10. Heavy Vehicles, Equipment, and Machinery

What Does This Section Cover? (Section 3.8.1)

The requirements in this section apply to the transportation of heavy vehicles, equipment, and machinery that:

- Operate on wheels or tracks, such as front end loaders, bulldozers, tractors, and power shovels.
- Individually weigh more than 4500 kg (10,000 lb.).

Vehicles, equipment, and machinery that are lighter than 4500kg (10,000 lb.) may also be secured in accordance with the provisions of this section, as well as with the general cargo securement requirements (Section 2) or Section 9, Automobiles, Light Trucks, and Vans.

Preparing Equipment To Be Transported (Section 3.8.2)

Requirements

- Lower and secure to the vehicle all accessory equipment (hydraulic shovels, booms, etc.).
- Restrain articulated vehicles to prevent articulation while in transit.

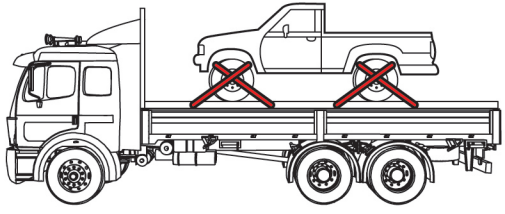
Parking Brake

- Set the parking brake on the equipment being transported.

Special Circumstances: Securing Heavy Vehicles, Equipment, or Machinery with Crawler Tracks or Wheels (Section 3.8.2.1)

Tiedown requirements

- Restrain cargo using a minimum of four tiedowns, each having a WLL of at least 2,268 kg (5,000 lb.).
  - Prevents cargo movement in the side-to-side, forward, rearward, and vertical directions.
- Attach tiedowns:
  - Either at the front and rear of the vehicle.
  - Or at the mounting points on the vehicle designed for that purpose.



Cargo is restrained using at least 4 tiedowns

More tiedowns may be required to satisfy the general cargo securement requirements (Section 2) that state: "The sum of the working load limits from all tiedowns must be at least 50% of the weight of the cargo."

Federal Motor Carrier Safety Administration

49 CFR 393 Parts and Accessories Necessary for Safe Operation

§393.108 How is the working load limit of a tiedown determined?

[Editor's Note: The section heading is revised effective July 24, 2006.]

(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.

(e)(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 x 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 ¾)	790(1,750)
50 (2)	910(2,000)
75 (3)	1,360(3,000)
100 (4)	1,810(4,000)

Wire Rope (6 x 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)
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 ¼ x 0.029)	540(1,190)
31.7 x .79 (1 ¼ x 0.031)	540(1,190)
31.7 x .89 (1 ¼ x 0.035)	540(1,190)
31.7 x 1.12 (1 ¼ x 0.044)	770(1,690)
31.7 x 1.27 (1 ¼ x 0.05)	770(1,690)
31.7 x 1.5 (1 ¼ 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)

[67 FR 61227, Sep. 27, 2002; 71 FR 35833, June 22, 2006]