

DEPARTMENT OF TRANSPORTATION
Federal Motor Carrier Safety Administration
49 CFR Part 393



Protection Against Shifting and Falling Cargo

(Includes amendments of final rule issued June 22, 2006)

§393.5 Definitions.

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.

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

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.

Crib-type log trailer means a trailer equipped with stakes, bunks, a front-end structure, and a rear structure to restrain logs. The stakes prevent movement of the logs from side to side on the vehicle while the front-end and rear structures prevent movement of the logs from front to back on the vehicle.

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.

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.

g. The acceleration due to gravity, 32.2 ft/sec² (9.823 m/sec²).

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.



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.

Longwood means all logs, including utility poles, that are not shortwood, i.e., that are over 4.9 m (16 feet) long. Such logs are usually described as long logs or treelength.

Metal coil means an article of cargo comprised of elements, mixtures, compounds, or alloys commonly known as metal, metal foil, metal leaf, forged metal, stamped metal, metal wire, metal rod, or metal chain that are packaged as a roll, coil, spool, wind, or wrap, including plastic or rubber coated electrical wire and communications cable.

Rail vehicle. A vehicle whose skeletal structure is fitted with stakes at the front and rear to contain logs loaded crosswise.

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.

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.

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.

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.

§393.100 Application & Objectives



(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 vehicle's stability or maneuverability is adversely affected.

§393.102 Minimum Performance Criteria

(a) *Performance criteria*

(1) *Breaking Strength*. 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 be designed, installed, and maintained to ensure that the maximum forces acting on the devices or systems do not exceed the manufacturer's breaking strength rating under the following conditions, applied separately:

- (i) 0.8 g deceleration in the forward direction;
- (ii) 0.5 g acceleration in the rearward direction; and
- (iii) 0.5 g acceleration in a lateral direction.

(2) *Working Load Limit*. 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 be designed, installed, and maintained to ensure that the forces acting on the devices or systems do not exceed the working load limit for the devices under the following conditions, applied separately:

- (i) 0.435 g deceleration in the forward direction;
- (ii) 0.5 g acceleration in the rearward direction; and
- (iii) 0.25 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 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.

§393.104 Securement Devices & Systems

(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: (refer to table on following page)

(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 General Securing Requirements

(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 of 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.



Table to §393.104(e)

Manufacturing Standards for Tiedown Assemblies

An assembly Component of	Must conform to
(1) Steel strapping ^{1,2}	Standard Specification for Strapping, Flat Steel and Seals, American Society for Testing and Materials (ASTM) D3953-97, February 1998.
(2) Chain	National Association of Chain Manufacturers' Welded Steel Chain Specifications, November 15, 1999.
(3) Webbing	Web Sling and Tiedown Association's Recommended Standard Specification for Synthetic Web Tiedowns, WSTDA-T1, 1998.
(4) Wire rope ³	Wire Rope Technical Board's Wire Rope Users Manual, 2nd Edition, November 1985.
(5) Cordage	Cordage Institute rope standard: (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, 3-Strand and 8-Strand Standard Construction, May 1979; (iv) NRS-1, Nylon Rope Specifications, 3-Strand and 8- Strand Standard Construction, May 19794; and (v) C-1, Double Braided Nylon Rope Specifications DBN, January 1984.

¹ 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.

² 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.

³ 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.

§393.108 Working Load Limit



(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 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.



Table - Working Load Limits (WLL) for Chain

Chain Size in millimeters (inches)	Unmarked Chain	Grade 30 proof coil	Grade 43 high test	Grade 70 transport	Grade 80 alloy	Grade 100 alloy
Chain Marking	<i>None</i>	<i>3, 30, 300</i>	<i>4, 43, 430</i>	<i>7, 70, 700</i>	<i>8, 80, 800</i>	<i>10, 100, 1000</i>
7mm (1/4in)	580kg (1,300lb)	580kg (1,300lb)	1,180kg (2,600lb)	1,430kg (3,150lb)	1,570kg (3,500lb)	1,950kg (4,300lb)
8 mm (5/16in)	860kg (1,900lb)	860kg (1,900lb)	1,770kg (3,900lb)	2,130kg (4,700lb)	2,000kg (4,500lb)	2,600kg (5,700lb)
10 mm (3/8in)	1,200kg (2,650lb)	1,200kg (2,650lb)	2,450kg (5,400lb)	2,990kg (6,600lb)	3,200kg (7,100lb)	4,000kg (8,800lb)
11 mm (7/16in)	1,680kg (3,700lb)	1,680kg (3,700lb)	3,270kg (7,200lb)	3,970kg (8,750lb)	n/a	n/a
13 mm (1/2in)	2,030kg (4,500lb)	2,030kg (4,500lb)	4,170kg (9,200lb)	5,130kg (11,300lb)	5,400kg (12,000lb)	6,800kg (15,000lb)
16 mm (5/8in)	3,130kg (6,900lb)	3,130kg (6,900lb)	5,910kg (13,000lb)	7,170kg (15,800lb)	8,200kg (18,100lb)	10,300kg (22,600lb)



Working Load Limits (WLL)

Wire Rope		Steel Strapping		Synthetic Webbing	
Size	WLL	Size	WLL	Width	WLL
7mm (1/4in)	640kg (1,400lb)	31.7 x .74mm (1-1/4 x 0.029in)	540kg (1,190lb.)	45mm (1 3/4in)	790kg (1,750lb)
8mm (5/16in)	950kg (2,100lb)	31.7 x .79mm (1-1/4 x 0.031in)	540kg (1,190lb.)	50mm (2in)	910kg (2,000lb)
10mm (3/8 in)	1,360kg (3,000 lb)	31.7 x .89mm (1-1/4 x 0.035in)	540kg (1,190lb)	75mm (3in)	1,360kg (3,000lb)
11mm (7/16in)	1,860kg (4,100lb)	31.7 x 1.12mm (1-1/4 x 0.044in)	770kg (1,690lb)	100mm (4in)	1,810kg (4,000lb)
13mm (1/2in)	2,400kg (5,300lb)	31.7 x 1.27mm (1-1/4 x 0.050in)	770kg (1,690lb)		
16mm (5/8 in)	3,770kg (8,300 lb)	31.7 x 1.5mm (1-1/4 x 0.057in)	870kg (1,925lb)		
20mm (3/4in)	4,940kg (10,900lb)	50.8 x 1.12mm (2 x 0.044in)	1200kg (2,650lb)		
22mm (7/8in)	7,300kg (16,100lb)	50.8 x 1.27mm (2 x 0.050in)	1200kg (2,650lb)		
25mm (1in)	9,480kg (20,900lb)				

Working Load Limits (WLL) for Natural and Synthetic Fiber Rope

Manila		Polypropylene (3 & 8 Strand)		Polyester (3 & 8 Strand)		Nylon		Double Braided Nylon	
Size	WLL	Size	WLL	Size	WLL	Size	WLL	Size	WLL
10mm (3/8in)	90kg (205lb)	10mm (3/8in)	180kg (400lb)	10mm (3/8in)	250kg (555lb)	10mm (3/8in)	130kg (278lb)	10mm (3/8in)	150kg (336lb)
11mm (7/16in)	120kg (265lb)	11mm (7/16in)	240kg (525lb)	11mm (7/16in)	340kg (750lb)	11mm (7/16in)	190kg (410lb)	11mm (7/16in)	230kg (502lb)
13mm (1/2in)	150kg (315lb)	13mm (1/2in)	280kg (625lb)	13mm (1/2in)	440kg (960lb)	13mm (1/2in)	240kg (525lb)	13mm (1/2in)	300kg (655lb)
16mm (5/8in)	210kg (465lb)	16mm (5/8in)	420kg (925lb)	16mm (5/8in)	680kg (1,500lb)	16mm (5/8in)	420kg (935lb)	16mm (5/8in)	510kg (1,130lb)
20mm (3/4in)	290kg (640lb)	20mm (3/4in)	580kg (1,275lb)	20mm (3/4in)	850kg (1,880lb)	20mm (3/4in)	640kg (1,420lb)	20mm (3/4in)	830kg (1,840lb)
25mm (1in)	480kg (1050lb)	25mm (1in)	950kg (2,100lb)	25mm (1in)	1,500kg (3,300lb)	25mm (1in)	1,140kg (2,520lb)	25mm (1in)	1,470kg (3,250lb)

§393.110 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 lbs (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 lbs (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.

§393.112 Adjustable Tiedowns

Each tiedown, or its associated connectors, or its attachment mechanisms must be designed, constructed, and maintained so the driver of an intransit commercial motor vehicle can tighten them. However, this requirement does not apply to the use of steel strapping.

§393.114 Front End Structures



(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 or 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 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 unless the logs:

(i) are transported in a crib-type log trailer (as defined in 49 CFR 393.5), and

(ii) are loaded in compliance with paragraphs (b)(2) and (c) of this section.

(4) The aggregate working load limit for tiedowns used to secure a stack of logs on a frame vehicle, or a flatbed vehicle equipped with bunks, bolsters, or stakes must be at least one-sixth the weight of the stack of logs.

(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.

(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.



(1) *Shortwood*. 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 cradled in a bunk unit or contained by stakes and

(i) Secured to the vehicle by at least two tiedowns, or

(ii) If all the logs in any stack are blocked in the front by a front-end structure strong enough to restrain the load, or by another stack of logs, and blocked in the rear by another stack of logs or vehicle end structure, the stack may be secured with one tiedown. If one tiedown is used, it must be positioned about midway between the stakes, or

(iii) Be bound by at least two tiedown-type devices such as wire rope, used as wrappers that encircle the entire load at locations along the load that provide effective securement. If wrappers are being used to bundle the logs together, the wrappers are not required to be attached to the vehicle.

(2) *Longwood*. Longwood must be cradled in two or more bunks and must either:

(i) Be secured to the vehicle by at least two tiedowns at locations that provide effective securement, or

(ii) Be bound by at least two tiedown-type devices, such as wire rope, used as wrappers that encircle the entire load at locations along the load that provide effective securement. If a wrapper(s) is being used to bundle the logs together, the wrapper is not required to be attached to the vehicle.

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 Securing Dressed Lumber & 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 as follows:

(1) If there are 3 tiers, the middle and top bundles must be secured by tiedowns in accordance with the general provisions of §§ 393.100 through 393.114; or

(2) If there are more than 3 tiers then;

(i) One of the middle bundles and the top bundle must be secured by tiedown devices in accordance with the general provision of §§ 393.100 through 393.114, and the maximum height for the middle tier that must be secured may not exceed 6 feet about the deck of the trailer; or

(ii) Otherwise, the second tier from the bottom must be secured in accordance with the general provisions of §§ 393.100 through 393.114; 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.

(5) When loaded in a sided vehicle or container of adequate strength, dressed lumber or similar building products may be secured in accordance with the general provisions of §§ 393.100 through 393.114.



§393.120 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 2,268 kg (5,000 lbs) or more. Shipments of metal coils that weigh less than 2,268 kg (5,000 lbs) 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 forward most 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 forward most 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, 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 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 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 in the 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 Securing Paper Rolls



(a) *Applicability.* The rules in this section apply to shipments of paper rolls which, individually or together, weigh 2,268 kg (5,000 lbs) or more. Shipments of paper rolls that weigh less than 2,268 kg (5,000 lbs), 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 has a width greater than 1.75 times its diameter and it is not prevented from tipping or falling forwards by vehicle structure or other cargo, then it must be prevented from tipping or falling forwards by banding it to other rolls, bracing, or tiedowns.

(iii) If the forwardmost roll(s) in a group of paper rolls has a width equal to or less than 1.75 times its diameter, and it is restrained against forward movement by friction mat(s) alone, then banding, bracing, or tiedowns are not required to prevent tipping or falling forwards.

(iv) If a paper roll or the forwardmost roll in a group of paper rolls has a width greater than 1.25 times its diameter, and it is not prevented from tipping or falling forwards by vehicle structure or other cargo, and it is not restrained against forward movement by friction mat(s) alone, then 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 raised using dunnage may not be secured by friction mats alone.

(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 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 x 15 cm (4 x 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.

(e) *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 though 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 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) 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 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) All lower corners of the 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;

(2) The amount of overhang for the empty container on the trailer does not exceed 5 feet on either the front or rear of the trailer;

(3) The empty intermodal container must not interfere with the vehicle's maneuverability;

(4) The empty intermodal container is secured to prevent lateral, longitudinal, or vertical shifting.



§393.128 Securing Automobiles, Light Trucks & Vans

(a) *Applicability.* The rules in this section apply to the transportation of automobiles, light trucks, and vans which individually weigh 4,536 kg. (10,000 lbs) or less. Vehicles which individually are heavier than 4,536 kg (10,000 lbs) 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 Securing Heavy Vehicles, Equipment & 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 lbs) or more. Vehicles, equipment and machinery which is lighter than 4,536 kg (10,000 lbs) 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, 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 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 except that such webbing may be used to connect wire rope or chain to anchor points on the commercial motor vehicle. However, the webbing (regardless of whether edge protection is used) must not come into contact with the flattened or crushed cars.

(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 direction for which there is a 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 liquids from leaking from the bottom of the vehicle, and loose parts from falling from the bottom and all four sides of the vehicle extending 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 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 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 lbs) 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 lbs), but less than 5,000 kg (11,000 lbs) 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 x 10 cm (4 in x 4 in) 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.

(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, the angle of the chains must not exceed 45 degrees from the horizontal.