

*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 Sec. 393.106(b).

(c) *Equivalent means of securement.* The means of securing articles of cargo are considered to meet the performance requirements of this section if the cargo is “

(1) Immobilized, such so that it cannot shift or tip to the extent that the vehicle's stability or maneuverability is adversely affected; or

(2) Transported in a sided vehicle that has walls of adequate strength, such that each article of cargo within the vehicle is in contact with, or sufficiently close to a wall or other articles, so that it cannot shift or tip to the extent that the vehicle's stability or maneuverability is adversely affected; or

(3) Secured in accordance with the applicable requirements of §§393.104 through 393.136.

[71 FR 35832, June 22, 2006]

**§ 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 vehicle must be capable of meeting the requirements of § 393.102.

(b) *Prohibition on the use of damaged securement devices.* All tiedowns, cargo

securement 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, such as, but not limited to, cracks or cuts that will adversely affect their performance for cargo securement purposes, including reducing the working load limit.

(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, such as, but not limited to, cracks or cuts that will adversely affect their performance for cargo securement purposes, including reducing the working load limit.

(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, dated September 28, 2005. <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.

(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