

(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) 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.

[67 FR 61225, Sept. 27, 2002, as amended at 71 FR 35833, June 22, 2006]

§ 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 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) *Aggregate working load limit for tiedowns.* The aggregate working load limit of tiedowns 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 the working load limit of each tiedown that goes from an anchor point on the vehicle to an anchor point on an article of cargo;

(2) One-half the working load limit of each tiedown that is attached to an anchor point on the vehicle, passes through, over, or around the article of cargo, and is then attached to an anchor point on the same side of the vehicle.

(3) The working load limit for each tiedown that goes from an anchor point on the vehicle, through, over, or around the article of cargo, and then attaches to another anchor point on the other side of the vehicle.

[67 FR 61225, Sept. 27, 2002, as amended at 68 FR 56208, Sept. 30, 2003; 71 FR 35833, June 22, 2006]

§ 393.108 How is the working load limit of a tiedown, or the load restraining value of a friction mat, 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

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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) |

MANILA ROPE—Continued

| Diameter mm (inches) | WLL kg (pounds) |
|----------------------|-----------------|
| 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) |

POLYESTER FIBER ROPE WLL (3-STRAND AND 8-STRAND CONSTRUCTIONS)—Continued

| Diameter mm (inches) | WLL kg (pounds) |
|----------------------|-----------------|
| 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) |
| 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 × thickness mm (inches) | WLL kg (pounds) |
|-------------------------------|-----------------|
| 31.7 × .74 (1 1/4 × 0.029) | 540 (1,190) |
| 31.7 × .79 (1 1/4 × 0.031) | 540 (1,190) |
| 31.7 × .89 (1 1/4 × 0.035) | 540 (1,190) |
| 31.7 × 1.12 (1 1/4 × 0.044) | 770 (1,690) |
| 31.7 × 1.27 (1 1/4 × 0.05) | 770 (1,690) |
| 31.7 × 1.5 (1 1/4 × 0.057) | 870 (1,925) |
| 50.8 × 1.12 (2 × 0.044) | 1,200 (2,650) |
| 50.8 × 1.27 (2 × 0.05) | 1,200 (2,650) |

§ 393.110 What else do I have to do to determine the minimum number of tiedowns?

(a) When tiedowns are used as part of a cargo securement system, 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. These requirements are in addition to the rules under § 393.106.

(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 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) of 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.

[67 FR 61225, Sept. 27, 2002, as amended at 71 FR 35833, June 22, 2006]

§ 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