



**Department of
Motor Vehicles**

**DRIVER'S MANUAL FOR THE
SAFE SECUREMENT
OF
METAL COILS
AND
OTHER CARGO**



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INTRODUCTION

Cargo being transported on the highway must remain secured on or within the transporting vehicle. The Federal Motor Carrier Safety Administration (FMCSA) has established regulations in Title 49 CFR Part 393.100-136 that specify proper loading and securement requirements for cargo transported on public roads by commercial motor vehicles (CMVs). The regulations may be accessed at www.FMCSA.dot.gov (search: 49 CFR 393).

Although these regulations, by Federal definition, pertain to interstate transportation by commercial transporters, they have been adopted by all states, including New York, for commercial transportation (New York State Transportation Law Section 140 together with Commissioner's Regulation 17 NYCRR 820.5 and New York State Vehicle & Traffic Law Sections 377-378 together with Commissioner's Regulation 15 NYCRR 48.1). The intent of the regulations is to prevent/reduce the number of crashes caused by cargo shifting on, within, or falling from ALL vehicles operating in New York State.

The regulations include general cargo securement rules for all types of cargo (with certain exceptions); those rules are covered in this manual. There are also some commodity-specific rules for certain products, including metal coils. The metal coil specific rules are also explained in this manual.

You need a New York State commercial driver license (CDL) with a metal coil endorsement (M) if you are driving a CMV as defined in New York State Vehicle and Traffic Law §501-a(4) and transporting 5,000 or more pounds of metal coil. Section 501(2)(b)(ix) of the New York State Vehicle and Traffic Law together with Commissioner's Regulations 15 NYCRR 3.2(b)(1)(i), (a) and (b) require the metal coil endorsement when transporting metal coils within the state that, individually or bundled together, weigh 5,000 pounds or more. CMV operators licensed by another state are not required to have this endorsement when transporting metal coils through New York State.

You must hold a Class A, B or C license and pass a written metal coil knowledge test to qualify for the metal coil endorsement (it will be identified as the code "M" on the endorsement section of your license).

The metal coil knowledge test is based on the material presented in this manual. Cargo securement terms are italicized throughout the manual and are defined on pages 4.1 and 4.2. At the test site, you will be given a copy of the Working Load Limit Table (see page 2.7) to use in answering some of the test questions.



DRIVER LICENSE CLASS DESCRIPTIONS

License Class / (Minimum Age)	Vehicle Type	Vehicle Descriptions	Endorsement Codes
A (21)	Combination— such as tractor-trailer or truck- trailer	<ul style="list-style-type: none"> Gross combination weight rating (GCWR) of more than 26,000 pounds provided the gross vehicle weight rating (GVWR) or GCWR of vehicle(s) being towed is more than 10,000 pounds. 	H**, M, N, P, S, T, W, X** Commercial Learner Permit (CLP) Limited to: M, N, P, S, W
B (21) (18 - No interstate commerce. Cannot transport hazardous materials or operate a school bus.)	Single— such as heavy single unit truck or bus	<ul style="list-style-type: none"> GVWR of more than 26,000 pounds (Class B may tow vehicles with a GVWR of 10,000 pounds or less, or may tow a vehicle of more than 10,000 pounds providing the GCWR is not more than 26,000 pounds) 	H**, M, N, P, S, W, X** Commercial Learner Permit (CLP) Limited to: M, N, P, S, W
CDL C (21) (18 - No interstate commerce. Cannot transport hazardous materials or operate a school bus.)	Single— such as single unit truck or bus	<ul style="list-style-type: none"> GVWR of 26,000 pounds or less that: <ul style="list-style-type: none"> - Transports 15 or more passengers; OR - V & T Law, OR - Carries Hazardous Materials (Class C may tow vehicles with a GVWR of 10,000 pounds or less, or may tow a vehicle of more than 10,000 pounds providing the GCWR is not more than 26,000 pounds) 	H**, M, N, P, S, W, X**

** See HAZMAT Manual (CDL-11) for requirements.

SECTION 1

FUNDAMENTALS OF CARGO SECUREMENT

General Requirements of Title 49 Code of Federal Regulations Part 393 §100-136 (Subpart I); Regulations for Protection Against Shifting and Falling Cargo

Cargo being transported on the highway must remain secured on or within the transporting vehicle under all conditions that could reasonably be expected to occur in normal driving. This includes when a driver is responding in an emergency situation, except when there is a crash.

Federal cargo securement rules apply to trucks, truck tractors, semi-trailers, full trailers and tractor-pole trailers with a gross vehicle weight rating of more than 10,000 lbs. When transporting cargo on public roads, commercial vehicles must be loaded and equipped and the cargo secured so that it does not:

- Leak
- Spill
- Blow off the vehicle
- Fall from the vehicle
- Fall through the vehicle
- Otherwise become dislodged from the vehicle
- Swing or shift, making the vehicle unstable or adversely affecting maneuverability

Consequences for Drivers Who Do Not Follow the Cargo Securement Rules

An improperly secured load can result in:

- A crash
- Loss of life; personal injury
- Loss of load
- Damage to the cargo
- Damage to the vehicle
- Issuance of citations/fines to the driver/carrier
- The vehicle being placed Out of Service

Specific Securement Requirements for Metal Coils

In addition to the general requirements for cargo securement, there are additional federal requirements for certain commodities (see 49 CFR §393.116 - 393.136). If additional requirements exist for a commodity, those commodity-specific rules take precedence over the general cargo securement requirements.

Metal Coils are one of those commodities. A metal coil is defined as a product comprised of mixtures, compounds and/or alloys commonly known as metal, metal foil, metal leaf, forged metal, stamped metal, metal wire or metal chain that are generally good conductors of electricity and heat and can be melted or fused, hammered into thin sheets, or drawn into wire, and that are bulk packaged or packaged from a continuous pull or multiple pulls as a roll, coil, spool, wind or wrap.

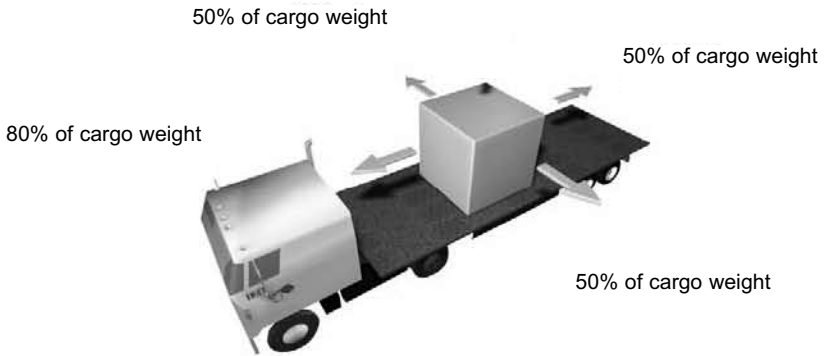
The rules for securing metal coils are listed in 49 CFR §393.120. The rules apply to the transportation of one or more metal coils which, individually or grouped together, weigh 5,000 lbs. or more. Shipments of metal coils that weigh less than 5,000 lbs. may be secured in accordance with the general cargo securement rules.

Performance Criteria for Securement Systems

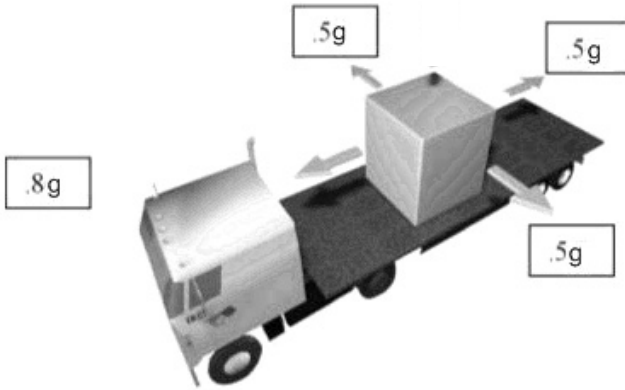
PART I - Cargo Securement Performance Criteria

The FMCSA requirements establish the minimum amount of force that a cargo securement system must be able to withstand. These minimum force requirements, called the “performance criteria”, were determined after extensive testing. Each securement system **MUST** be able to withstand a minimum amount of force in each direction, as shown below.

- The forward force =80% of the cargo weight when braking while driving straight ahead (decelerating).
- The rearward force =50% of the cargo weight when accelerating or braking in reverse.
- The side-to-side or lateral force =50% of the cargo weight when traveling on a curve or ramp, changing lanes or turning.



PART I (con't)



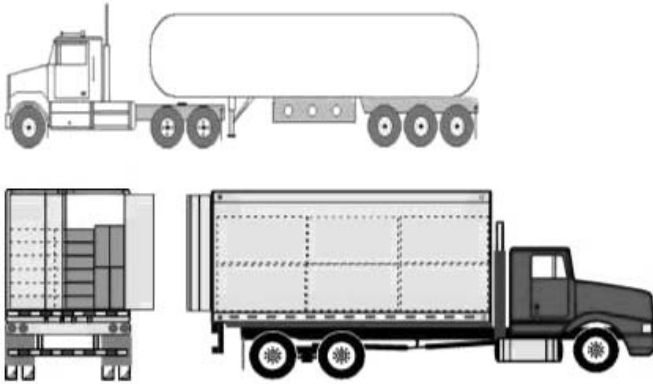
The performance criteria may also be expressed in terms of acceleration, which is shown above (“g” is the term used for gravity, and represents acceleration or deceleration).

- 0.8 g deceleration in the forward direction
- 0.5 g acceleration in the rearward direction
- 0.5 g acceleration in a side-to-side or lateral direction

EXAMPLE: If a steel coil weighs 10,000 lbs., the load securement must provide 8,000 lbs. of securement to prevent movement in the forward direction, which is expressed as 80% of the cargo weight (or 0.8 g).

"Fully Contained" Cargo

"Fully contained" means that the cargo is placed against a vehicle structure of adequate strength or other cargo so that it cannot shift or tip. Cargo that fills a *sided vehicle* of adequate strength is considered fully contained.



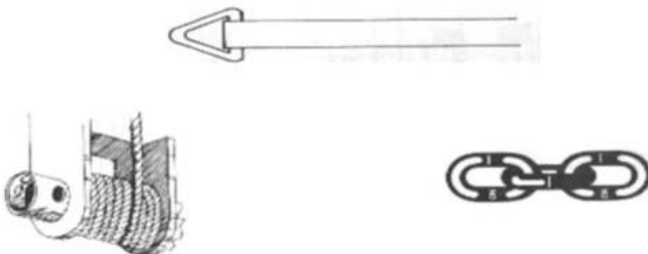
PART II - Performance Criteria for Components of a Securement System

Each component of the cargo securement system should not exceed its *Working Load Limit* (WLL), when at maximum force. The Working Load Limit is the maximum load that may be applied to a component of a cargo securement system during normal service; it is usually assigned by the manufacturer of the component.



Each force in the performance criteria is to be applied separately to the securement system to determine if it is compliant.

Components of a Securement System

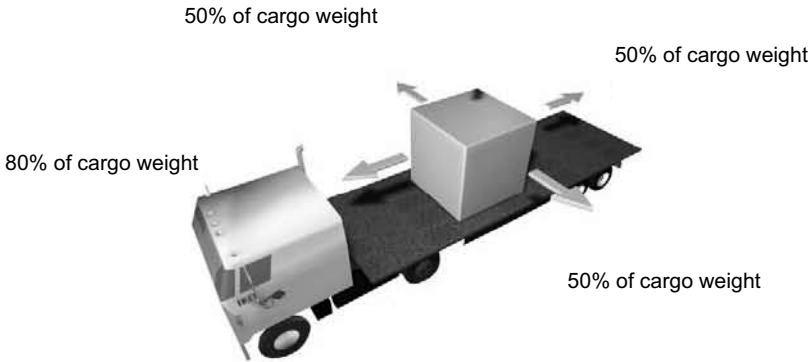


TEST YOUR KNOWLEDGE OF SECTION 1

1. What types of commercial vehicles are required to comply with the cargo securement regulations?
2. What is the minimum amount of force that a cargo securement system should be expected to withstand when traveling on a curve, ramp or when changing lanes?
3. If an aluminum coil weighs 12,000 lbs., the load securement must provide 6,000 lbs. of securement to prevent movement in the rearward direction. How is this performance criteria expressed in terms of gravity ("g")?
4. What is the definition of Working Load Limit (WLL)?

SECTION 2

GENERAL PROVISIONS AND REQUIREMENTS



What is a Securement System?

A securement system is a securement method that uses one or a combination of the following elements: vehicle structure, securing devices, and/or blocking and bracing equipment. The securement system chosen must be appropriate for the cargo's size, shape, strength and characteristics.

Failure Modes for Securement Systems

When cargo is subjected to the forces in the performance criteria (Section 1), and when the securement system is not adequate, the system will fail in one of the following three failure modes:

- rolling
- sliding
- tipping

Objectives for Securement Equipment and Devices

It is the responsibility of drivers, shippers, motor carriers and enforcement personnel to ensure that all securement equipment, devices and the vehicle structure are in good working order and are used within their capability and in accordance with the manufacturer's instructions.

Securement System Elements

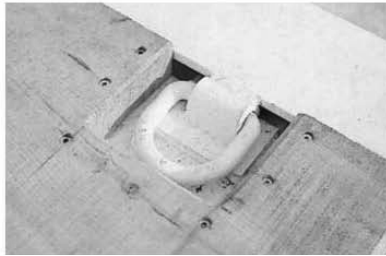
Securement system elements are described in the following categories:

- Category 1- Vehicle Structure and *Anchor Points*, Cargo Securement Responsibility and Cab Shields
- Category 2 - Securement Methods
- Category 3 - Devices, Assemblies and Components
- Category 4 - *Dunnage* Materials

CATEGORY 1

Vehicle Structure and Anchor Points

The vehicle must be strong enough to resist the forces in the performance criteria (Section 1). The vehicle must be appropriate for the cargo it is to transport, or it must be adapted to be suitable by using fittings, fixtures, dunnage, cribbing or other means.



(Photo courtesy of: Doecker Industries Ltd)

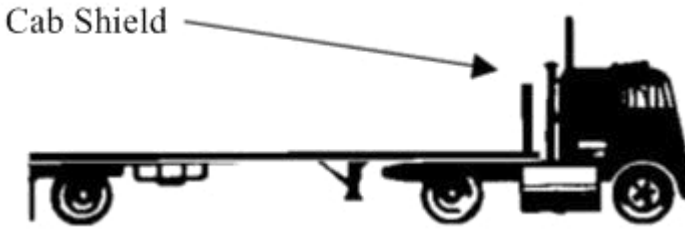
Cargo Securement Responsibility

According to federal and state regulations, the motor carrier and driver are responsible for ensuring that the vehicles, anchor points and other securement components are in good working order, with no obvious signs of damage. The driver is also required to conduct a pre-trip inspection by other operating regulations.

Roadside inspections are conducted in accordance with federal, state and provincial laws. If securement equipment fails inspection, it is likely that the vehicle may be placed out of service, and the motor carrier and/or the driver may be fined.

Cab Shields

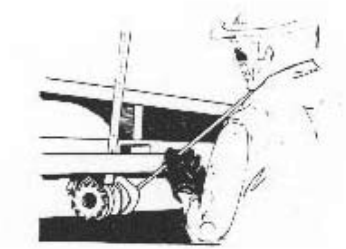
A cab shield is a safety device mounted to the tractor.



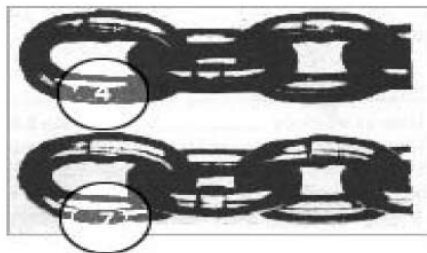
CATEGORY 2

Securement Method

Because cargo varies in size, shape, weight and other properties, the shipper and the carrier should devise a securement method that is suited to the characteristics of their cargo, and that meets the performance criteria (Section 1).



(Illustration courtesy of: Gouvernement du Québec Ministère des Transports)



CATEGORY 3

Securement Devices, Assemblies and Components - Packaging

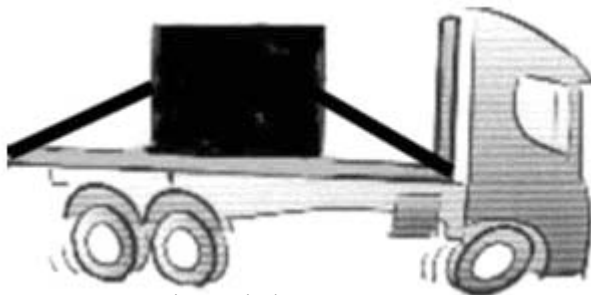
If a package collapses in transit after the *tiedowns* are tensioned, the tiedowns become loose and parts of the load may fall from the vehicle. Because the shipper usually packages cargo, the shipper needs to make sure that the packages are strong enough to withstand the forces during transport (see the performance criteria in Section 1). After the driver completes an inspection, it is the responsibility of the driver to inform the carrier if the packaging is not adequate.

Securement Devices, Assemblies and Components - Tiedowns

A tiedown is made up of an assembly (combination) of securing devices that restrains cargo on a trailer or vehicle. A tiedown can be attached to anchor points on the vehicle, or the vehicle might have provisions where a tiedown can pass through points on the vehicle and be attached to itself.

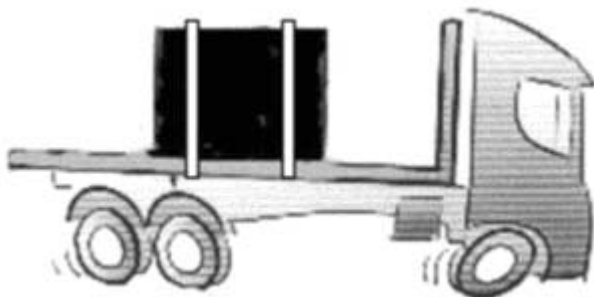
There are two types of tiedowns that are used to restrain cargo: direct tiedowns and indirect tiedowns.

- **Direct tiedowns** are attached to the vehicle and attached to the cargo. Direct tiedowns also include tiedowns that are attached to the vehicle, pass through or around an article of cargo, then attach to the vehicle again. Direct tiedowns provide direct resistance to oppose the forces that are acting on the cargo. This direct resistance keeps the cargo in place, and prevents movement.



Direct Tiedowns

- **Indirect tiedowns** are attached to the vehicle, passed over the cargo, and then are attached to the vehicle again. Indirect tiedowns create a downward force that increases the effect of friction between the cargo and the deck. This friction restrains the cargo.



Indirect Tiedowns

Tiedown Condition and Maintenance

All components of a tiedown must be in proper working condition. 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 not contain knots. If any component of a tiedown is repaired, it must be repaired in accordance with the applicable standards in 49 CFR §393.104 (e), or the manufacturer's instructions.

Responsibility for Tightening Tiedowns

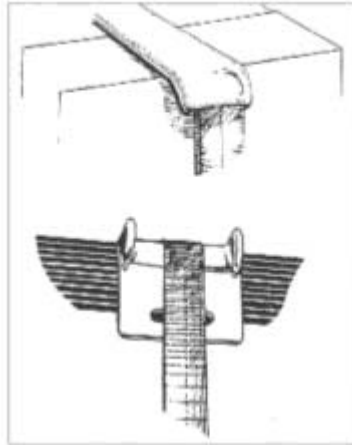
Tiedowns (except for steel strapping) must be designed, constructed and maintained so they can be tightened by the driver. Each tiedown must be attached and secured in a manner that prevents it from loosening, unfastening, opening or releasing while the vehicle is in transit.

Location of Tiedowns

All tiedowns and other components of a cargo securement system used to secure loads on a trailer equipped with rub rails should be located inboard of the rub rails whenever practicable (this does not apply when the load extends beyond the rub rails).

Use of Edge Protection

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. An edge protection device should fit properly on the edge of the article and must be secured so that there is no gap between the device and the cargo, thereby preventing it from being crushed.



Edge Protection

CATEGORY 4

Dunnage Materials

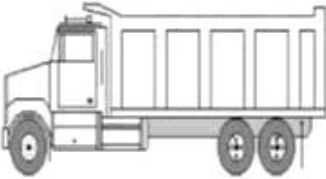
Timber used between tiedowns and cargo must be strong enough not to split or be crushed.

Any timber used should be properly seasoned, and free of rot or decay. The grain should run lengthwise along the timber when it is used for structural purposes like *blocking* and *bracing*. Timber should be free of knots, knotholes and splits that may affect its strength or interfere with nailing.

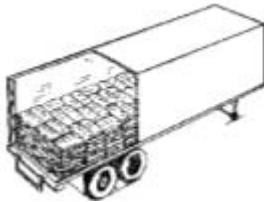
Securement Options

All types of cargo must satisfy one of the following three conditions when being secured:

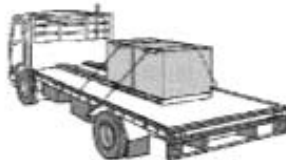
- fully contained by structures of adequate strength, or



- immobilized by structures of adequate strength to prevent shifting or tipping, or



- immobilized on or within a vehicle by appropriate means to prevent shifting or tipping.



Note: If additional securement is required for a specific commodity (such as metal coils), the specific requirements for securing that commodity take precedence.

Working Load Limit

The Working Load Limit is the maximum load that may be applied to a component of a cargo securement system during normal service. This value is assigned by the component manufacturer or the default rating in the Working Load Limit Table (see page 2.8).

Note: Welded steel chain that is not marked or labeled with a grade or working load limit is considered to have a working load limit equal to that for grade 30 proof coil chain.



WORKING LOAD LIMIT (WLL) TABLE

Size (inches)	Chain				
	WLL (pounds)	Grade 43	Grade 70	Grade 80	Grade 100
	Proof coil	High	Transport	Alloy	Alloy
1/4	1,300	2,600	3,150	3,500	4,300
5/16	1,900	3,900	4,700	4,500	5,700
3/8	2,650	5,400	6,600	7,100	8,800
7/16	3,700	7,200	8,750		
1/2	4,500	9,200	11,300	12,000	15,000
5/8	6,900	13,000	15,800	18,100	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

Wire Rope (6 x 37 Fiber Core)	
Diameter (inches)	WLL (pounds)
1/4	1,400
5/16	2,100
3/8	3,000
7/16	4,100
1/2	5,300
5/8	8,300
3/4	10,900
7/8	16,100
1	20,900

Polypropylene Fiber Rope (3-Strand and 8-Strand Constructions)	
Diameter (inches)	WLL (pounds)
3/8	400
7/16	525
1/2	625
5/8	925
3/4	1,275
1	2,100

Polyester Fiber Rope (3-Strand and 8-Strand Constructions)	
Diameter (inches)	WLL (pounds)
3/8	555
7/16	750
1/2	960
5/8	1,500
3/4	1,880
1	3,300

Nylon Rope	
Diameter (inches)	WLL (pounds)
3/8	278
7/16	410
1/2	525
5/8	935
3/4	1,420
1	2,520

Double Braided Nylon Rope	
Diameter (inches)	WLL (pounds)
3/8	336
7/16	502
1/2	655
5/8	1,130
3/4	1,840
1	3,250

Manila Rope	
Diameter (inches)	WLL (pounds)
3/8	205
7/16	265
1/2	315
5/8	465
3/4	640
1	1,050

Steel Strapping	
Width x thickness (inches)	WLL (pounds)
1-1/4 x .029	1,190
1-1/4 x .031	1,190
1-1/4 x .035	1,190
1-1/4 x .044	1,690
1-1/4 x .050	1,690
1-1/4 x .057	1,925
2 x .044	2,650
2 x .050	2,650

Synthetic Webbing	
Diameter (inches)	WLL (pounds)
1-3/4	1,750
2	2,000
3	3,000
4	4,000

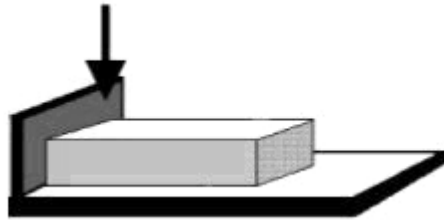


Strength Rating for Blocking Systems

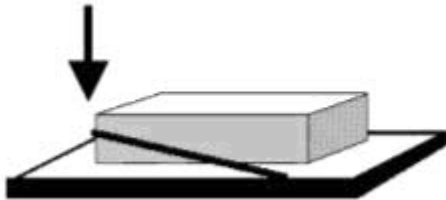
The working load limit of all components used to block cargo from forward movement must be 50% (or more) of the weight of the article being blocked.

The most important securement task is to prevent an article from moving forward, and the best way to prevent forward movement is to immobilize the cargo.

This can be done by placing it against a headboard, bulkhead, stakes or other vehicle structure, or against other cargo that is immobilized in that manner. Blocking and bracing can be placed between the article and vehicle structure, other cargo, or a *void-filler*. A “void-filler” is 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 (for example, 4 ft. x 4 ft. timbers placed between two adjacent articles of cargo to fill the void).



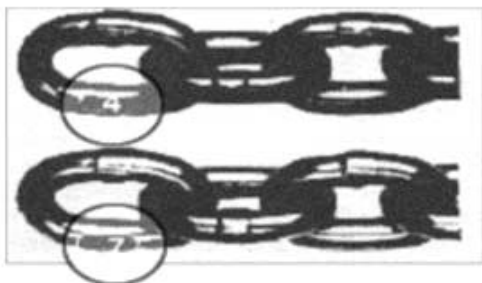
A direct tiedown can also be used to secure cargo against forward movement (see page 2.13)



Securement System Strength Rating for Marked Components

The working load limit of a tiedown is the working load limit of its weakest part, including anchor points (that is, a tiedown is only as strong as its weakest link). In the case of synthetic webbing, the working load limit is the working load limit of the tiedown assembly or the anchor point, whichever is the least.

Some manufacturers mark their manufactured tiedown assemblies, or components, with a numeric Working Load Limit value. In the absence of other information, this value should be used as the working load limit of the component or assembly.



Other manufacturers mark components using a code or symbol that is defined in a recognized standard. For example, a piece of grade 7 chain may be marked with a 7 or 70, in accordance with the standard of the National Association of Chain Manufacturers. The standard then gives the Working Load Limit for that piece of chain, depending on its size.

Securement System Strength Rating for Unmarked Components

Securement components and assemblies which are not marked are considered to have working load limits as specified in the Working Load Limit Table (see page 2.7).

Note: If markings cannot be read, the tiedown will be considered unmarked.

Carriers should try to purchase and use components that are rated and marked by their manufacturer. That way, the carrier, driver, shipper and inspector can all verify that the proper equipment is being used for the job.

Note: *Friction mats* provide a resistance to horizontal movement equal to 50% of the cargo weight that is resting on the mat.

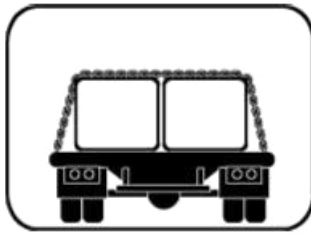
Cargo Placement and Restraint

Articles of cargo that are placed beside each other and secured by side-to-side, indirect tiedowns must be either:

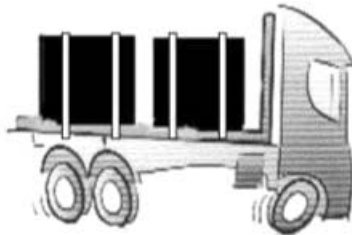
- placed in direct contact with each other, or
- prevented from shifting towards each other

Some tiedowns lose their initial tension very quickly in normal driving if there are gaps between articles. Articles must be placed in contact with each other to ensure that there are no gaps, or must be secured by some means to prevent them from moving towards each other in transit. This requirement applies to all layers and stacks of articles that are loaded across a vehicle.

Acceptable Cargo Placement

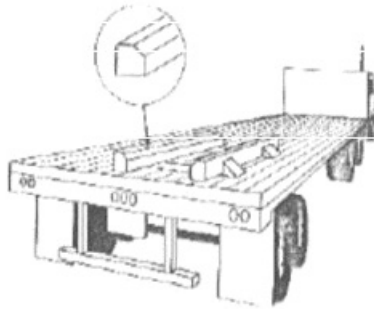


Where two or more long articles (like metal ingots or bundles of reinforcing bars) are loaded lengthwise on a vehicle, if the space between articles cannot be filled with other cargo or blocking, transverse tiedowns can be wrapped around each article to immobilize it against side-to-side movement.



Cargo Roll Prevention

- (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



A cradle is a very effective way to prevent rolling. Cradles that have angles of 45 degrees provide the most restraining force. As the cradle angle decreases from 45 degrees, so does the restraining force.



Where multiple similar articles are placed against each other, the tendency to rock can be controlled if tiedowns through the two end articles pull the articles together, as required for multiple coils.

Attaching tiedowns diagonally through the eye of a coil to form an X-pattern when viewed from above the vehicle is **prohibited**.

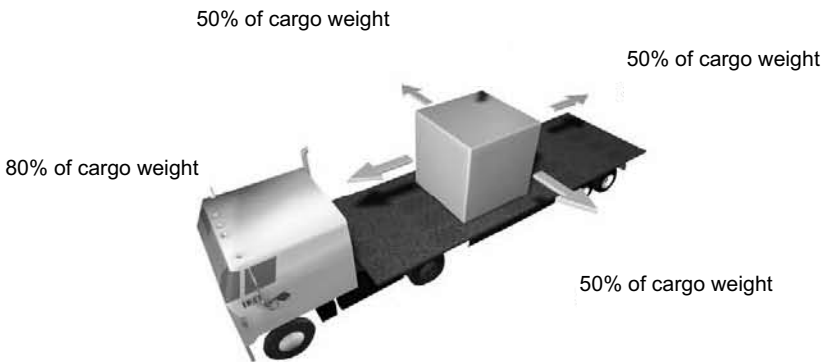
Aggregate Working Load Limit for Tiedowns

The sum of the working load limits from all tiedowns must be at least 50% of the weight of the cargo.

The aggregate working load limit is the sum of:

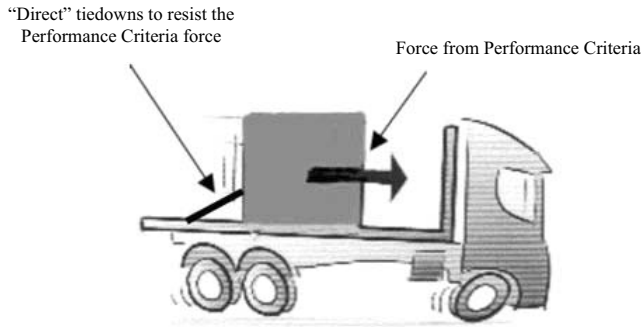
- (1) One-half the working load limit of each tiedown that goes from an anchor point on the vehicle to an anchor point on an article of cargo;
- (2) One-half the working load limit of each tiedown that is attached to an anchor point on the vehicle, passes through, over, or around the article of cargo, 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.

This is the minimum requirement. More tiedown capacity should be used if it is needed to secure an article against any movement.



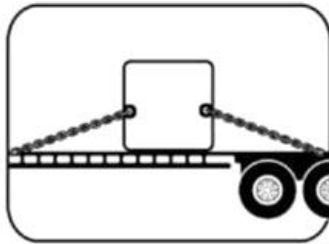
Purpose of Direct Tiedowns

A direct tiedown resists the performance criteria forces that are applied to the cargo.

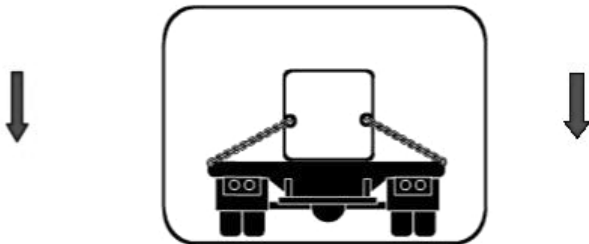


Angles Required When Using Direct Tiedowns

A direct tiedown is considered effective against forward and rearward forces if it makes an angle less than 45 degrees when viewed from the side of the vehicle.



A direct tiedown is considered effective against side-to-side forces if it makes an angle less than 45 degrees with the horizontal when viewed from the front or rear of the vehicle.



Calculating Working Load Limits for Direct Tiedowns

When calculating the *aggregate working load limit* of all direct tiedowns, count 100% of the tiedown working load limit for each tiedown attached to both sides of the vehicle, as shown in Figure #1, and 50% of the working load limit for each tiedown attached to only one side of the vehicle, as shown in Figure #2. If each tiedown has a working load limit of 4,000 lbs. in the figures below, the aggregate working load limit for the securement system shown in Figure #1 is 8,000 lbs. Each tiedown is connected to the vehicle TWICE. In figure #2 each tiedown is connected to the vehicle once, and the aggregate working load limit for all tiedowns is 4,000 lbs.

Figure #1

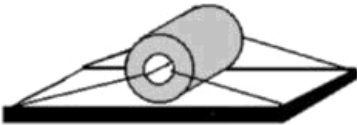
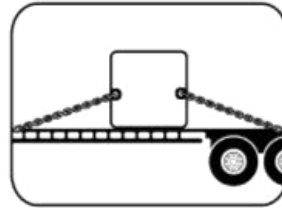


Figure #2

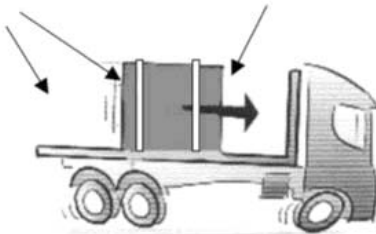


Purpose of Indirect Tiedowns

The purpose of the indirect tiedown is to increase the pressure of the article on the deck (that is, to increase the frictional force between the article and the deck).

“Indirect” tiedowns to resist the
Performance Criteria force

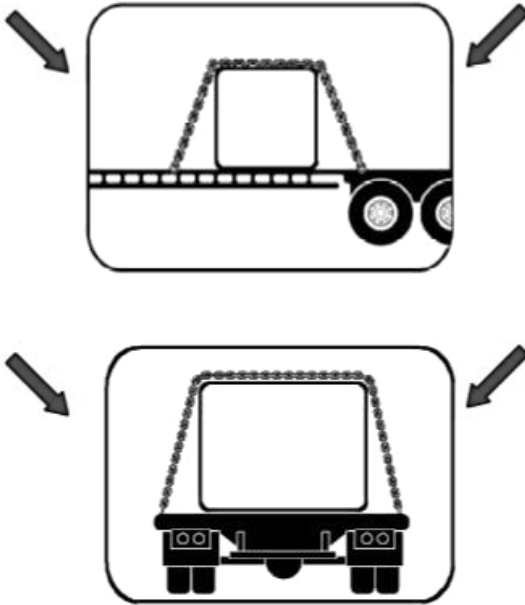
Force from Performance Criteria



An indirect tiedown has failed if the article shifts. If friction is low between the deck and the cargo (such as a plastic skid, plastic-coated article, or an oil-soaked/wet deck), direct tiedowns can be more effective. Under these conditions, consider using friction mats or other friction enhancing devices.

Angles Required for Using Indirect Tiedowns

An indirect tiedown that is used to prevent front-to-back cargo movement must make an angle of at least 30 degrees with the deck when viewed from the side of the vehicle.



An indirect tiedown that is used to prevent side-to-side movement must make an angle of at least 30 degrees when viewed from the front or back of the vehicle.

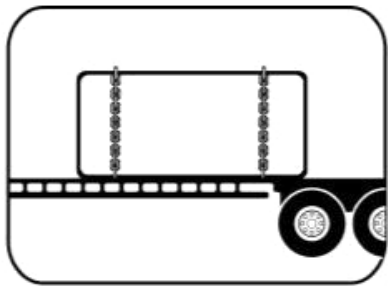
An indirect tiedown should be tensioned to as high an initial tension as possible, at least 50% of its working load limit. The tension should be maintained throughout the trip.

Calculating Working Load Limits for Indirect Tiedowns

Each tiedown that passes over an article is considered to be 1 tiedown.

The aggregate working load limit of all indirect tiedowns is the sum of the working load limits of each indirect tiedown. In this picture, if each tiedown has a working load limit of 4,000 lbs., the aggregate working load limit for this securement system is 8,000 lbs.

$2 \text{ tiedowns} \times 4,000 \text{ lbs.} = 8,000 \text{ lbs.}$



Minimum Number of Indirect Tiedowns Required

When cargo is **not prevented** from forward movement (by using a headboard, bulkhead, other cargo or direct tiedown), it must be secured using the following requirements [METAL COILS HAVE SPECIFIC REQUIREMENTS]:

Article Description	Minimum Number of Indirect Tiedowns
5 ft. or shorter; 1,100 lbs. or lighter	1
5 ft. or shorter; over 1,100 lbs.	2
Longer than 5 ft., up to and including 10 ft.	2
Longer than 10 ft.	2 + 1 tiedown for every additional 10 ft., or part thereof

When cargo is **prevented** from forward movement (by using a headboard, bulkhead, other cargo or direct tiedown) it must be secured using the following requirements [METAL COILS HAVE SPECIFIC REQUIREMENTS]:

Article Description	Minimum Number of Indirect Tiedowns
All cargo	1 tiedown for every 10 ft., or part thereof

Inspection of Securement Systems

The driver is responsible for the following cargo securement inspection activities:

Responsibility of Driver	Within first 50 miles	When duty status of driver changes	After 3 hours or 150 miles
Inspect cargo and securing devices	✓	✓	✓
Adjust cargo and/or securing devices	As necessary	As necessary	As necessary
Add additional securing devices	As necessary	As necessary	As necessary

If adjustments need to be made at any inspection, the driver must make them, or must add devices (as necessary) to ensure that the load is properly secured. This means that the vehicle should carry, or be equipped with, additional tiedowns for this purpose.

The driver may be unable to make the inspection if the vehicle is sealed, or if the securement cannot be inspected. There may also be some loads where the driver cannot adjust the securing devices. However, the responsibility for cargo securement still exists, as explained in Section 1. Such loads are still subject to on-highway inspection. If the load is not adequately secured, the driver and/or carrier could be cited for a violation.

TEST YOUR KNOWLEDGE OF SECTION 2

1. As required by state and federal regulations, who is responsible for proper load securement?
2. A driver is required to check the cargo and its securing devices within how many miles after beginning a trip?
3. What is the maximum working load limit of a binder with a handle marked “3/8-G7, 7/16-G43”?
4. A 5/8-inch chain that has a working load limit of 13,000 lbs. should have links marked with what strength rating?
5. What is the working load limit of unmarked 2-inch synthetic webbing?
6. If a metal coil is secured with 3/8-inch chains that do not display a grade rating, what is the default strength rating assigned to each chain?

SECTION 3

METAL COILS

Preventing Securement Failure

- Use a securement system to immobilize metal coils to ensure they are prevented from sliding, tipping or rolling.
- Comply with specific securement methods required in regulations.

Application:

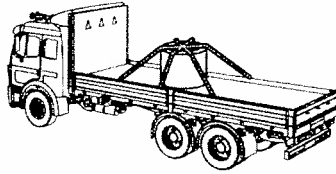
Metal Coil(s) and Weight	Cargo Securement Requirements	License Requirements
Metal coil shipments that weigh 5,000 lbs. or more, individually or bundled together	METAL COIL SPECIFIC SECUREMENT RULES APPLY	NYS COMMERCIAL DRIVER LICENSE WITH METAL COIL ENDORSEMENT ("M")
Metal coil shipments that weigh less than 5,000 lbs., individually or bundled together	GENERAL CARGO SECUREMENT RULES APPLY	NYS COMMERCIAL DRIVER LICENSE ("M" endorsement not required)

The following securement requirements are for metal coils transported on flatbed vehicles, van-type vehicles or intermodal containers that have anchor points. Securement requirements for sided vehicles or intermodal containers without anchor points are covered at the end of this section.

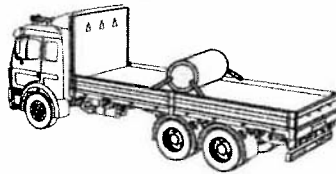
Coil Orientation

Securement requirements for metal coils vary based on the orientation of the eye of the coil on the vehicle. The three possible orientations are: eyes vertical, eyes crosswise, and eyes lengthwise.

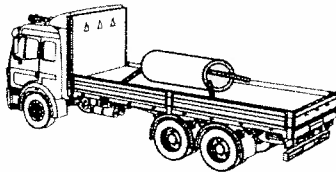
Eyes vertical



Eyes crosswise



Eyes lengthwise

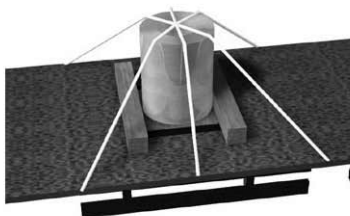


Securement Requirements for a Single Metal Coil with Eye Vertical

If the coil is fastened to a pallet, the pallet must be strong enough so it cannot collapse under the forces described in the performance criteria (Section 1).

Tiedowns must be arranged in the following manner to prevent the coils from tipping in the forward, rearward and side-to-side (lateral) directions:

- at least one indirect tiedown attached diagonally from the left side of the vehicle, across the eye of the coil, to the right side of the vehicle;
- at least one indirect tiedown attached diagonally from the right side of the vehicle, across the eye of the coil, to the left side of the vehicle;
- at least one indirect tiedown attached side-to-side over the eye of the coil;
- either blocking and bracing, friction mats or direct tiedowns must be used to prevent forward - rearward movement.

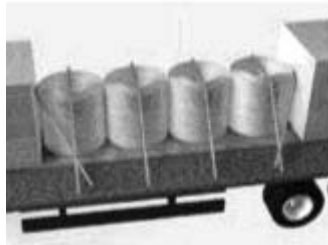


Note: Use a friction mat under the pallet to increase the friction between the pallet and the deck.

The coil should be secured to the pallet to withstand all the forces in the performance criteria (Section 1).

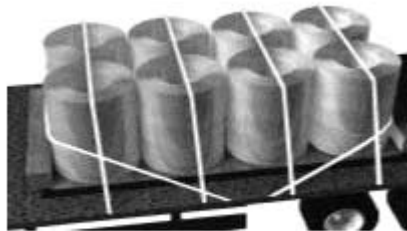
The sum of the working load limits from all tiedowns must be at least 50% of the weight of the coils.

Securement Requirements for a Row of Metal Coils with Eyes Vertical



Coils that are transported in rows must be secured by:

- at least one direct tiedown against the front of the row of coils, restraining against forward motion, and if practicable, making an angle 45 degrees or less with the floor.
- at least one direct tiedown against the rear of the row of coils, restraining against rearward motion, and if practicable, making an angle 45 degrees or less with the floor.
- at least one indirect tiedown over the top of each coil or side-by-side row of coils, restraining against vertical motion. Indirect tiedowns going over the top of a coil must be as close as possible to the eye of the coil.
- direct tiedowns, blocking or bracing must be arranged to prevent shifting or tipping in all directions.



Note: If there are more than two coils in the front and rear rows, the direct tiedown must run outside some kind of channel that bears against all coils in these rows.

Use a friction mat under each pallet to increase the friction between the pallet and the deck. This should always be done when the deck or coil is soaked with oil.

Securement Requirements for Metal Coils With Eyes Crosswise

Step #1: Support the Coil

To prevent rocking, the coil must be supported above the deck.



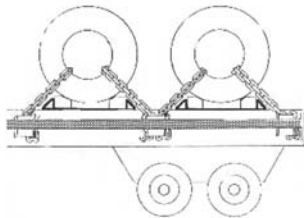
The coil supports must be held in place so they do not become loose during a trip.

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.

The cradle can be restrained against sliding by placing friction mats under the timbers and coil bunks, using nailed wood blocking or cleats against the front timber, or by placing a direct tiedown around the front of the cradle.

If a direct tiedown is used around the front of the cradle, it does not count towards the aggregate working load limit for tiedowns through the eye of the coil.



Step #2: Prevent the Coil from Forward Movement

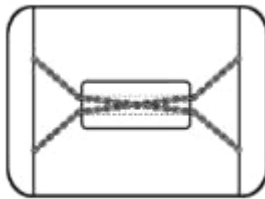
At least one direct tiedown is required through its eye, restricting forward motion.

Step #3: Prevent the Coil from Rearward Movement

At least one direct tiedown is required through its eye, restricting rearward motion.

If more than two chains are required, they should be placed symmetrically on either side of the coil. If an odd number of chains are required, the last chain should be to the rear.

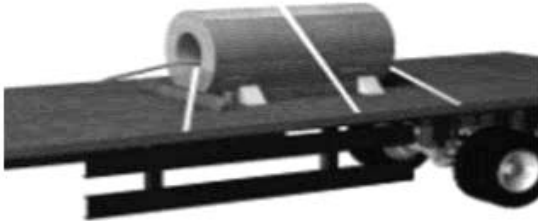
When transporting metal coils with the eyes crosswise, attaching direct tiedowns diagonally through the eye of a coil to form an X-pattern is **prohibited**:



Securement Requirements for Individual Metal Coils with Eyes Lengthwise

There are three options for safely securing individual coils that are loaded with their eyes lengthwise.

Securement Option #1

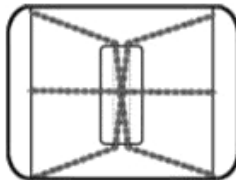


Step #1: Support the coil above the deck to prevent the coil from rolling.



Step #2: Attach at least one direct tiedown on each diagonal through the eye of the coil making an angle not more than 45 degrees with the floor of the vehicle when viewed from the side.

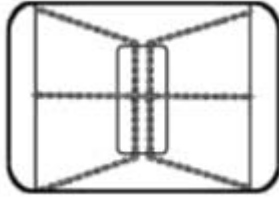
Step #3: Attach at least one indirect tiedown side-to-side over the top of the coil.



Step #4: Use blocking or friction mats to prevent forward movement.

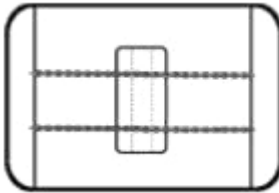
Securement Option #2:

Same as Option #1, except the direct tiedowns are straight instead of diagonal.



Securement Option #3:

As with Options #1 and #2, begin by supporting the coil above the deck to prevent rolling.



In Option #3, two indirect tiedowns are attached over the front and rear parts of the coil. Use blocking or friction mats to prevent forward movement.

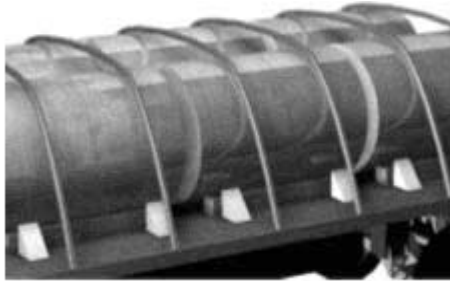
Securement Requirements for a Row of Metal Coils with Eyes Lengthwise

A row of coils is made up of three or more coils loaded in like mode and in a line. The requirements for securing a row of coils is similar to securing individual coils (Option #3).

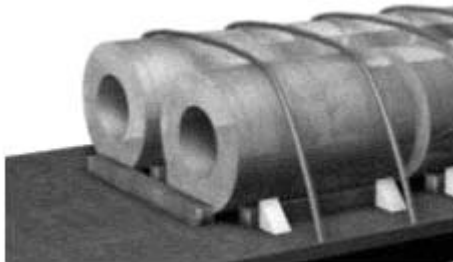
Step #1: Support the coils above the deck to prevent the coils from rolling. The means to support the coils (for example, timbers, chocks or wedges, a cradle, etc.) must not become unfastened or loose while the vehicle is in transit.



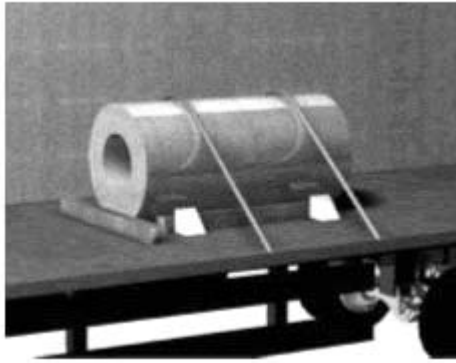
Step #2: Attach at least two indirect tiedowns over each coil or side-by-side row.



Step #3: Use blocking or friction mats to prevent front-to-back movement in the forward direction.



Securement Requirements for Metal Coils in *Sided Vehicles* or Intermodal Containers without Anchor Points



NOTE: Although the vehicle is not equipped with anchor points, the coil itself or a tiedown attached to itself would form an anchor point. See the definition of anchor point on page 4.1. Example: A tiedown may travel through the vehicle structure and is attached to itself around the coil, forming indirect securement.

Coils must be prevented from horizontal movement or from tipping by the use of the following:

- friction mats
- system of blocking and bracing
- tiedowns and blocking
- tiedowns and bracing

The carrier/driver must ensure that the securement system meets the Performance Criteria requirements in Section 1.

TEST YOUR KNOWLEDGE OF SECTION 3

1. Transportation of one or more metal coils (individually or bundled together) weighing 5,000 lbs. or more, must comply with which load securement requirement?
2. How are tiedowns used to secure coils transported with eyes vertical on a flatbed vehicle, in a sided vehicle or intermodal container with anchor points?
3. What structure or device is used to prevent longitudinal movement of the coil in the forward direction?
4. Which means of securement is prohibited when transporting coils with the coil eye crosswise on the vehicle?
5. The sum of the working load limits (WLL) from all tiedowns must be at least what percentage of the weight of the coils?
6. When is use of a friction mat recommended?
7. What are the requirements for securing metal coils with eyes lengthwise?

DEFINITIONS

Aggregate working load limit - 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.

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 or gaseous cargo, that includes articles grouped together so they can be handled as a single unit or can be grouped together by wrapping, strapping, banding or edge protection device(s).

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.

Dunnage - All loose materials used to support and protect cargo.

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.

Friction mat - A device placed between the deck of a vehicle and an 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).

Metal Coil - A product comprised of mixtures, compounds and/or alloys commonly known as metal, metal foil, metal leaf, forged metal, stamped metal, metal wire or metal chain that are generally good conductors of electricity and heat, and that can be melted or fused, hammered into thin sheets, or drawn into wire, that are bulk packaged or packaged from a continuous pull or multiple pulls as a roll, coil, spool, wind or wrap, and where the aggregate weight of the coil is equal to or greater than 5,000 pounds.

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. Includes vans, dump bodies, and a sided internodal 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 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.

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.

ACKNOWLEDGMENTS

The NYS Department of Motor Vehicles wishes to thank the staff of the NYS Department of Transportation and the Canadian Council of Motor Transport Administrators (CCMTA) who contributed their time and expertise to the North American Metal Coil Cargo Securement Program, on which the materials in this manual are based.



Department of Motor Vehicles

Andrew M. Cuomo
Governor

