

DOT CARGO SECUREMENT

COURSE OUTLINE

- **In studying incidents that involve commercial vehicles, the Federal Motor Carrier Safety Administration (FMCSA) determined that problems with how cargo is loaded and secured are more likely to cause a crash than any other type of issue.**
- **The DOT has established "cargo securement" regulations to specify how different types of cargo should be loaded and secured on vehicles so that it can be transported safely.**
- **Cargo that has not been loaded and secured properly can create serious hazards.**
 - Not only for the truck and driver that are carrying it, but for other vehicles, drivers, pedestrians and anything else that happens to be nearby.
- **If the cargo is hazardous, the effects of a crash can be even more widespread and longer-lasting.**
- **In addition to causing property damage and injuries, losing a load can also lead to big trouble with local, state or federal authorities.**
 - Including citations and fines for the driver or motor carrier, and the vehicle having to be taken out-of-service.
- **The Federal Highway Administration of the U.S. Department of Transportation, the Canadian Council of Motor Transport Administrators and the nation of Mexico have collaborated in creating a set of safety regulations known as the North American Cargo Securement Standard.**
- **The standard requires that cargo being transported over the highways on trucks with a Gross Vehicle Weight Rating (GVWR) of over 10,000 lbs must be "properly distributed and remain secure 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 to an emergency situation such as having to suddenly brake for an obstruction, but not as a result of an actual crash.

- **The Standard also prohibits cargo from:**
 - Obscuring a driver's view ahead or to the right or left of them.
 - Interfering with the free movement of a driver's arms and legs.
 - Inhibiting access to emergency equipment.
 - Preventing an easy exit from the vehicle's cab.
- **The regulation establishes uniform standards for what "secure" means for different types of loads under different conditions, and sets requirements for the equipment and practices that should be used to meet these standards.**
- **Whether or not a driver loads the cargo themselves, they are responsible for properly securing the load on the vehicles that they operate.**
 - It's important for them to be aware of these requirements.
 - To help with all of this, the Securement Standard organizes different combinations of cargo restraint equipment and practices into "systems".
- **The system that is used to secure a load must be appropriate for its size, shape, strength and other characteristics, to make sure that it stays put.**
- **The system also must be able to withstand a minimum amount of force in every direction:**
 - Forward.
 - Rearward.
 - Sideways.
 - Upward.
- **In general terms, the Standard requires all types of cargo to meet one of three conditions in order to be transported securely.**
 - If the cargo is fully contained within a vehicle it must be restrained against horizontal movement by adequately strong structures within the vehicle, or by other cargo.
 - If it is on a load deck, it must be "immobilized" using a vehicle structures of adequate strength, or a combination of structures, blocking and bracing to prevent shifting or tipping.
 - It can be "immobilized or secured on or within a vehicle" using tiedowns, along with blocking, bracing, friction mats, other cargo, "void fillers" or combinations of these.
- **The securement systems that are used to restrain materials such as metal coils or concrete pipe on a flatbed will be very different from those used for intermodal containers or earth-moving equipment.**

- **The Standard goes into considerable detail regarding what systems to use under various conditions and with specific types of cargo.**
 - You can find this information in the "Driver's Handbook on Cargo Securement" that is published by the FMCSA (Federal Motor Carrier Safety Administration), or you can ask your supervisor for help.
- **Cargo-related highway accidents can have devastating results.**
 - Not only for people and property, but for businesses and drivers' careers as well.
 - Preventing these accidents begins with organizing and standardizing all of the securement process.
- **The North American Cargo Securement Standard requires motor carriers and their employees to secure the cargo on the vehicles that they operate using "securement systems".**
 - The Standard requires any system that is used to restrain a load be "appropriate for the cargo's size, shape, strength, and characteristics".
- **More specifically, it must be able to withstand physical force equal to...**
 - 80% of the cargo weight in a forward direction, such as occurs when a truck that is driving straight ahead puts on the brakes.
 - 50% of the cargo weight in a rearward direction, which can occur when a truck is accelerating, shifting gears while climbing a hill, or braking in reverse.
 - 50% of the cargo weight in a sideways direction, such as occurs when a truck is turning, changing lanes, or braking while turning.
 - 20% of the cargo weight in an upwards direction, which can occur when a truck is traveling over bumps or cresting a hill.
- **To achieve all of this, a securement system can make use of vehicle structures, blocking and bracing equipment and securing devices.**
- **"Blocking and bracing" can include chocks and cradles, as well as any material used for "dunnage", such as tarpaulins, plastic wrapping, liner bags and matting.**
- **"Securing devices" are devices that have been specially manufactured to attach or secure cargo to a vehicle or trailer.**
 - These can include chains, manila rope, synthetic webbing, clamps and latches, grab hooks, binders, shackles, D-rings, friction mats and more.

- **"Tiedowns" are another important concept in cargo securement.**
 - They are assembled by connecting several securing devices together.
 - A tiedown could include a couple of grab hooks, a length of chain, a shackle and a ratchet-tightening device.
- **One end of a tiedown attaches to an anchor point on the vehicle.**
 - The other end can be attached to the cargo directly... or passed through, around or over the cargo, then fastened to a second anchor point.
- **In situations where a tiedown rests against the cargo, "edge protection" should be used to prevent them from damaging one another.**
- **The Cargo Securement Standard requires that all of these vehicle structures, blocking, bracing and securing devices (including tiedowns) have "adequate strength" to restrain the cargo that a vehicle is transporting.**
- **The Standard also specifies that wood which is used for blocking, bracing or dunnage should be...**
 - Properly-seasoned hardwood.
 - Free of knots, splits or decay.
 - With grain that runs lengthwise.
- **If the elements of a securement system become worn or damaged, their strength and function could be compromised.**
 - So all securement equipment must be inspected before use, and replaced if it shows signs of any problems.
- **Whether you're transporting stacks of lumber, rolls of newsprint, packaged electronic equipment or a combination of materials, each load that you carry has specific characteristics that will have to be addressed by the securement system that restrains it.**
 - The North American Cargo Securement Standard helps to ensure that creating that system isn't based on "guesswork".
- **Motor carriers and CDL drivers are required to follow proper procedures and use adequate equipment in a securement system... to make sure the load stays put.**
- **The process begins with establishing how much the cargo that you are transporting weighs.**
 - The first thing this will tell you is what type of truck or truck/trailer combination you should use to carry the weight safely.

- **Each vehicle manufacturer provides a "Gross Vehicle Weight Rating" (GVWR) for their equipment, which is its maximum operating weight.**
 - This number is usually marked on the inside door jam on the driver's side of the cab.
- **To determine how much cargo a vehicle can carry safely, you need to subtract the vehicle's "curb weight" from its Gross Weight Rating.**
- **"Curb weight" is what the vehicle weighs without passengers or cargo, but with all of the components it needs to function, including fluids such as coolant, gas and oils.**
 - This is also marked on the vehicle's door jam.
- **You will also need to use the weight of the cargo to help determine what type of securement system you should use to restrain it.**
- **The Cargo Securement Standard requires a system to withstand forces equal to:**
 - 80% of the cargo weight in forward direction.
 - 50% in a rearward direction.
 - 50% sideways.
 - 20% upwards.
- **So the vehicle structures, blocking and bracing equipment, and securing devices that are used in the securement system must be strong enough to handle these strains.**
- **To help you determine if a securement system meets these criteria, the Standard has established a standard measure of component strength that can be used to assess individual parts of a system.**
 - Called the "Working Load Limit" (WLL), it is the maximum amount of strain that a component can withstand during normal use.
- **Securing devices such as those used in tiedowns are usually marked by their manufacturer with their WLL.**
- **"Friction mats", which are typically not marked by the manufacturer, are assumed to provide a resistance to horizontal movement equal to 50% of the cargo weight that is resting on the mat.**
- **The default Working Load Limits for most other unmarked devices can be found in Appendix A of the Driver's Handbook on Cargo Securement, which is published by the Federal Motor Carrier Safety Administration.**

- **You can use all of these load limits to calculate an "Aggregate Working Load Limit" (AWLL) for a tiedown.**
 - This will tell you whether a securement system can handle the weight of the cargo you're handling.
- **For any system, the Aggregate Working Load Limit equals...**
 - 50% of the Working Load Limit of each end section of a tiedown that is attached to an anchor point...
 - ... plus 50% of the WLL of each end section that is attached to the cargo, or to another anchor point.
 - The resulting number must be at least 50% of the weight of the cargo to be secured by the system.
- **When making these calculations, remember that a tiedown assembly is only as strong as its weakest component.**
 - So the WLL for a tiedown, including those of synthetic webbing, equals the lowest WLL of any of its parts, or the anchor points it is attached to, whichever is less.
 - Remember, that's a minimum requirement under the Standard.
 - To prevent any movement of the cargo, more than the minimum tiedown capacity should be used.
- **The North American Cargo Securement Standard not only specifies the equipment and materials that should be used to secure different types of cargo on or in a commercial vehicle.**
 - It also establishes a set of safe work procedures and best practices for loading the cargo, distributing it in or on a truck, and applying a securement system to it.
- **For example, the Standard states that any type of cargo that you load onto a truck or trailer should be positioned on the vehicle to avoid overloading any one of its axles.**
- **Since most of the time you will need to "restrain" it by using tiedowns, the Standard also requires you to determine:**
 - Whether to wrap the tiedown around or attach it to the cargo.
 - Whether to pass it through or over the cargo.
 - Where to place any tiedowns that pass over the cargo.
 - ...and how many tiedowns to use.

- **In general, tiedowns restrain cargo either by providing direct resistance to any movement, or by exerting downward pressure on the load.**
- **To secure a cargo using direct resistance, a tiedown should either be attached....**
 - Directly to the cargo on one end, and to an anchor point at the other end...
 - ...or to an anchor point at one end then wrapped around the cargo and attached to another anchor point at the other end.
- **Downward pressure keeps the cargo in place by maximizing friction between it, any spacers that are beneath it, and the load deck of the vehicle itself.**
- **To restrain a load this way a tiedown should:**
 - Connect to an anchor point at one end.
 - Pass over or through the cargo.
 - Connect to another anchor point at the other end.
- **The Cargo Securement Standard also specifies the minimum number of tiedowns that should pass over or through cargo to restrain it.**
 - This number varies depending on tiedown length, the weight of the cargo that is being secured, and whether it is also braced by a headboard, bulkhead or other cargo.
- **Guidance on how many tiedowns you should use under different circumstances can be found in the "Driver's Handbook on Cargo Securement" that is published by the Federal Motor Carrier Safety Administration.**
- **Where you place tiedowns that stretch over or through a load is also important, because putting them in the wrong place and tightening them down could cause damage.**
- **So tiedowns should be:**
 - Placed as close as possible to spacers under the cargo.
 - Positioned as symmetrically as possible along the length of the load.
- **The vertical angle that tiedowns create with the load deck can also affect how well cargo is secured.**
 - Angles of 45 degrees or more do a better job of preventing the cargo from shifting than lesser angles.
 - High angles tend to pull the cargo almost straight down onto a spacer or load deck.

- **To prevent pieces of cargo that are secured by side-by-side tiedowns from shifting horizontally or from tipping on the load deck, they should:**
 - Be loaded up against each other to provide mutual support.
 - Blocked and braced apart to help keep them secure.
- **As a rule of thumb, any objects that have the potential to tip or roll should be loaded with more than one point of contact between them and cargo spacers or the load deck itself.**
 - This can normally be done by using chocks or wedges, or a cradle.
- **Whatever type of blocking or bracing you use, the Cargo Securement Standard requires you to make sure that it and any tiedowns that you attach cannot come loose.**

*** * * SUMMARY * * ***

- **The North American Cargo Securement Standard helps to keep the roads safer, not just for the people who drive commercial vehicles but for everyone who uses the road.**
- **The Standard is an international regulation that affects motor carriers and drivers in the United States, Canada and Mexico.**
- **The Standard requires that cargo be loaded, distributed and restrained so that it stays secure during normal operation, as well as when a vehicle operator must respond to an emergency.**
- **The Standard also organizes securing devices and best practices into "systems" which can ensure that different types of cargo stay put under various conditions.**
- **Standard measures such as "Working Load Limits" help to ensure that a securement system can handle the weight of a load and its other characteristics.**
- **Motor carriers and their employees are required to follow a set of safe work practices when loading, distributing and securing cargo for transport.**
- **Now that you understand the requirements of the North American Cargo Securement Standard, and know how to make sure cargo stays put during transport, you can help make highways safer for everyone who uses them... every day!**