chain .....	National Association of Chain Manufacturers' Welded Steel Chain Specifications, November 15, 1999. <sup>4</sup>
(3) Webbing .....	Web Sling and Tiedown Association's Recommended Standard Specification for Synthetic Web Tiedowns, WSTDA-T1, 1998. <sup>4</sup>
(4) Wire rope <sup>3</sup> .....	Wire Rope Technical Board's Wire Rope Users Manual, 2nd Edition, November 1985. <sup>4</sup>
(5) Cordage .....	Cordage Institute rope standard:
	(i) PETRS-2, Polyester Fiber Rope, three-Strand and eight-Strand Constructions, January 1983; <sup>4</sup>
	(ii) PPRS-2, Polypropylene Fiber Rope, three-Strand and eight-Strand Constructions, August 1992; <sup>4</sup>
	(iii) CRS-1, Polyester/Polypropylene Composite Rope Specifications, three-Strand and eight-Strand Standard Construction, May 1979; <sup>4</sup>
	(iv) NRS-1, Nylon Rope Specifications, three-Strand and eight-Strand Standard Construction, May 1979; <sup>4</sup> and
	(v) C-1, Double Braided Nylon Rope Specifications DBN, January 1984. <sup>4</sup>

<sup>1</sup> Steel strapping not marked by the manufacturer with a working load limit will be considered to have a working load limit equal to one-fourth of the breaking strength listed in ASTM D3953-97.

<sup>2</sup> Steel strapping 25.4 mm (1 inch) or wider must have at least two pairs of crimps in each seal and, when an end-over-end lap joint is formed, must be sealed with at least two seals.

<sup>3</sup> Wire rope which is not marked by the manufacturer with a working load limit shall be considered to have a working load limit equal to one-fourth of the nominal strength listed in the manual.

<sup>4</sup> See § 393.7 for information on the incorporation by reference and availability of this document.

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(f) *Use of tiedowns.* (1) Tiedowns and securing devices must not contain knots.

(2) If a tiedown is repaired, it must be repaired in accordance with the applicable standards in paragraph (e) of this section, or the manufacturer's instructions.

(3) Each tiedown must be attached and secured in a manner that prevents it from becoming loose, unfastening, opening or releasing while the vehicle is in transit.

(4) All tiedowns and other components of a cargo securement system used to secure loads on a trailer equipped with rub rails, must be located inboard of the rub rails whenever practicable.

(5) Edge protection must be used whenever a tiedown would be subject to abrasion or cutting at the point where it touches an article of cargo. The edge protection must resist abrasion, cutting and crushing.

#### § 393.106 What are the general requirements for securing articles of cargo?

(a) *Applicability.* The rules in this section are applicable to the transportation of all types of articles of cargo, except commodities in bulk that lack structure or fixed shape (e.g., liquids, gases, grain, liquid concrete, sand, gravel, aggregates) and are transported in a tank, hopper, box or similar device that forms part of the structure of a commercial motor vehicle. The rules in this section apply to the cargo types covered by the commodity-specific rules of § 393.116 through § 393.136. The commodity-specific rules take precedence over the general requirements of this section when additional requirements are given for a commodity listed in those sections.

(b) *General.* Cargo must be firmly immobilized or secured on or within a vehicle by structures of adequate strength, dunnage or dunnage bags, shoring bars, tiedowns or a combination of these.

(c) *Cargo placement and restraint.* (1) Articles of cargo that are likely to roll must be restrained by chocks, wedges, a cradle or other equivalent means to prevent rolling. The means of preventing rolling must not be capable of

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becoming unintentionally unfastened or loose while the vehicle is in transit.

(2) Articles or cargo placed beside each other and secured by transverse tiedowns must either:

(i) Be placed in direct contact with each other, or

(ii) Be prevented from shifting towards each other while in transit.

(d) *Minimum strength of cargo securement devices and systems.* The aggregate working load limit of any securement system used to secure an article or group of articles against movement must be at least one-half times the weight of the article or group of articles. The aggregate working load limit is the sum of:

(1) One-half of the working load limit of each associated connector or attachment mechanism used to secure a part of the article of cargo to the vehicle; and

(2) One-half of the working load limit for each end section of a tiedown that is attached to an anchor point.

[67 FR 61225, Sept. 27, 2002, as amended at 68 FR 56208, Sept. 30, 2003]

#### § 393.108 How is the working load limit of a tiedown determined?

(a) The working load limit (WLL) of a tiedown, associated connector or attachment mechanism is the lowest working load limit of any of its components (including tensioner), or the working load limit of the anchor points to which it is attached, whichever is less.

(b) The working load limits of tiedowns may be determined by using either the tiedown manufacturer's markings or by using the tables in this section. The working load limits listed in the tables are to be used when the tiedown material is not marked by the manufacturer with the working load limit. Tiedown materials which are marked by the manufacturer with working load limits that differ from the tables, shall be considered to have a working load limit equal to the value for which they are marked.

(c) Synthetic cordage (e.g., nylon, polypropylene, polyester) which is not marked or labeled to enable identification of its composition or working load limit shall be considered to have a

working load limit equal to that for polypropylene fiber rope.

(d) Welded steel chain which is not marked or labeled to enable identification of its grade or working load limit shall be considered to have a working load limit equal to that for grade 30 proof coil chain.

(e)(1) Wire rope which is not marked by the manufacturer with a working load limit shall be considered to have a working load limit equal to one-fourth of the nominal strength listed in the Wire Rope Users Manual.

(2) Wire which is not marked or labeled to enable identification of its

construction type shall be considered to have a working load limit equal to that for 6 × 37, fiber core wire rope.

(f) Manila rope which is not marked by the manufacturer with a working load limit shall be considered to have a working load limit based on its diameter as provided in the tables of working load limits.

(g) Friction mats which are not marked or rated by the manufacturer shall be considered to provide resistance to horizontal movement equal to 50 percent of the weight placed on the mat.

TABLES TO § 393.108  
[Working Load Limits (WLL), Chain]

Size mm (inches)	WLL in kg (pounds)				
	Grade 30 proof coil	Grade 43 high test	Grade 70 transport	Grade 80 alloy	Grade 100 alloy
1. 7 (1/4) .....	580 (1,300)	1,180 (2,600)	1,430 (3,150)	1,570 (3,500)	1,950 (4,300)
2. 8 (5/16) .....	860 (1,900)	1,770 (3,900)	2,130 (4,700)	2,000 (4,500)	2,600 (5,700)
3. 10 (3/8) .....	1,200 (2,650)	2,450 (5,400)	2,990 (6,600)	3,200 (7,100)	4,000 (8,800)
4. 11 (7/16) .....	1,680 (3,700)	3,270 (7,200)	3,970 (8,750)		
5. 13 (1/2) .....	2,030 (4,500)	4,170 (9,200)	5,130 (11,300)	5,400 (12,000)	6,800 (15,000)
6. 16 (5/8) .....	3,130 (6,900)	5,910 (13,000)	7,170 (15,800)	8,200 (18,100)	10,300 (22,600)
Chain Mark Examples:					
Example 1 .....	3	4	7	8	10
Example 2 .....	30	43	70	80	100
Example 3 .....	300	430	700	800	1000

**SYNTHETIC WEBBING**

Width mm (inches)	WLL kg (pounds)
45 (1 3/4) .....	790 (1,750)
50 (2) .....	910 (2,000)
75 (3) .....	1,360 (3,000)
100 (4) .....	1,810 (4,000)

**WIRE ROPE (6 × 37, FIBER CORE)**

Diameter mm (inches)	WLL kg (pounds)
7 (1/4) .....	640 (1,400)
8 (5/16) .....	950 (2,100)
10 (3/8) .....	1,360 (3,000)
11 (7/16) .....	1,860 (4,100)
13 (1/2) .....	2,400 (5,300)
16 (5/8) .....	3,770 (8,300)
20 (3/4) .....	4,940 (10,900)
22 (7/8) .....	7,300 (16,100)
25 (1) .....	9,480 (20,900)

**MANILA ROPE**

Diameter mm (inches)	WLL kg (pounds)
10 (3/8) .....	90 (205)
11 (7/16) .....	120 (265)
13 (1/2) .....	150 (315)
16 (5/8) .....	210 (465)
20 (3/4) .....	290 (640)
25 (1) .....	480 (1,050)

**POLYPROPYLENE FIBER ROPE WLL (3-STRAND AND 8-STRAND CONSTRUCTIONS)**

Diameter mm (inches)	WLL kg (pounds)
10 (3/8) .....	180 (400)
11 (7/16) .....	240 (525)
13 (1/2) .....	280 (625)
16 (5/8) .....	420 (925)
20 (3/4) .....	580 (1,275)
25 (1) .....	950 (2,100)

**POLYESTER FIBER ROPE WLL (3-STRAND AND 8-STRAND CONSTRUCTIONS)**

Diameter mm (inches)	WLL kg (pounds)
10 (3/8) .....	250 (555)
11 (7/16) .....	340 (750)
13 (1/2) .....	440 (960)
16 (5/8) .....	680 (1,500)
20 (3/4) .....	850 (1,880)
25 (1) .....	1,500 (3,300)

**NYLON ROPE**

Diameter mm (inches)	WLL kg (pounds)
10 (3/8) .....	130 (278)
11 (7/16) .....	190 (410)
13 (1/2) .....	240 (525)
16 (5/8) .....	420 (935)
20 (3/4) .....	640 (1,420)

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NYLON ROPE—Continued

Diameter mm (inches)	WLL kg (pounds)
25 (1) .....	1,140 (2,520)

DOUBLE BRAIDED NYLON ROPE

Diameter mm (inches)	WLL kg (pounds)
10 (3/8) .....	150 (336)
11 (7/16) .....	230 (502)
13 (1/2) .....	300 (655)
16 (5/8) .....	510 (1,130)
20 (3/4) .....	830 (1,840)
25 (1) .....	1,470 (3,250)

STEEL STRAPPING

Width x thickness mm (inches)	WLL kg (pounds)
31.7 x .74 (1 1/4 x 0.029) .....	540 (1,190)
31.7 x .79 (1 1/4 x 0.031) .....	540 (1,190)
31.7 x .89 (1 1/4 x 0.035) .....	540 (1,190)
31.7 x 1.12 (1 1/4 x 0.044) .....	770 (1,690)
31.7 x 1.27 (1 1/4 x 0.05) .....	770 (1,690)
31.7 x 1.5 (1 1/4 x 0.057) .....	870 (1,925)
50.8 x 1.12 (2 x 0.044) .....	1,200 (2,650)
50.8 x 1.27 (2 x 0.05) .....	1,200 (2,650)

**§ 393.110 What else do I have to do to determine the minimum number of tiedowns?**

(a) In addition to the requirements of § 393.106, the minimum number of tiedowns required to secure an article or group of articles against movement depends on the length of the article(s) being secured, and the requirements of paragraphs (b) and (c) of this section.

(b) When an article is not blocked or positioned to prevent movement in the forward direction by a headerboard, bulkhead, other cargo that is positioned to prevent movement, or other appropriate blocking devices, it must be secured by at least:

(1) One tiedown for articles 5 feet (1.52 meters) or less in length, and 1,100 pounds (500 kg) or less in weight;

(2) Two tiedowns if the article is:

(i) 5 feet (1.52 meters) or less in length and more than 1,100 pounds (500 kg) in weight; or

(ii) Longer than 5 feet (1.52 meters) but less than or equal to 10 feet (3.04 meters) in length, irrespective of the weight.

(3) Two tiedowns if the article is longer than 10 feet (3.04 meters), and one additional tiedown for every 10 feet (3.04 meters) of article length, or fraction thereof, beyond the first 10 feet (3.04 meters) of length.

(c) If an individual article is required to be blocked, braced or immobilized to prevent movement in the forward direction by a headerboard, bulkhead, other articles which are adequately secured or by an appropriate blocking or immobilization method, it must be secured by at least one tiedown for every 3.04 meters (10 feet) or article length, or fraction thereof.

(d) *Special rule for special purpose vehicles.* The rules in this section do not apply to a vehicle transporting one or more articles of cargo such as, but not limited to, machinery or fabricated structural items (e.g., steel or concrete beams, crane booms, girders, and trusses, etc.) which, because of their design, size, shape, or weight, must be fastened by special methods. However, any article of cargo carried on that vehicle must be securely and adequately fastened to the vehicle.

**§ 393.112 Must a tiedown be adjustable?**

Each tiedown, or its associated connectors, or its attachment mechanisms must be designed, constructed, and maintained so the driver of an in-transit commercial motor vehicle can tighten them. However, this requirement does not apply to the use of steel strapping.

**§ 393.114 What are the requirements for front end structures used as part of a cargo securement system?**

(a) *Applicability.* The rules in this section are applicable to commercial motor vehicles transporting articles of cargo that are in contact with the front end structure of the vehicle. The front end structure on these cargo-carrying vehicles must meet the performance requirements of this section.

(b) *Height and width.* (1) The front end structure must extend either to a height of 4 feet above the floor of the vehicle or to a height at which it blocks forward movement of any item of article of cargo being carried on the vehicle, whichever is lower.

(2) The front end structure must have a width which is at least equal to the width of the vehicle or which blocks forward movement of any article of cargo being transported on the vehicle, whichever is narrower.

(c) *Strength.* The front end structure must be capable of withstanding the following horizontal forward static load:

(1) For a front end structure less than 6 feet in height, a horizontal forward static load equal to one-half (0.5) of the weight of the articles of cargo being transported on the vehicle uniformly distributed over the entire portion of the front end structure that is within 4 feet above the vehicle's floor or that is at or below a height above the vehicle's floor at which it blocks forward movement of any article of the vehicle's cargo, whichever is less; or

(2) For a front end structure 6 feet in height or higher, a horizontal forward static load equal to four-tenths (0.4) of the weight of the articles of cargo being transported on the vehicle uniformly distributed over the entire front end structure.

(d) *Penetration resistance.* The front end structure must be designed, constructed, and maintained so that it is capable of resisting penetration by any article of cargo that contacts it when the vehicle decelerates at a rate of 20 feet per second, per second. The front end structure must have no aperture large enough to permit any article of cargo in contact with the structure to pass through it.

(e) *Substitute devices.* The requirements of this section may be met by the use of devices performing the same functions as a front end structure, if the devices are at least as strong as, and provide protection against shifting articles of cargo at least equal to, a front end structure which conforms to those requirements.

SPECIFIC SECUREMENT REQUIREMENTS  
BY COMMODITY TYPE

**§ 393.116 What are the rules for securing logs?**

(a) *Applicability.* The rules in this section are applicable to the transportation of logs with the following exceptions:

(1) Logs that are unitized by banding or other comparable means may be transported in accordance with the general cargo securement rules of §§ 393.100 through 393.114.

(2) Loads that consist of no more than four processed logs may be transported in accordance with the general cargo securement rules of §§ 393.100 through 393.114.

(3) Firewood, stumps, log debris and other such short logs must be transported in a vehicle or container enclosed on both sides, front, and rear and of adequate strength to contain them. Longer logs may also be so loaded.

(b) *Components of a securement system.* (1) Logs must be transported on a vehicle designed and built, or adapted, for the transportation of logs. Any such vehicle must be fitted with bunks, bolsters, stakes or standards, or other equivalent means, that cradle the logs and prevent them from rolling.

(2) All vehicle components involved in securement of logs must be designed and built to withstand all anticipated operational forces without failure, accidental release or permanent deformation. Stakes or standards that are not permanently attached to the vehicle must be secured in a manner that prevents unintentional separation from the vehicle in transit.

(3) Tiedowns must be used in combination with the stabilization provided by bunks, stakes and bolsters to secure the load.

(c) *Use of securement system.* (1) Logs must be solidly packed, and the outer bottom logs must be in contact with and resting solidly against the bunks, bolsters, stakes or standards.

(2) Each outside log on the side of a stack of logs must touch at least two stakes, bunks, bolsters, or standards. If one end does not actually touch a stake, it must rest on other logs in a stable manner and must extend beyond the stake, bunk, bolster or standard.

(3) The center of the highest outside log on each side or end must be below the top of each stake, bunk or standard.

(4) Each log that is not held in place by contact with other logs or the stakes, bunks, or standards must be held in place by a tiedown. Additional tiedowns or securement devices must be used when the condition of the wood results in such low friction between logs that they are likely to slip upon each other.

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(d) *Securement of shortwood logs loaded crosswise on frame, rail and flatbed vehicles.* In addition to the requirements of paragraphs (b) and (c) of this section, each stack of logs loaded crosswise must meet the following rules:

(1) In no case may the end of a log in the lower tier extend more than one-third of the log's total length beyond the nearest supporting structure on the vehicle.

(2) When only one stack of shortwood is loaded crosswise, it must be secured with at least two tiedowns. The tiedowns must attach to the vehicle frame at the front and rear of the load, and must cross the load in this direction.

(3) When two tiedowns are used, they must be positioned at approximately one-third and two-thirds of the length of the logs.

(4) A vehicle that is more than 10 meters (33 feet) long must be equipped with center stakes, or comparable devices, to divide it into sections approximately equal in length. Where a vehicle is so divided, each tiedown must secure the highest log on each side of the center stake, and must be fastened below these logs. It may be fixed at each end and tensioned from the middle, or fixed in the middle and tensioned from each end, or it may pass through a pulley or equivalent device in the middle and be tensioned from one end.

(5) Any structure or stake that is subjected to an upward force when the tiedowns are tensioned must be anchored to resist that force.

(6) If two stacks of shortwood are loaded side-by-side, in addition to meeting the requirements of paragraphs (d)(1) through (d)(5) of this section, they must be loaded so that:

(i) There is no space between the two stacks of logs;

(ii) The outside of each stack is raised at least 2.5 cm (1 in) within 10 cm (4 in) of the end of the logs or the side of the vehicle;

(iii) The highest log is no more than 2.44 m (8 ft) above the deck; and

(iv) At least one tiedown is used lengthwise across each stack of logs.

(e) *Securement of logs loaded lengthwise on flatbed and frame vehicles.* In addition to meeting the requirements of

paragraphs (b) and (c) of this section, each stack of shortwood loaded lengthwise on a frame vehicle or on a flatbed must be secured to the vehicle by at least two tiedowns.

(f) *Securement of logs transported on pole trailers.* (1) The load must be secured by at least one tiedown at each bunk, or alternatively, by at least two tiedowns used as wrappers that encircle the entire load at locations along the load that provide effective securement.

(2) The front and rear wrappers must be at least 3.04 meters (10 feet) apart.

(3) Large diameter single and double log loads must be immobilized with chock blocks or other equivalent means to prevent shifting.

(4) Large diameter logs that rise above bunks must be secured to the underlying load with at least two additional wrappers.

**§ 393.118 What are the rules for securing dressed lumber or similar building products?**

(a) *Applicability.* The rules in this section apply to the transportation of bundles of dressed lumber, packaged lumber, building products such as plywood, gypsum board or other materials of similar shape. Lumber or building products which are not bundled or packaged must be treated as loose items and transported in accordance with §§ 393.100 through 393.114 of this subpart. For the purpose of this section, "bundle" refers to packages of lumber, building materials or similar products which are unitized for securement as a single article of cargo.

(b) *Positioning of bundles.* Bundles must be placed side by side in direct contact with each other, or a means must be provided to prevent bundles from shifting towards each other.

(c) *Securement of bundles transported using no more than one tier.* Bundles carried on one tier must be secured in accordance with the general provisions of §§ 393.100 through 393.114.

(d) *Securement of bundles transported using more than one tier.* Bundles carried in more than one tier must be either:

(1) Blocked against lateral movement by stakes on the sides of the vehicle and secured by tiedowns laid out over

the top tier, as outlined in the general provisions of §§ 393.100 through 393.114; or

(2) Restrained from lateral movement by blocking or high friction devices between tiers and secured by tiedowns laid out over the top tier, as outlined in the general provisions of §§ 393.100 through 393.114; or

(3) Placed directly on top of other bundles or on spacers and secured in accordance with the following:

(i) The length of spacers between bundles must provide support to all pieces in the bottom row of the bundle.

(ii) The width of individual spacers must be equal to or greater than the height.

(iii) If spacers are comprised of layers of material, the layers must be unitized or fastened together in a manner which ensures that the spacer performs as a single piece of material.

(iv) The arrangement of the tiedowns for the bundles must be:

(A) Secured by tiedowns over the top tier of bundles, in accordance with the general provisions of §§ 393.100 through 393.114 with a minimum of two tiedowns for bundles longer than 1.52 meters (5 ft); and

(B) Secured by tiedowns in accordance with the general provisions of §§ 393.100 through 393.114 over the second tier or over a middle tier of a maximum height of 1.85 meters (6 ft) above the trailer deck, whichever is greater, for each stack of bundles composed of more than two tiers; or

(4) Secured by tiedowns over each tier of bundles, in accordance with §§ 393.100 through 393.114 using a minimum of two tiedowns over each of the top bundles longer than 1.52 meters (5 ft), in all circumstances.

**§ 393.120 What are the rules for securing metal coils?**

(a) *Applicability.* The rules in this section apply to the transportation of one or more metal coils which, individually or grouped together, weigh 2268 kg (5000 pounds) or more. Shipments of metal coils that weigh less than 2268 kg (5000 pounds) may be secured in accordance with the provisions of §§ 393.100 through 393.114.

(b) *Securement of coils transported with eyes vertical on a flatbed vehicle, in a*

*sided vehicle or intermodal container with anchor points*—(1) *An individual coil.* Each coil must be secured by tiedowns arranged in a manner to prevent the coils from tipping in the forward, rearward, and lateral directions. The restraint system must include the following:

(i) At least one tiedown attached diagonally from the left side of the vehicle or intermodal container (near the forwardmost part of the coil), across the eye of the coil, to the right side of the vehicle or intermodal container (near the rearmost part of the coil);

(ii) At least one tiedown attached diagonally from the right side of the vehicle or intermodal container (near the forwardmost part of the coil), across the eye of the coil, to the left side of the vehicle or intermodal container (near the rearmost part of the coil);

(iii) At least one tiedown attached transversely over the eye of the coil; and

(iv) Either blocking and bracing, friction mats or tiedowns must be used to prevent longitudinal movement in the forward direction.

(2) *Coils grouped in rows.* When coils are grouped and loaded side by side in a transverse or longitudinal row, the each row of coils must be secured by the following:

(i) At least one tiedown attached to the front of the row of coils, restraining against forward motion, and whenever practicable, making an angle no more than 45 degrees with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container;

(ii) At least one tiedown attached to the rear of the row of coils, restraining against rearward motion, and whenever practicable, making an angle no more than 45 degrees with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container;

(iii) At least one tiedown over the top of each coil or transverse row of coils, restraining against vertical motion. Tiedowns going over the top of a coil(s) must be as close as practicable to the eye of the coil and positioned to prevent the tiedown from slipping or becoming unintentionally unfastened while the vehicle is in transit; and

(iv) Tiedowns must be arranged to prevent shifting or tipping in the forward, rearward and lateral directions.

(c) *Securement of coils transported with eyes crosswise on a flatbed vehicle, in a sided vehicle or intermodal container with anchor points*—(1) *An individual coil.* Each coil must be secured by the following:

(i) A means (*e.g.*, timbers, chocks or wedges, a cradle, etc.) to prevent the coil from rolling. The means of preventing rolling must support the coil off the deck, and must not be capable of becoming unintentionally unfastened or loose while the vehicle is in transit. If timbers, chocks or wedges are used, they must be held in place by coil bunks or similar devices to prevent them from coming loose. The use of nailed blocking or cleats as the sole means to secure timbers, chocks or wedges, or a nailed wood cradle, is prohibited;

(ii) At least one tiedown through its eye, restricting against forward motion, and whenever practicable, making an angle no more than 45 degrees with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container; and

(iii) At least one tiedown through its eye, restricting against rearward motion, and whenever practicable, making an angle no more than 45 degrees with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container.

(2) *Prohibition on crossing of tiedowns when coils are transported with eyes crosswise.* Attaching tiedowns diagonally through the eye of a coil to form an X-pattern when viewed from above the vehicle is prohibited.

(d) *Securement of coils transported with eyes lengthwise on a flatbed vehicle, in a sided vehicle or intermodal container with anchor points*—(1) *An individual coil—option 1.* Each coil must be secured by:

(i) A means (*e.g.*, timbers, chocks or wedges, a cradle, etc.) to prevent the coil from rolling. The means of preventing rolling must support the coil off the deck, and must not be capable of becoming unintentionally unfastened or loose while the vehicle is in transit. If timbers, chocks or wedges are used, they must be held in place by coil bunks or similar devices to pre-

vent them from coming loose. The use of nailed blocking or cleats as the sole means to secure timbers, chocks or wedges, or a nailed wood cradle, is prohibited;

(ii) At least one tiedown attached diagonally through its eye from the left side of the vehicle or intermodal container (near the forward-most part of the coil), to the right side of the vehicle or intermodal container (near the rearmost part of the coil), making an angle no more than 45 degrees, whenever practicable, with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container;

(iii) At least one tiedown attached diagonally through its eye, from the right side of the vehicle or intermodal container (near the forward-most part of the coil), to the left side of the vehicle or intermodal container (near the rearmost part of the coil), making an angle no more than 45 degrees, whenever practicable, with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container;

(iv) At least one tiedown attached transversely over the top of the coil; and

(v) Either blocking, or friction mats to prevent longitudinal movement.

(2) *An individual coil—option 2.* Each coil must be secured by:

(i) A means (*e.g.*, timbers, chocks or wedges, a cradle, etc.) to prevent the coil from rolling. The means of preventing rolling must support the coil off the deck, and must not be capable of becoming unintentionally unfastened or loose while the vehicle is in transit. If timbers, chocks or wedges are used, they must be held in place by coil bunks or similar devices to prevent them from coming loose. The use of nailed blocking or cleats as the sole means to secure timbers, chocks or wedges, or a nailed wood cradle, is prohibited;

(ii) At least one tiedown attached straight through its eye from the left side of the vehicle or intermodal container (near the forward-most part of the coil), to the left side of the vehicle or intermodal container (near the rearmost part of the coil), and, whenever practicable, making an angle no more

than 45 degrees with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container;

(iii) At least one tiedown attached straight through its eye, from the right side of the vehicle or intermodal container (near the forward-most part of the coil), to the right side of the vehicle or intermodal container (near the rearmost part of the coil), and whenever practicable, making an angle no more than 45 degrees with the floor of the vehicle or intermodal container when viewed from the side of the vehicle or container;

(iv) At least one tiedown attached transversely over the top of the coil; and

(v) Either blocking or friction mats to prevent longitudinal movement.

(3) *An individual coil—option 3.* Each coil must be secured by:

(i) A means (*e.g.*, timbers, chocks or wedges, a cradle, etc.) to prevent the coil from rolling. The means of preventing rolling must support the coil off the deck, and must not be capable of becoming unintentionally unfastened or loose while the vehicle is in transit. If timbers, chocks or wedges are used, they must be held in place by coil bunks or similar devices to prevent them from coming loose. The use of nailed blocking or cleats as the sole means to secure timbers, chocks or wedges, or a nailed wood cradle, is prohibited;

(ii) At least one tiedown over the top of the coil, located near the forward-most part of the coil;

(iii) At least one tiedown over the top of the coil located near the rearmost part of the coil; and

(iv) Either blocking or friction mats to prevent longitudinal movement, he forward direction.

(4) *Rows of coils.* Each transverse row of coils having approximately equal outside diameters must be secured with:

(i) A means (*e.g.*, timbers, chocks or wedges, a cradle, etc.) to prevent each coil in the row of coils from rolling. The means of preventing rolling must support each coil off the deck, and must not be capable of becoming unintentionally unfastened or loose while the vehicle is in transit. If timbers,

chocks or wedges are used, they must be held in place by coil bunks or similar devices to prevent them from coming loose. The use of nailed blocking or cleats as the sole means to secure timbers, chocks or wedges, or a nailed wood cradle, is prohibited;

(ii) At least one tiedown over the top of each coil or transverse row, located near the forward-most part of the coil;

(iii) At least one tiedown over the top of each coil or transverse row, located near the rearmost part of the coil; and

(iv) Either blocking, bracing or friction mats to prevent longitudinal movement.

(e) *Securement of coils transported in a sided vehicle without anchor points or an intermodal container without anchor points.* Metal coils transported in a vehicle with sides without anchor points or an intermodal container without anchor points must be loaded in a manner to prevent shifting and tipping. The coils may also be secured using a system of blocking and bracing, friction mats, tiedowns, or a combination of these to prevent any horizontal movement and tipping.

#### § 393.122 What are the rules for securing paper rolls?

(a) *Applicability.* The rules in this section apply to shipments of paper rolls which, individually or together, weigh 2268 kg (5000 lb) or more. Shipments of paper rolls that weigh less than 2268 kg (5000 lb), and paper rolls that are unitized on a pallet, may either be secured in accordance with the rules in this section or the requirements of §§ 393.100 through 393.114.

(b) *Securement of paper rolls transported with eyes vertical in a sided vehicle.* (1) Paper rolls must be placed tightly against the walls of the vehicle, other paper rolls, or other cargo, to prevent movement during transit.

(2) If there are not enough paper rolls in the shipment to reach the walls of the vehicle, lateral movement must be prevented by filling the void, blocking, bracing, tiedowns or friction mats. The paper rolls may also be banded together.

(3) When any void behind a group of paper rolls, including that at the rear of the vehicle, exceeds the diameter of the paper rolls, rearward movement

must be prevented by friction mats, blocking, bracing, tiedowns, or banding to other rolls.

(4)(i) If a paper roll is not prevented from tipping or falling sideways or rearwards by vehicle structure or other cargo, and its width is more than 2 times its diameter, it must be prevented from tipping or falling by banding it to other rolls, bracing, or tiedowns.

(ii) If the forwardmost roll(s) in a group of paper rolls is not prevented from tipping or falling forwards by vehicle structure or other cargo and it is restrained against forward movement by friction mat(s) alone, and its width is more than 1.75 times its diameter, it must be prevented from tipping or falling forwards by banding it to other rolls, bracing, or tiedowns.

(iii) Otherwise, when a paper roll or the forwardmost roll in groups of rolls that are not prevented from tipping or falling forwards by vehicle structure or other cargo and its width exceeds 1.25 times its diameter it must be prevented from tipping or falling by banding it to other rolls, bracing or tiedowns.

(5) If paper rolls are banded together, the rolls must be placed tightly against each other to form a stable group. The bands must be applied tightly, and must be secured so that they cannot fall off the rolls or to the deck.

(6) A friction mat used to provide the principal securement for a paper roll must protrude from beneath the roll in the direction in which it is providing that securement.

(c) *Securement of split loads of paper rolls transported with eyes vertical in a sided vehicle.* (1) If a paper roll in a split load is not prevented from forward movement by vehicle structure or other cargo, it must be prevented from forward movement by filling the open space, or by blocking, bracing, tiedowns, friction mats, or some combination of these.

(2) A friction mat used to provide the principal securement for a paper roll must protrude from beneath the roll in the direction in which it is providing that securement.

(d) *Securement of stacked loads of paper rolls transported with eyes vertical in a sided vehicle.* (1) Paper rolls must not be

loaded on a layer of paper rolls beneath unless the lower layer extends to the front of the vehicle.

(2) Paper rolls in the second and subsequent layers must be prevented from forward, rearward or lateral movement by means as allowed for the bottom layer, or by use of a blocking roll from a lower layer.

(3) The blocking roll must be at least 38 mm (1.5 in) taller than other rolls, or must be raised at least 38 mm (1.5 in) using dunnage.

(4) A roll in the rearmost row of any layer must not be raised using dunnage.

(e) *Securement of paper rolls transported with eyes crosswise in a sided vehicle.* (1) The paper rolls must be prevented from rolling or shifting longitudinally by contact with vehicle structure or other cargo, by chocks, wedges or blocking and bracing of adequate size, or by tiedowns.

(2) Chocks, wedges or blocking must be held securely in place by some means in addition to friction, so they cannot become unintentionally unfastened or loose while the vehicle is in transit.

(3) The rearmost roll must not be secured using the rear doors of the vehicle or intermodal container, or by blocking held in place by those doors.

(4) If there is more than a total of 203 mm (8 in) of space between the ends of a paper roll, or a row of rolls, and the walls of the vehicle, void fillers, blocking, bracing, friction mats, or tiedowns must be used to prevent the roll from shifting towards either wall.

(f) *Securement of stacked loads of paper rolls transported with eyes crosswise in a sided vehicle.* (1) Rolls must not be loaded in a second layer unless the bottom layer extends to the front of the vehicle.

(2) Rolls must not be loaded in a third or higher layer unless all wells in the layer beneath are filled.

(3) The foremost roll in each upper layer, or any roll with an empty well in front of it, must be secured against forward movement by:

(i) Banding it to other rolls, or

(ii) Blocking against an adequately secured eye-vertical blocking roll resting on the floor of the vehicle which is

at least 1.5 times taller than the diameter of the roll being blocked, or

(iii) Placing it in a well formed by two rolls on the lower row whose diameter is equal to or greater than that of the roll on the upper row.

(4) The rearmost roll in each upper layer must be secured by banding it to other rolls if it is located in either of the last two wells formed by the rearmost rolls in the layer below.

(5) Rolls must be secured against lateral movement by the same means allowed for the bottom layer when there is more than a total of 203 mm (8 in) of space between the ends of a paper roll, or a row of rolls, and the walls of the vehicle.

(g) *Securement of paper rolls transported with the eyes lengthwise in a sided vehicle.*

(1) Each roll must be prevented from forward movement by contact with vehicle structure, other cargo, blocking or tiedowns.

(2) Each roll must be prevented from rearward movement by contact with other cargo, blocking, friction mats or tiedowns.

(3) The paper rolls must be prevented from rolling or shifting laterally by contact with the wall of the vehicle or other cargo, or by chocks, wedges or blocking of adequate size.

(4) Chocks, wedges or blocking must be held securely in place by some means in addition to friction, so they cannot become unintentionally unfastened or loose while the vehicle is in transit.

(h) *Securement of stacked loads of paper rolls transported with the eyes lengthwise in a sided vehicle.* (1) Rolls must not be loaded in a higher layer if another roll will fit in the layer beneath.

(2) An upper layer must be formed by placing paper rolls in the wells formed by the rolls beneath.

(3) A roll in an upper layer must be secured against forward and rearward movement by any of the means allowed for the bottom layer, by use of a blocking roll, or by banding to other rolls.

(i) *Securement of paper rolls transported on a flatbed vehicle or in a curtain-sided vehicle—(1) Paper rolls with eyes vertical or with eyes lengthwise.*

(i) The paper rolls must be loaded and secured as described for a sided vehicle, and the entire load must be secured by tiedowns in accordance with the requirements of §§ 393.100 through 393.114.

(ii) Stacked loads of paper rolls with eyes vertical are prohibited.

(2) *Paper rolls with eyes crosswise.* (i) The paper rolls must be prevented from rolling or shifting longitudinally by contact with vehicle structure or other cargo, by chocks, wedges or blocking and bracing of adequate size, or by tiedowns.

(ii) Chocks, wedges or blocking must be held securely in place by some means in addition to friction so that they cannot become unintentionally unfastened or loose while the vehicle is in transit.

(iii) Tiedowns must be used in accordance with the requirements of §§ 393.100 through 393.114 to prevent lateral movement.

**§ 393.124 What are the rules for securing concrete pipe?**

(a) *Applicability.* (1) The rules in this section apply to the transportation of concrete pipe on flatbed trailers and vehicles, and lowboy trailers.

(2) Concrete pipe bundled tightly together into a single rigid article that has no tendency to roll, and concrete pipe loaded in a sided vehicle or container must be secured in accordance with the provisions of §§ 393.100 through 393.114.

(b) *General specifications for tiedowns.* (1) The aggregate working load limit of all tiedowns on any group of pipes must not be less than half the total weight of all the pipes in the group.

(2) A transverse tiedown through a pipe on an upper tier or over longitudinal tiedowns is considered to secure all those pipes beneath on which that tiedown causes pressure.

(c) *Blocking.* (1) Blocking may be one or more pieces placed symmetrically about the center of a pipe.

(2) One piece must extend at least half the distance from the center to each end of the pipe, and two pieces must be placed on the opposite side, one at each end of the pipe.

(3) Blocking must be placed firmly against the pipe, and must be secured

to prevent it moving out from under the pipe.

(4) Timber blocking must have minimum dimensions of at least 10 × 15 cm (4 × 6 in).

(d) *Arranging the load*—(1) *Pipe of different diameter.* If pipe of more than one diameter are loaded on a vehicle, groups must be formed that consist of pipe of only one size, and each group must be separately secured.

(2) *Arranging a bottom tier.* The bottom tier must be arranged to cover the full length of the vehicle, or as a partial tier in one group or two groups.

(3) *Arranging an upper tier.* Pipe must be placed only in the wells formed by adjacent pipes in the tier beneath. A third or higher tier must not be started unless all wells in the tier beneath are filled.

(4) *Arranging the top tier.* The top tier must be arranged as a complete tier, a partial tier in one group, or a partial tier in two groups.

(5) *Arranging bell pipe.* (i) Bell pipe must be loaded on at least two longitudinal spacers of sufficient height to ensure that the bell is clear of the deck.

(ii) Bell pipe loaded in one tier must have the bells alternating on opposite sides of the vehicle.

(iii) The ends of consecutive pipe must be staggered, if possible, within the allowable width, otherwise they must be aligned.

(iv) Bell pipe loaded in more than one tier must have the bells of the bottom tier all on the same side of the vehicle.

(v) Pipe in every upper tier must be loaded with bells on the opposite side of the vehicle to the bells of the tier below.

(vi) If the second tier is not complete, pipe in the bottom tier which do not support a pipe above must have their bells alternating on opposite sides of the vehicle.

(a) *Securing pipe with an inside diameter up to 1,143 mm (45 in).* In addition to the requirements of paragraphs (b), (c) and (d) of this section, the following rules must be satisfied:

(1) *Stabilizing the bottom tier.* (i) The bottom tier must be immobilized longitudinally at each end by blocking, vehicle end structure, stakes, a locked pipe unloader, or other equivalent means.

(ii) Other pipe in the bottom tier may also be held in place by blocks and/or wedges; and

(iii) Every pipe in the bottom tier must also be held firmly in contact with the adjacent pipe by tiedowns through the front and rear pipes:

(A) At least one tiedown through the front pipe of the bottom tier must run aft at an angle not more than 45 degrees with the horizontal, whenever practicable.

(B) At least one tiedown through the rear pipe of the bottom tier must run forward at an angle not more than 45 degrees with the horizontal, whenever practicable.

(2) *Use of tiedowns.* (i) Each pipe may be secured individually with tiedowns through the pipe.

(ii) If each pipe is not secured individually with a tiedown, then:

(A) Either one 1/2-inch diameter chain or wire rope, or two 3/8-inch diameter chain or wire rope, must be placed longitudinally over the group of pipes;

(B) One transverse tiedown must be used for every 3.04 m (10 ft) of load length. The transverse tiedowns may be placed through a pipe, or over both longitudinal tiedowns between two pipes on the top tier.

(C) If the first pipe of a group in the top tier is not placed in the first well formed by pipes at the front of the tier beneath, it must be secured by an additional tiedown that runs rearward at an angle not more than 45 degrees to the horizontal, whenever practicable. This tiedown must pass either through the front pipe of the upper tier, or outside it and over both longitudinal tiedowns; and

(D) If the last pipe of a group in the top tier is not placed in the last well formed by pipes at the rear of the tier beneath, it must be secured by an additional tiedown that runs forward at an angle not more than 45 degrees to the horizontal, whenever practicable. This tiedown must pass either through the rear pipe of the upper tier or outside it and over both longitudinal tiedowns.

(f) *Securing large pipe, with an inside diameter over 1143 mm (45 in).* In addition to the requirements of paragraphs (b), (c) and (d) of this section, the following rules must be satisfied:

(1) The front pipe and the rear pipe must be immobilized by blocking, wedges, vehicle end structure, stakes, locked pipe unloader, or other equivalent means.

(2) Each pipe must be secured by tiedowns through the pipe:

(i) At least one tiedown through each pipe in the front half of the load, which includes the middle one if there is an odd number, and must run rearward at an angle not more than 45 degrees with the horizontal, whenever practicable.

(ii) At least one tiedown through each pipe in the rear half of the load, and must run forward at an angle not more than 45 degrees with the horizontal, whenever practicable, to hold each pipe firmly in contact with adjacent pipe; and

(iii) If the front or rear pipe is not also in contact with vehicle end structure, stakes, a locked pipe unloader, or other equivalent means, at least two tiedowns positioned as described in paragraphs (f)(2)(i) and (ii) of this section, must be used through that pipe.

(3) If only one pipe is transported, or if several pipes are transported without contact between other pipes, the requirements in this paragraph apply to each pipe as a single front and rear article.

**§ 393.126 What are the rules for securing intermodal containers?**

(a) *Applicability.* The rules in this section apply to the transportation of intermodal containers. Cargo contained within an intermodal container must be secured in accordance with the provisions of §§ 393.100 through 393.114 or, if applicable, the commodity specific rules of this part.

(b) *Securement of intermodal containers transported on container chassis vehicle(s).* (1) Each intermodal container must be secured to the container chassis with securement devices or integral locking devices that cannot unintentionally become unfastened while the vehicle is in transit.

(2) The securement devices must restrain the container from moving more than 1.27 cm (1/2 in) forward, more than 1.27 cm (1/2 in) aft, more than 1.27 cm (1/2 in) to the right, more than 1.27 cm (1/2 in) to the left, or more than 2.54 cm (1 in) vertically.

(3) The front and rear of the container must be secured independently.

(c) *Securement of loaded intermodal containers transported on vehicles other than container chassis vehicle(s).* (1) All lower corners of the intermodal container must rest upon the vehicle, or the corners must be supported by a structure capable of bearing the weight of the container and that support structure must be independently secured to the motor vehicle.

(2) Each container must be secured to the vehicle by:

(i) Chains, wire ropes or integral devices which are fixed to all lower corners; or

(ii) Crossed chains which are fixed to all upper corners; and,

(3) The front and rear of the container must be secured independently. Each chain, wire rope, or integral locking device must be attached to the container in a manner that prevents it from being unintentionally unfastened while the vehicle is in transit.

(d) *Securement of empty intermodal containers transported on vehicles other than container chassis vehicle(s).* Empty intermodal containers transported on vehicles other than container chassis vehicles do not have to have all lower corners of the intermodal container resting upon the vehicle, or have all lower corners supported by a structure capable of bearing the weight of the empty container, provided:

(1) The empty intermodal container is balanced and positioned on the vehicle in a manner such that the container is stable before the addition of tiedowns or other securement equipment; and,

(2) The amount of overhang for the empty container on the trailer does not exceed five feet on either the front or rear of the trailer;

(3) The empty intermodal container must not interfere with the vehicle's maneuverability; and,

(4) The empty intermodal container is secured to prevent lateral, longitudinal, or vertical shifting.

**§ 393.128 What are the rules for securing automobiles, light trucks and vans?**

(a) *Applicability.* The rules in this section apply to the transportation of

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automobiles, light trucks, and vans which individually weigh 4,536 kg. (10,000 lb) or less. Vehicles which individually are heavier than 4,536 kg (10,000 lb) must be secured in accordance with the provisions of § 393.130 of this part.

(b) *Securement of automobiles, light trucks, and vans.*

(1) Automobiles, light trucks, and vans must be restrained at both the front and rear to prevent lateral, forward, rearward, and vertical movement using a minimum of two tiedowns.

(2) Tiedowns that are designed to be affixed to the structure of the automobile, light truck, or van must use the mounting points on those vehicles that have been specifically designed for that purpose.

(3) Tiedowns that are designed to fit over or around the wheels of an automobile, light truck, or van must provide restraint in the lateral, longitudinal and vertical directions.

(4) Edge protectors are not required for synthetic webbing at points where the webbing comes in contact with the tires.

**§ 393.130 What are the rules for securing heavy vehicles, equipment and machinery?**

(a) *Applicability.* The rules in this section apply to the transportation of heavy vehicles, equipment and machinery which operate on wheels or tracks, such as front end loaders, bulldozers, tractors, and power shovels and which individually weigh 4,536 kg (10,000 lb.) or more. Vehicles, equipment and machinery which is lighter than 4,536 kg (10,000 lb.) may also be secured in accordance with the provisions of this section, with § 393.128, or in accordance with the provisions of §§ 393.100 through 393.114.

(b) *Preparation of equipment being transported.* (1) Accessory equipment, such as hydraulic shovels, must be completely lowered and secured to the vehicle.

(2) Articulated vehicles shall be restrained in a manner that prevents articulation while in transit.

(c) *Securement of heavy vehicles, equipment or machinery with crawler tracks or wheels.* (1) In addition to the requirements of paragraph (b) of this section,

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heavy equipment or machinery with crawler tracks or wheels must be restrained against movement in the lateral, forward, rearward, and vertical direction using a minimum of four tiedowns.

(2) Each of the tiedowns must be affixed as close as practicable to the front and rear of the vehicle, or mounting points on the vehicle that have been specifically designed for that purpose.

**§ 393.132 What are the rules for securing flattened or crushed vehicles?**

(a) *Applicability.* The rules in this section apply to the transportation of vehicles such as automobiles, light trucks, and vans that have been flattened or crushed.

(b) *Prohibition on the use of synthetic webbing.* The use of synthetic webbing to secure flattened or crushed vehicles is prohibited.

(c) *Securement of flattened or crushed vehicles.* Flattened or crushed vehicles must be transported on vehicles which have:

(1) Containment walls or comparable means on four sides which extend to the full height of the load and which block against movement of the cargo in the forward, rearward and lateral directions; or

(2)(i) Containment walls or comparable means on three sides which extend to the full height of the load and which block against movement of the cargo in the forward, rearward and the lateral direction for which there is no containment wall or comparable means, and

(ii) A minimum of two tiedowns are required per vehicle stack; or

(3)(i) Containment walls on two sides which extend to the full height of the load and which block against movement of the cargo in the forward and rearward directions, and

(ii) A minimum of three tiedowns are required per vehicle stack; or

(4) A minimum of four tiedowns per vehicle stack.

(5) In addition to the requirements of paragraphs (c)(2), (3), and (4), the following rules must be satisfied:

(i) Vehicles used to transport flattened or crushed vehicles must be equipped with a means to prevent loose

parts from falling from all four sides of the vehicle which extends to the full height of the cargo.

(ii) The means used to contain loose parts may consist of structural walls, sides or sideboards, or suitable covering material, alone or in combinations.

(iii) The use of synthetic material for containment of loose parts is permitted.

**§ 393.134 What are the rules for securing roll-on/roll-off or hook lift containers?**

(a) *Applicability.* The rules in this section apply to the transportation of roll-on/roll-off or hook lift containers.

(b) *Securement of a roll-on/roll-off and hook lift container.* Each roll-on/roll-off and hook lift container carried on a vehicle which is not equipped with an integral securement system must be:

(1) Blocked against forward movement by the lifting device, stops, a combination of both or other suitable restraint mechanism;

(2) Secured to the front of the vehicle by the lifting device or other suitable restraint against lateral and vertical movement;

(3) Secured to the rear of the vehicle with at least one of the following mechanisms:

(i) One tiedown attached to both the vehicle chassis and the container chassis;

(ii) Two tiedowns installed lengthwise, each securing one side of the container to one of the vehicle's side rails; or

(iii) Two hooks, or an equivalent mechanism, securing both sides of the container to the vehicle chassis at least as effectively as the tiedowns in the two previous items.

(4) The mechanisms used to secure the rear end of a roll-on/roll off or hook lift container must be installed no more than two meters (6 ft 7 in) from the rear of the container.

(5) In the event that one or more of the front stops or lifting devices are missing, damaged or not compatible, additional manually installed tiedowns must be used to secure the container to the vehicle, providing the same level of securement as the missing, damaged or incompatible components.

**§ 393.136 What are the rules for securing large boulders?**

(a) *Applicability.* (1) The rules in this section are applicable to the transportation of any large piece of natural, irregularly shaped rock weighing in excess of 5,000 kg (11,000 lb.) or with a volume in excess of 2 cubic-meters on an open vehicle, or in a vehicle whose sides are not designed and rated to contain such cargo.

(2) Pieces of rock weighing more than 100 kg (220 lb.), but less than 5,000 kg (11,000 lb.) must be secured, either in accordance with this section, or in accordance with the provisions of §§ 393.100 through 393.114, including:

(i) Rock contained within a vehicle which is designed to carry such cargo; or

(ii) Secured individually by tiedowns, provided each piece can be stabilized and adequately secured.

(3) Rock which has been formed or cut to a shape and which provides a stable base for securement must also be secured, either in accordance with the provisions of this section, or in accordance with the provisions of §§ 393.100 through 393.114.

(b) *General requirements for the positioning of boulders on the vehicle.* (1) Each boulder must be placed with its flattest and/or largest side down.

(2) Each boulder must be supported on at least two pieces of hard wood blocking at least 10 cm × 10 cm (4 inches × 4 inches) side dimensions extending the full width of the boulder.

(3) Hardwood blocking pieces must be placed as symmetrically as possible under the boulder and should support at least three-fourths of the length of the boulder.

(4) If the flattest side of a boulder is rounded or partially rounded, so that the boulder may roll, it must be placed in a crib made of hardwood timber fixed to the deck of the vehicle so that the boulder rests on both the deck and the timber, with at least three well-separated points of contact that prevent its tendency to roll in any direction.

(5) If a boulder is tapered, the narrowest end must point towards the front of the vehicle.

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(c) *General tiedown requirements.* (1) Only chain may be used as tiedowns to secure large boulders.

(2) Tiedowns which are in direct contact with the boulder should, where possible, be located in valleys or notches across the top of the boulder, and must be arranged to prevent sliding across the rock surface.

(d) *Securement of a cubic shaped boulder.* In addition to the requirements of paragraphs (b) and (c) of this section, the following rules must be satisfied:

(1) Each boulder must be secured individually with at least two chain tiedowns placed transversely across the vehicle.

(2) The aggregate working load limit of the tiedowns must be at least half the weight of the boulder.

(3) The tiedowns must be placed as closely as possible to the wood blocking used to support the boulder.

(e) *Securement of a non-cubic shaped boulder—with a stable base.* In addition to the requirements of paragraphs (b) and (c) of this section, the following rules must be satisfied:

(1) The boulder must be secured individually with at least two chain tiedowns forming an “X” pattern over the boulder.

(2) The aggregate working load limit of the tiedowns must be at least half the weight of the boulder.

(3) The tiedowns must pass over the center of the boulder and must be attached to each other at the intersection by a shackle or other connecting device.

(f) *Securement of a non-cubic shaped boulder—with an unstable base.* In addition to the requirements of paragraphs (b) and (c) of this section, each boulder must be secured by a combination of chain tiedowns as follows:

(1) One chain must surround the top of the boulder (at a point between one-half and two-thirds of its height). The working load limit of the chain must be at least half the weight of the boulder.

(2) Four chains must be attached to the surrounding chain and the vehicle to form a blocking mechanism which prevents any horizontal movement. Each chain must have a working load limit of at least one-fourth the weight of the boulder. Whenever practicable,

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the angle of the chains must not exceed 45 degrees from the horizontal.

**Subpart J—Frames, Cab and Body Components, Wheels, Steering, and Suspension Systems**

SOURCE: 53 FR 49402, Dec. 7, 1988, unless otherwise noted.

**§ 393.201 Frames.**

(a) The frame of every bus, truck, and truck tractor shall not be cracked, loose, sagging or broken.

(b) Bolts or brackets securing the cab or the body of the vehicle to the frame must not be loose, broken, or missing.

(c) The frame rail flanges between the axles shall not be bent, cut or notched, except as specified by the manufacturer.

(d) All accessories mounted to the truck tractor frame must be bolted or riveted.

(e) No holes shall be drilled in the top or bottom rail flanges, except as specified by the manufacturer.

(f) Field repairs are allowed.

**§ 393.203 Cab and body components.**

(a) The cab compartment doors or door parts used as an entrance or exist shall not be missing or broken. Doors shall not sag so that they cannot be properly opened or closed. No door shall be wired shut or otherwise secured in the closed position so that it cannot be readily opened. EXCEPTION: When the vehicle is loaded with pipe or bar stock that blocks the door and the cab has a roof exit.

(b) Bolts or brackets securing the cab or the body of the vehicle to the frame shall not be loose, broken, or missing.

(c) The hood must be securely fastened.

(d) All seats must be securely mounted.

(e) The front bumper must not be missing, loosely attached, or protruding beyond the confines of the vehicle so as to create a hazard.

**§ 393.205 Wheels.**

(a) Wheels and rims shall not be cracked or broken.

(b) Stud or bolt holes on the wheels shall not be elongated (out of round).

(c) Nuts or bolts shall not be missing or loose.

**§ 393.207 Suspension systems.**

(a) *Axles.* No axle positioning part shall be cracked, broken, loose or missing. All axles must be in proper alignment.

(b) *Adjustable axles.* Adjustable axle assemblies shall not have locking pins missing or disengaged.

(c) *Leaf springs.* No leaf spring shall be cracked, broken, or missing nor shifted out of position.

(d) *Coil springs.* No coil spring shall be cracked or broken.

(e) *Torsion bar.* No torsion bar or torsion bar suspension shall be cracked or broken.

(f) *Air suspensions.* The air pressure regulator valve shall not allow air into the suspension system until at least 55 psi is in the braking system. The vehicle shall be level (not tilting to the left or right). Air leakage shall not be greater than 3 psi in a 5-minute time period when the vehicle's air pressure gauge shows normal operating pressure.

**§ 393.209 Steering wheel systems.**

(a) The steering wheel shall be secured and must not have any spokes cracked through or missing.

(b) The steering wheel lash shall not exceed the following parameters:

Steering wheel diameter	Manual steering system	Power steering system
16" or less .....	2"+	4 1/2"+
18" .....	2 1/4"+	4 3/4"+
20" .....	2 1/2"+	5 1/4"+
22" .....	2 3/4"+	5 3/4"+

(c) *Steering column.* The steering column must be securely fastened.

(d) *Steering system.* Universal joints shall not be worn, faulty or repaired by welding. The steering gear box shall not have loose or missing mounting bolts or cracks in the gear box or mounting brackets. The pitman arm on the steering gear output shaft shall not be loose. Steering wheels shall turn freely through the limit of travel in both directions.

(e) *Power steering systems.* All components of the power system must be in operating condition. No parts shall be loose or broken. Belts shall not be frayed, cracked or slipping. The system shall not leak. The power steering system shall have sufficient fluid in the reservoir.

**PART 394 [RESERVED]**

**PART 395—HOURS OF SERVICE OF DRIVERS**

- Sec.
- 395.1 Scope of rules in this part.
- 395.2 Definitions.
- 395.3 Maximum driving time for property-carrying vehicles.
- 395.5 Maximum driving time for passenger-carrying vehicles.
- 395.7 [Reserved]
- 395.8 Driver's record of duty status.
- 395.10-395.12 [Reserved]
- 395.13 Drivers declared out of service.
- 395.15 Automatic on-board recording devices.

AUTHORITY: 49 U.S.C. 504, 14122, 31133, 31136, and 31502; sec. 113, Pub. L. 103-311, 108 Stat. 1673, 1676; and 49 CFR 1.73.

SOURCE: 33 FR 19758, Dec. 25, 1968, unless otherwise noted.

EDITORIAL NOTE: Nomenclature changes to part 395 appear at 66 FR 49874, Oct. 1, 2001.

**§ 395.1 Scope of rules in this part.**

(a) *General.* (1) The rules in this part apply to all motor carriers and drivers, except as provided in paragraphs (b) through (n) of this section.

(2) The exceptions from Federal requirements contained in paragraphs (l) through (n) do not preempt State laws and regulations governing the safe operation of commercial motor vehicles.

(b) *Adverse driving conditions.* (1) Except as provided in paragraph (h)(2) of this section, a driver who encounters adverse driving conditions, as defined in § 395.2, and cannot, because of those conditions, safely complete the run within the maximum driving time permitted by §§ 395.3(a) or 395.5(a) may drive and be permitted or required to drive a commercial motor vehicle for not more than 2 additional hours in order to complete that run or to reach a place offering safety for the occupants of the commercial motor vehicle