SAFETY & COMPLIANCE RESOURCE

Securement Quick Reference

A practical field guide to FMCSA cargo securement requirements under 49 CFR Part 393, Subparts F & I. Designed for commercial drivers, fleet managers, and safety directors as a cab-ready reference for daily operations.

Prepared By	First Underwriters Insurance Brokers
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1. General Securement Rules

Federal Motor Carrier Safety Administration (FMCSA) regulations under 49 CFR Part 393 require that all cargo transported on commercial motor vehicles be properly contained, immobilized, or secured to prevent it from shifting, falling, or otherwise creating a hazard. These rules apply to all vehicles with a GVWR of 10,001 lbs or more.

The 4 Fundamental Principles

Every securement method must prevent the cargo from moving in all four directions: forward, rearward, and to each side. Specifically, the securement system must withstand the following deceleration and acceleration forces:

Direction	Force	Equivalent
Forward (braking)	0.8g	80% of cargo weight
Rearward (acceleration)	0.5g	50% of cargo weight
Lateral (side-to-side)	0.5g	50% of cargo weight
Vertical (upward)	0.2g	20% of cargo weight

CRITICAL RULE: Aggregate Working Load Limit

The aggregate WLL of all tiedowns used to secure an article must be at least 50% of the weight of the article. This is the single most important number to know. For example, a 20,000 lb load requires tiedowns with a combined WLL of at least 10,000 lbs.

Securement Methods Recognized by FMCSA

Method	Description
Tiedowns	Chains, straps, wire rope, or cord attached to the vehicle and cargo to restrain movement
Blocking	Material placed in direct contact with cargo to prevent horizontal movement
Bracing	Bars, posts, or other rigid devices placed against cargo and fixed to the vehicle structure
Friction Mats	Rubber or textured mats placed between cargo and deck to increase friction
Cargo Nets / Tarps	Nets, tarps, or other flexible devices that cover and restrain cargo (must meet WLL)
Vehicle Structure	Headboard, bulkhead, sides, or doors that meet strength requirements

Method	Description
Combination	Most loads require a combination of methods for full compliance

2. Working Load Limit (WLL) Reference

The Working Load Limit (WLL) is the maximum load that a tiedown component may be subjected to during normal service. Always use the WLL stamped or marked on the device. If no WLL is marked, the tiedown must not be used. The tables below provide standard WLL values from 49 CFR 393.108.

Chain WLL by Grade & Size

Size	Grade 30	Grade 43	Grade 70	Grade 80/100
1/4"	3,150	3,500	---	---
5/16"	3,900	4,700	4,700	---
3/8"	5,400	6,600	7,100	8,750
7/16"	---	---	---	11,300
1/2"	9,200	11,300	12,000	15,800
5/8"	13,000	16,200	18,100	22,600
3/4"	18,800	23,000	24,500	31,300
7/8"	---	28,300	---	43,000
1"	---	---	---	57,000

Values in lbs. "---" = not commonly available in that grade.

Synthetic Web Strap WLL

Width	Flat (no ratchet)	With Ratchet
1"	---	1,100
2"	1,667	3,333
3"	2,500	5,000
4"	3,333	6,667

These are typical rated values. Always verify the WLL marked on the strap label. Damaged, frayed, knotted, or UV-degraded straps must be removed from service.

Wire Rope WLL

Diameter	WLL (lbs)
3/8"	2,400
7/16"	3,360
1/2"	4,320
9/16"	5,520
5/8"	6,720
3/4"	9,360
7/8"	12,000

Based on 6x19 classification wire rope with independent wire rope core (IWRC).

3. Tiedown Requirements by Weight & Length

Minimum Number of Tiedowns

The number of tiedowns required depends on the length and weight of the article being secured. These are the minimums mandated by 49 CFR 393.106 — additional tiedowns may be needed to meet the aggregate WLL requirement.

Article Length / Weight	Minimum Tiedowns Required
5 ft or less, 1,100 lbs or less	1 tiedown
5 ft or less, more than 1,100 lbs	2 tiedowns
Greater than 5 ft but 10 ft or less	2 tiedowns
Greater than 10 ft	2 tiedowns + 1 for each additional 10 ft (or fraction)

Quick Count Formula

For articles over 10 ft long: Minimum tiedowns = 2 + [(Length - 10) / 10], rounded up. Example: A 27-ft beam = 2 + (17/10) = 2 + 1.7 = 4 tiedowns minimum. Always verify that the aggregate WLL of all tiedowns meets or exceeds 50% of the article's weight.

Tiedown Angle Adjustment Factors

When tiedowns are not applied vertically, their effective WLL is reduced based on the angle between the tiedown and the deck. The lower the angle, the less effective the tiedown. Consequently, it is important to keep tiedown angles as steep as practical.

Angle (degrees)	Adjustment Factor	Effective WLL
90 (vertical)	1.00	100%
75	0.97	97%
60	0.87	87%
45	0.71	71%
30	0.50	50%

WARNING: Low-Angle Tiedowns

At a 30-degree angle, a tiedown only provides 50% of its rated WLL. This means you may need twice as many tiedowns to meet aggregate WLL requirements. Never use tiedowns at angles less than 30 degrees from the horizontal — they are virtually ineffective at restraining cargo.

4. Commodity-Specific Securement Rules

49 CFR 393 Subpart I contains additional securement requirements for specific types of commodities. These rules are in addition to — not instead of — the general securement requirements. Below is a summary of the most commonly hauled commodities with specific rules.

4.1 Logs (393.116)

Logs must be transported on vehicles designed and built specifically for log transport, or on flatbeds with standards (stakes/bolsters) that meet structural requirements. Key rules include:

- Each stack must be secured by at least 2 tiedowns (if shortwood) or by the vehicle structure plus tiedowns
- Outer logs must be in contact with at least 2 stakes, bunks, or bolsters
- No log may extend more than 1/3 of its total length beyond the last support point
- Tiedowns must be positioned at the top one-third of the stack to prevent rolling

4.2 Metal Coils (393.120)

Metal coils are among the most dangerous cargo types because of their extreme weight and tendency to roll. Securement depends on the coil's eye orientation:

Orientation	Securement Requirements
Eyes crosswise (perpendicular to travel)	Each coil: cradle or chock to prevent rolling + tiedowns. Up to 5,000 lbs: 1 tiedown per coil. Over 5,000 lbs: Blocking/bracing front and rear + tiedowns through the eye or over the top.
Eyes lengthwise (parallel to travel)	Timbers, cradles, or wedges to prevent rolling. Must have blocking to prevent forward and rearward movement. Over 5,000 lbs: at least 3 tiedowns (1 at front third, 1 at rear third, 1 over the top).
Eyes vertical (standing on end)	Must sit on a flat surface or friction mat. Must be blocked or braced to prevent tipping in all directions. At least 4 tiedowns for any coil over 5,000 lbs.

4.3 Concrete Pipe (393.122)

- Pipe must be prevented from rolling by blocking, wedging, or cradles
- Up to 45 inches in diameter: At least 1 tiedown per pipe or per group of bundled pipe
- Over 45 inches in diameter: At least 2 tiedowns per pipe
- Bell-end pipe must have bells alternating or all on same end with blocking to prevent nesting

4.4 Intermodal Containers (393.118)

- Must be secured to the chassis or vehicle by twist locks, clamps, or other locking devices at all four corners
- All four securing devices must be engaged and locked before transport
- Empty containers must be secured the same as loaded containers
- Container chassis must be properly coupled and locked to the tractor

4.5 Automobiles, Light Trucks & Vans (393.124)

- At least 2 tiedowns at the front and 2 at the rear (4 total minimum per vehicle)
- Tiedowns must attach to the frame, axle, or a designated securement point — never to bumpers, mirrors, or body trim
- Vehicles must be in park (automatic) or in gear (manual) with the parking brake set
- All loose or detachable parts must be secured or removed
- Tiedowns must restrain against lateral, forward, rearward, and vertical movement

4.6 Heavy Vehicles, Equipment & Machinery (393.126)

- Must use chains or wire rope rated for the load — synthetic straps alone are generally insufficient
- Must be restrained against forward, rearward, lateral, and vertical movement
- At least 4 tiedowns for items over 10,000 lbs
- Crawler or tracked equipment must have tracks and blades lowered and secured
- Articulated vehicles must have the steering/articulation mechanism locked or secured
- All buckets, blades, booms, and attachments must be fully lowered and secured

4.7 Crushed or Flattened Vehicles (393.128)

- Stacks may not extend above the sides of the vehicle unless additional tiedowns are used
- At least 2 tiedowns per stack for stacks up to 4 ft, plus 1 additional per each additional 2 ft
- If transported without sides: 4 tiedowns per stack minimum, over the top and through the stack

4.8 Dressed Lumber & Similar Building Materials (393.110)

- Bundles must be tightly banded or wrapped by the shipper before transport
- Bundles must be blocked to prevent lateral and longitudinal movement
- Follow the standard tiedown count: 2 tiedowns for lengths up to 10 ft, plus 1 per additional 10 ft
- Friction mats or anti-skid material must be used when deck is smooth steel

4.9 Boulders (393.132)

- Each boulder must be supported on at least 2 pieces of blocking or cradle material
- Boulders weighing more than 11,000 lbs must each be individually secured with at least 2 chain tiedowns
- The aggregate WLL must equal or exceed the boulder's weight (not the standard 50%)
- Boulders must not be stacked unless a specific securement plan is documented

5. Pre-Trip Securement Inspection Checklist

Use this checklist before every trip and at each en-route inspection point. Federal law requires drivers to inspect cargo securement within the first 50 miles and then every 150 miles or every 3 hours (whichever comes first). This checklist mirrors those requirements.

Tiedown Condition

- ■ All straps, chains, and wire ropes are free of cuts, fraying, kinks, or knots
- ■ Ratchets and tensioning devices are functioning properly and fully engaged
- ■ Hooks, shackles, and anchor points are not cracked, bent, or corroded
- ■ WLL markings are legible on all tiedowns in use
- ■ No tiedowns are dragging on the ground or contacting tires

Load Securement

- ■ Cargo has not shifted, leaned, or settled since last inspection
- ■ All tiedowns remain tight — re-tension any that have loosened
- ■ Aggregate WLL of all tiedowns equals or exceeds 50% of cargo weight
- ■ Tiedowns are spaced evenly and positioned to prevent forward, rearward, and lateral movement
- ■ Edge protection is in place wherever tiedowns contact sharp edges

Blocking & Bracing

- ■ Blocking material is firmly in contact with cargo and vehicle structure
- ■ Bracing bars or posts are properly wedged and secured
- ■ Friction mats have not shifted or bunched
- ■ Headboard/bulkhead is intact and free of damage
- ■ Side rails or stakes are upright and properly pinned (if applicable)

Vehicle & Deck

- ■ Deck surface is clean and free of oil, ice, gravel, or debris
- ■ Anchor points and stake pockets are undamaged and free of corrosion
- ■ Coaming rail (side rail) is structurally sound
- ■ Rub rails and winch tracks are secure and functioning
- ■ Lights and reflectors are not blocked by cargo or securement devices

Documentation & Compliance

- ■ Driver has verified cargo weight against tiedown capacity calculations
- ■ Load is within legal axle weight limits and does not exceed GVWR
- ■ Oversize/overweight permits are on board (if required)
- ■ Hazmat placards are displayed correctly (if applicable)

- Securement inspection time and location are logged

INSPECTION TIP

Develop a consistent walk-around pattern — start at the driver door and work clockwise. Check every tiedown by hand: tug chains for tension, press straps for slack, and visually confirm every hook and ratchet. A disciplined routine catches problems that a casual glance misses.

6. Common Violations & How to Avoid Them

Cargo securement violations are among the most frequently cited in FMCSA roadside inspections. Many result in out-of-service (OOS) orders, which shut down the vehicle until the violation is corrected — costing time, money, and CSA points. Here are the most common violations and how to prevent them.

Violation	What Goes Wrong	How to Prevent It
Insufficient tiedowns	Not enough tiedowns for the length/weight of the article	Count tiedowns against the 393.106 table before departure. Verify aggregate WLL.
Loose tiedowns	Straps or chains have slack and are not providing restraint	Re-tension at every inspection stop. Replace ratchets that will not hold tension.
Damaged tiedowns	Frayed straps, stretched links, cracked hooks, or corroded hardware	Inspect before every use. Remove damaged equipment from service immediately.
No edge protection	Straps contact sharp metal edges, causing cuts and potential failure	Use corner protectors or rubber edge guards wherever straps cross sharp edges.
Improper blocking	Blocking not in firm contact with cargo, or not secured to the deck	Ensure blocking is tight against cargo with no gaps. Nail or secure to deck if needed.
Missing headboard	No front-end structure to prevent forward cargo shift	Use a rated headboard, bulkhead, or additional front tiedowns to prevent forward shift.
WLL not marked	Using tiedowns without legible WLL markings	Only use tiedowns with readable WLL labels. Retire unmarked equipment.
Failure to re-inspect	Driver did not inspect within 50 miles or every 3 hours	Set odometer reminders. Log each inspection in your trip record.

CSA IMPACT

Cargo securement violations fall under the FMCSA Cargo-Related BASIC. Accumulating points above the intervention threshold can trigger carrier investigations, increased inspections, and higher insurance premiums. Furthermore, a single out-of-service order stays on your record for 24 months. Prevention is always cheaper than the consequence.

7. Quick-Reference Formulas & Conversions

Essential Securement Formulas

Formula	Calculation	Notes
Minimum Aggregate WLL	= Cargo Weight x 0.5	Total WLL of all tiedowns must be at least half the cargo weight.
Tiedown Count (over 10 ft)	= 2 + [(Length - 10) / 10] rounded up	Minimum tiedowns by article length; still must meet WLL.
Adjusted WLL (by angle)	= Rated WLL x Angle Factor	Multiply by factor from angle table (e.g., 45 degrees = 0.71).
Friction Contribution	= Weight x Friction Coefficient	Rubber mat on steel ~ 0.6; wood on steel ~ 0.3; steel on steel ~ 0.2.

Common Friction Coefficients

Surface Combination	Coefficient Range	Notes
Rubber on steel (friction mat)	0.55 - 0.70	Most effective non-tiedown method
Wood on steel (pallets on deck)	0.25 - 0.35	Common but limited; tiedowns still required
Steel on steel (coils on flatbed)	0.15 - 0.25	Very low friction; maximum tiedowns needed
Rubber on wood	0.50 - 0.65	Good contact surface for mixed loads
Concrete on steel	0.20 - 0.30	Similar to wood; block and tie generously

Unit Conversions

Unit	Equivalent
1 short ton	= 2,000 lbs
1 metric ton	= 2,205 lbs
1 kilogram	= 2.205 lbs
1 foot	= 0.305 meters

1 meter	= 3.281 feet
1 g (gravity)	= 32.2 ft/s^2

WORKED EXAMPLE

You have a 24,000 lb steel coil (eyes lengthwise) on a flatbed. Required aggregate WLL = 24,000 x 0.5 = 12,000 lbs. You are using 3/8" Grade 70 chain (WLL = 7,100 lbs each) at a 60-degree angle (factor = 0.87). Adjusted WLL per chain = 7,100 x 0.87 = 6,177 lbs. You would need at least 2 chains to reach 12,354 lbs (exceeds 12,000). However, coil-specific rules in 393.120 require at least 3 tiedowns, so use 3 chains.

8. Emergency Contact & Reporting

If cargo becomes unsecured during transit, creates a road hazard, or is involved in a spill or accident, take the following steps immediately:

1. **Ensure safety first.** Pull over to a safe location. Activate hazard flashers. If cargo is blocking the roadway, call 911 immediately.
2. **Assess the situation.** Do not attempt to re-secure heavy cargo on an active roadway. Wait for emergency services or a qualified crew if conditions are unsafe.
3. **Notify your dispatcher or fleet manager.** Report the situation, your location, and whether emergency services are needed.
4. **Document everything.** Take photographs of the cargo, securement equipment, road conditions, and any damage. Note the time, location, weather, and what happened.
5. **Contact First Underwriters.** Report the incident to our claims team as soon as possible so we can begin the insurance process on your behalf.
6. **Do not admit fault.** Cooperate with law enforcement, but do not make statements about liability at the scene. Let the investigation determine responsibility.

Key Contact Information

Contact	Phone	Email / Web
First Underwriters — Claims	(425) 242-5357	claims@firstunderwriters.com
First Underwriters — Main	(425) 242-5357	info@firstunderwriters.com
FMCSA Safety Hotline	1-888-327-4236	nccdb.fmcsa.dot.gov
National Response Center (Hazmat Spills)	1-800-424-8802	nrc.uscg.mil
Roadside Assistance (fleet)	[Your Provider #]	[Update as needed]

Regulatory References

- 49 CFR 393.100 — Applicability and definitions
- 49 CFR 393.102 — Securement systems (general performance criteria)
- 49 CFR 393.104 — Blocking and bracing
- 49 CFR 393.106 — Tiedown requirements (number, aggregate WLL)
- 49 CFR 393.108 — Working load limits table

- 49 CFR 393.110 — Dressed lumber and similar building products
- 49 CFR 393.116 — Logs
- 49 CFR 393.118 — Intermodal containers
- 49 CFR 393.120 — Metal coils
- 49 CFR 393.122 — Concrete pipe
- 49 CFR 393.124 — Automobiles, light trucks, and vans
- 49 CFR 393.126 — Heavy vehicles, equipment, and machinery
- 49 CFR 393.128 — Crushed or flattened vehicles
- 49 CFR 393.130 — Roll-on / roll-off containers
- 49 CFR 393.132 — Boulders
- 49 CFR 393.134 — Paper rolls, coils, and similar

End of Document

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