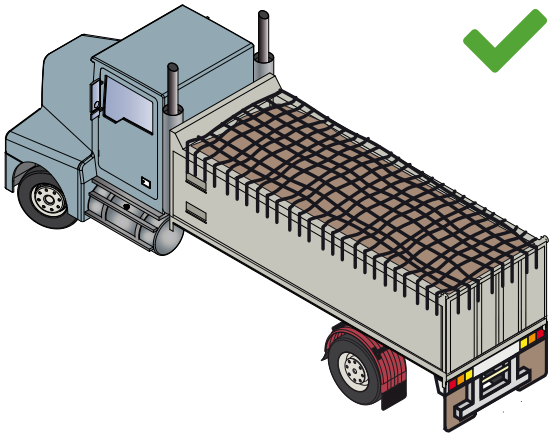
Other loose bulk loads

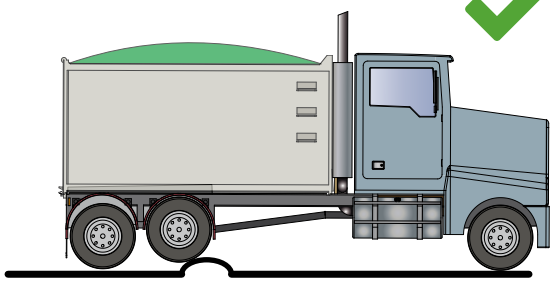
- Vertically restrain lightweight bulk loads with rated load covers – *Figure 204*.

Figure 204 Load cover



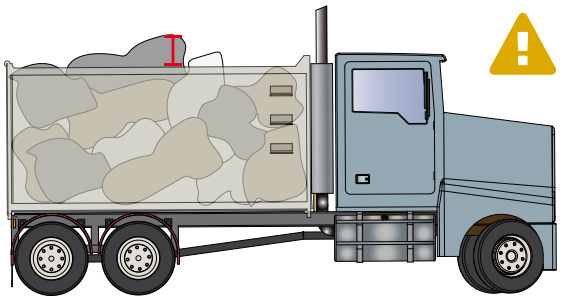
- Cover heavier bulk loads using load nets or tarpaulin to stop load items from becoming dislodged or bouncing out of the vehicle body – *Figure 205*.

Figure 205 Contained bulk load



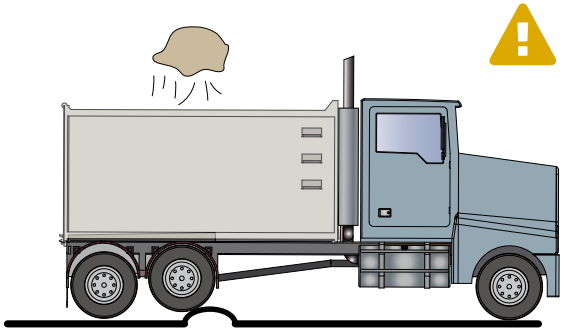
⚠ Loose bulk loads extending above the height of the containment walls can bounce out – *Figure 206*. Loads also may be blown.

Figure 206 Load exceeding containment



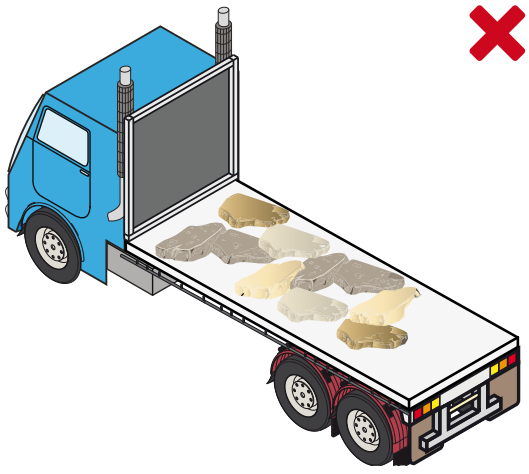
⚠ Loose bulk loads can become dislodged when travelling over bumps, even if they do not extend above the containment walls – *Figure 207*.

Figure 207 Load dislodged



✖ Do not transport loose loads on platform-bodied vehicles without sides or gates or on tipper bodies without tailgates – *Figure 208*.

Figure 208 Loose bulk load – no containment



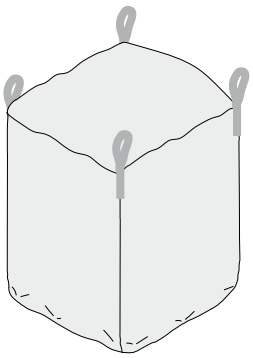
BULK BAGS

Bulk bags are industrial containers made of flexible fabrics. They are used to transport powdered and granular materials.

The guidelines below set out how you can meet the Performance Standards when restraining bulk bags. They are intended to be used as a guide only. You can restrain using other methods. It is recommended that an engineer certifies alternative methods.

Diagrams are indicative only. For more information on restraint equipment see Vehicles and equipment. To work out how many lashings to use, see the worked examples (in Working out load restraint) and Technical advice.

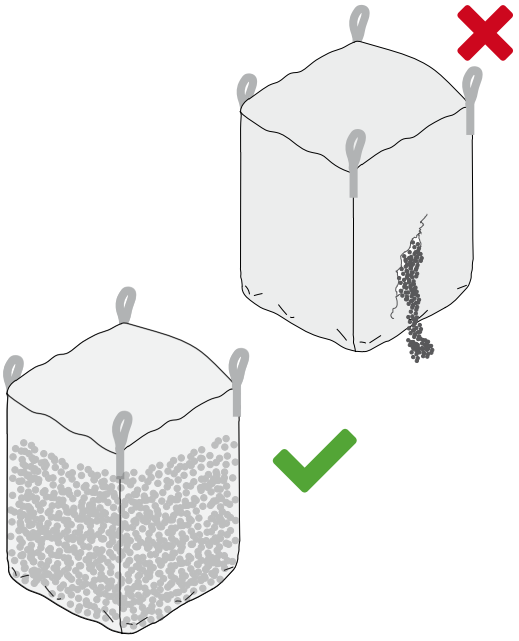
Figure 319 Bulk bag



GENERAL TIPS

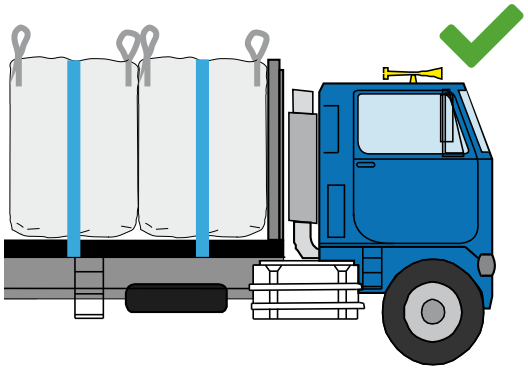
- Make sure bulk bags are in good condition and free of cuts and tears – *Figure 320*.

Figure 320 Bulk bag condition



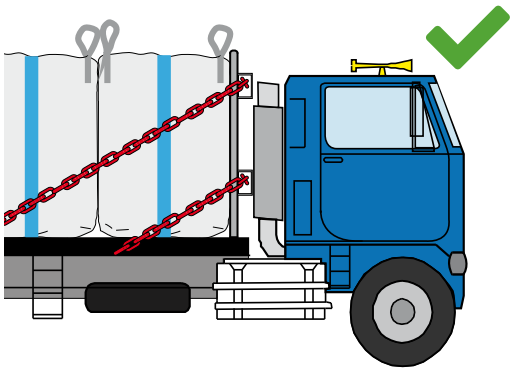
- Load bulk bags in groups without gaps and block in the forwards direction – *Figure 321*.
- Containing bulk bags can be an effective form of restraint.

Figure 321 Bulk bags blocked forwards



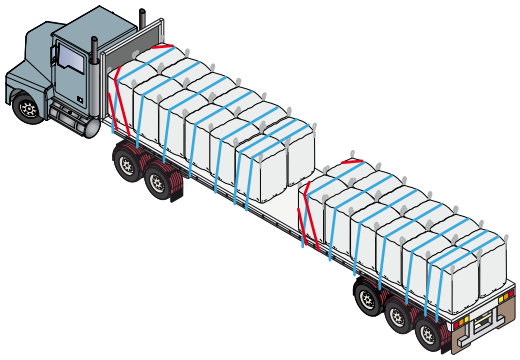
- Reinforce unrated blocking surfaces using chains (or similar) wrapped across the face of the blocking surface – *Figure 322*.
- Pass reinforcing chains through a hollow section welded to the blocking surface.
- Reinforced unrated blocking surfaces have **limited restraint capacity and may fail** if used improperly.

Figure 322 Reinforced unrated headboard



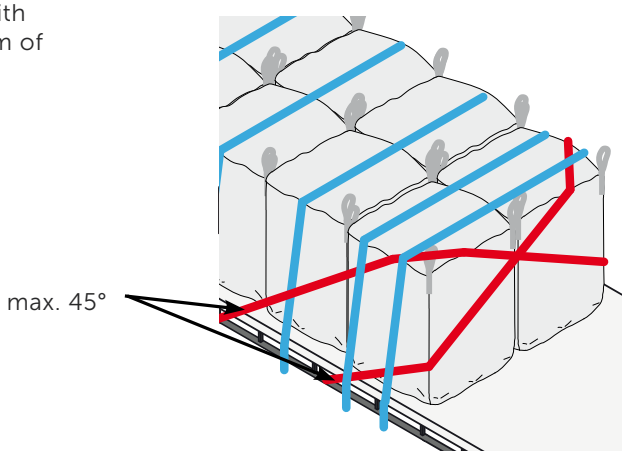
- Split full loads into multiple groups to reduce the load on each blocking surface – *Figure 323*.
- Apply a minimum of one webbing strap to every row and two webbing straps to the final row of each group.
- Additional straps may be required depending on the weight of the load.

Figure 323 Split load



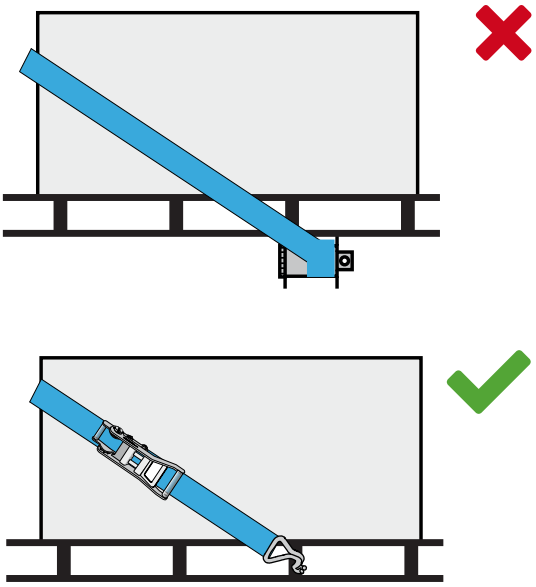
- Where a suitably engineered blocking surface is not available, block bags with crossover straps angled at a maximum of 45° to the horizontal – *Figure 324*.

Figure 324 Crossover strap blocking



- Tension crossover straps using in-line ratchets – *Figure 325*.
- Do not use drum winches to tension crossover straps.

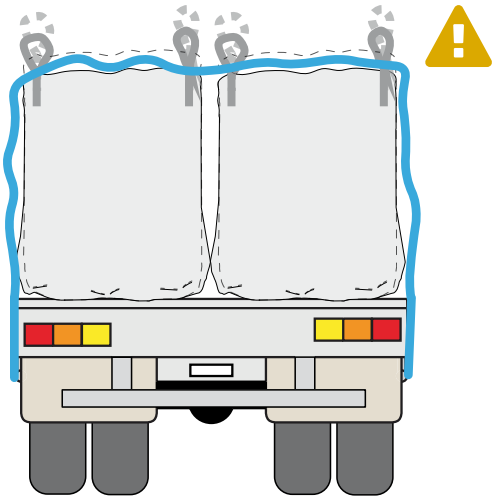
Figure 325 Crossover strap tension



During the journey

- Lashings may become loose during transport as the load settles – *Figure 326*.
- Check lashing tensions at regular intervals during transport and re-tighten as required.

Figure 326 Load settle



HEADBOARDS AND LOADING RACKS

WHAT ARE RATED HEADBOARDS AND LOADING RACKS?

- Rated headboards have been certified to withstand a certain force. They are designed based on accepted limits on strength and deflection for the load weight and design g-force – *Figure 364*.
- A loading rack is a pipe gate that has been reinforced by direct restraint chains – *Figure 365*.
- Plywood, metal sheeting or mesh can be used behind a loading rack to spread the load and support product packaging.
- If there is no rating stated on the headboard or loading rack, it is assumed to be unrated.

Figure 364 Typical rated headboard

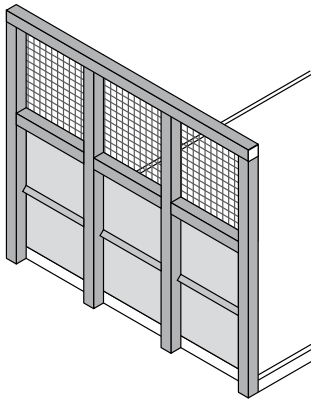
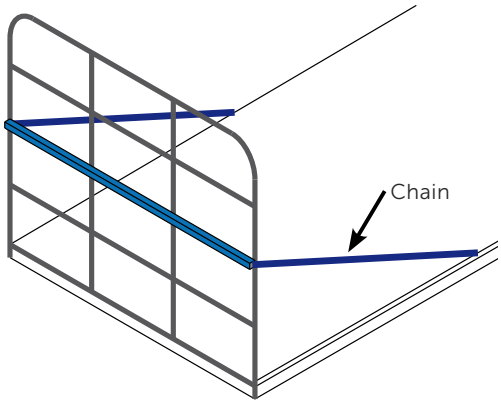


Figure 365 Reinforced "pipe gate" style load rack

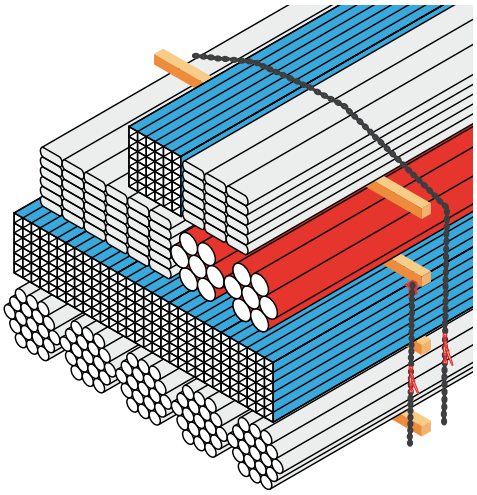


WHEN TO USE HEADBOARDS AND LOADING RACKS

- Use headboards and loading racks to provide some or all of the **forward** restraint, depending on whether they are rated, reinforced or otherwise.
- Additional restraints will be required for other directions.
- Most headboards and loading racks that are not rated are not strong enough to fully restrain heavy loads under heavy braking.
- Use **rated headboards** to provide some or all of the forwards restraint (depending on rating), as follows:
  - as part of full blocking systems, where the load is blocked sideways and rearwards by other means of restraint, or
  - in combination with tie-down restraint to reduce the number of tie-down lashings required.

- Use **rated headboards** when the load consists of long, slender products in multiple packs that may spear (e.g. pipes, beams, rail, logs) – *Figure 366*.
- Use **loading racks** to provide some or all of the forward blocking for heavier unit loads, in combination with tie-down restraint, reducing the number of tie-down lashings required.
- Use **loading racks** when product spearing is not a concern.

Figure 366 Loads at risk of spearing forwards



- Use **pipe gates** (i.e. unreinforced loading racks) in combination with tie-down restraint to provide some of the forward blocking for very lightweight loads only – *Figure 367* and *Figure 368*.

Figure 367 Unrated "pipe gate" style load rack

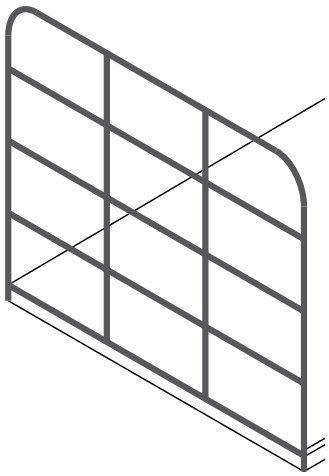
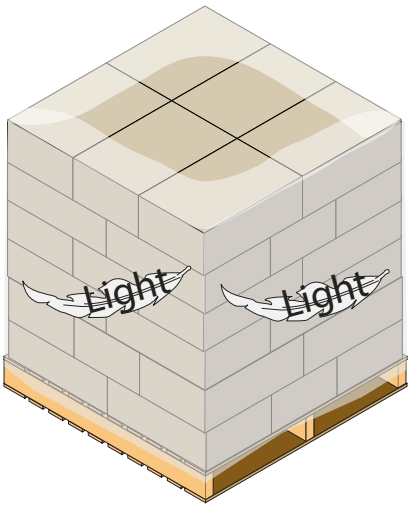


Figure 368 Lightweight unit load



HOW TO USE HEADBOARDS AND LOADING RACKS

- Position the load as close as practical to the headboard or loading rack.
- Within 200 mm to the headboard is generally considered blocked – *Figure 369* and *Figure 370*.

Figure 369 Blocked load against headboard

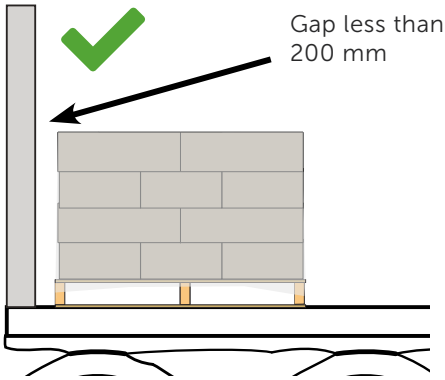
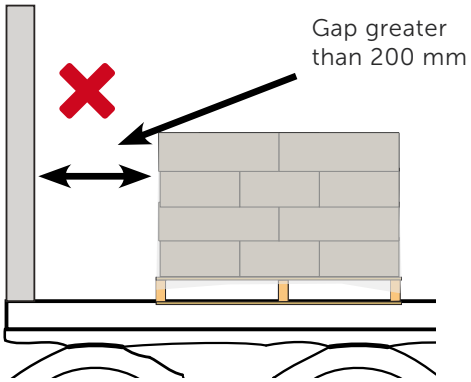
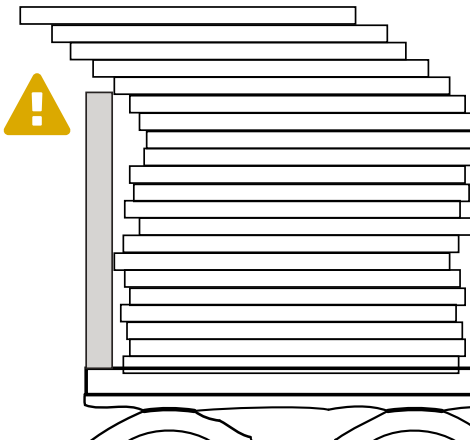


Figure 370 Unblocked load



- Make sure the load does not sit above the height of the headboard, unless the packaging is of adequate strength to contain the product against the full forward force – *Figure 371*.

Figure 371 Unblocked top portion of load



- If using **rated headboards**, check the rating is suitable to restrain the load before loading the vehicle. If needed, use additional restraint for forward blocking.

- If **reinforcing a loading rack/pipe gate** with a chain:
  - Make sure the chain is located at ¾ of the height of the load and at a 30 degree lashing angle – *Figure 372* and *Figure 373*.
  - Take up all slack in the chain.

Figure 372 Chained pipe gate

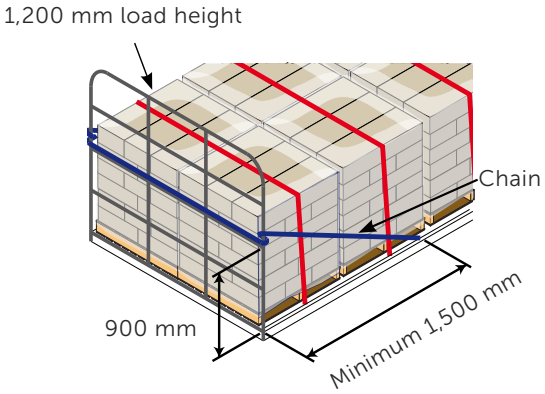
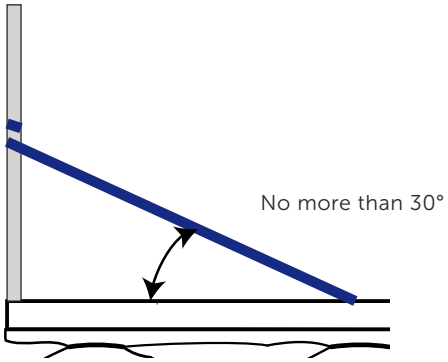
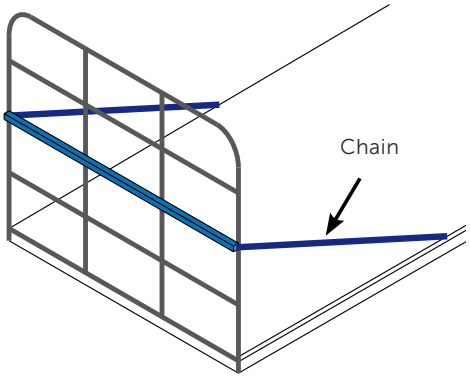


Figure 373 Chains should be kept below 30°



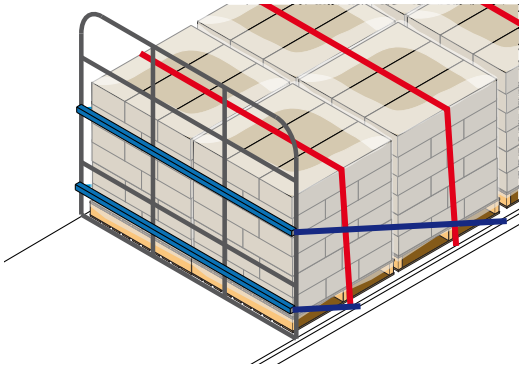
- To help keep the reinforcing chain in position on a loading rack, feed it through the bore of a square, hollow tube welded to the front of the gate – *Figure 374*.

Figure 374 Reinforced "pipe gate" style load rack



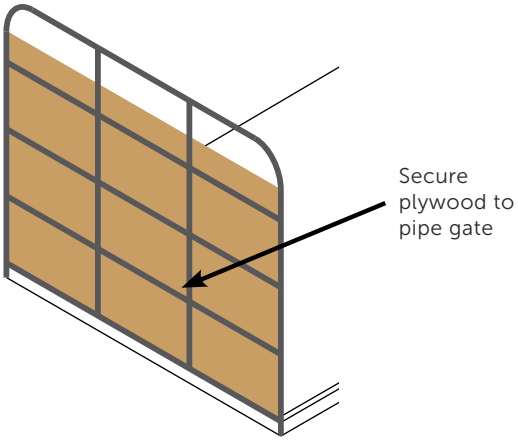
- Place moveable load racks that have been reinforced/supported with two chains along the trailer, as required – *Figure 375*.

Figure 375 Supported moveable load rack with two chains may be placed along the trailer



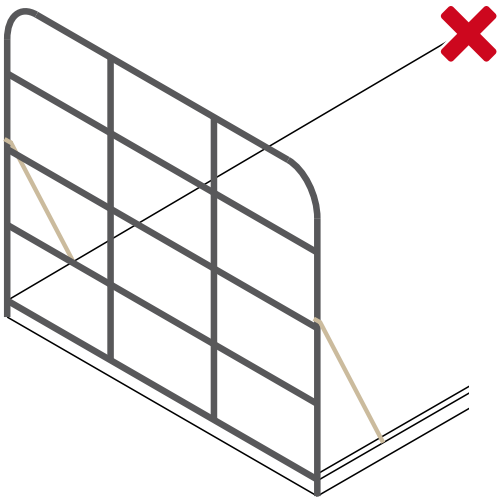
- Restrain any plywood, metal sheeting or mesh that is used behind a loading rack, separately to the load – *Figure 376*.
- If using **unrated headboards** or **loading racks** that have not been reinforced, use additional restraint for forward blocking.

Figure 376 Plywood sheeting used to contain the load



- Do not attach separate lashings to the side posts of a loading rack/pipe gate in order to reinforce it because the middle uprights will not be supported – *Figure 377*.

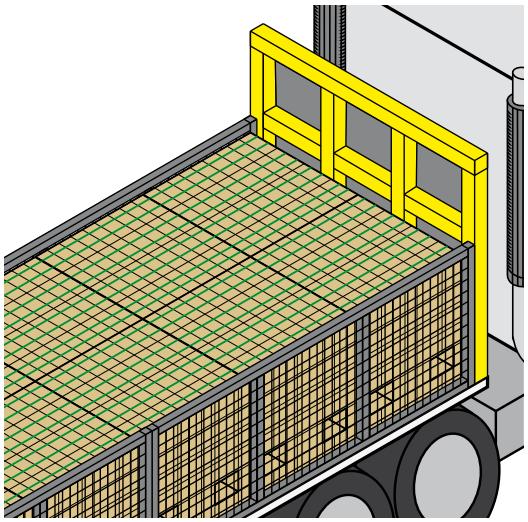
Figure 377 "Pipe gate" load rack restrained with rope on side post



CHECKLIST FOR CERTIFIERS AND DESIGNERS

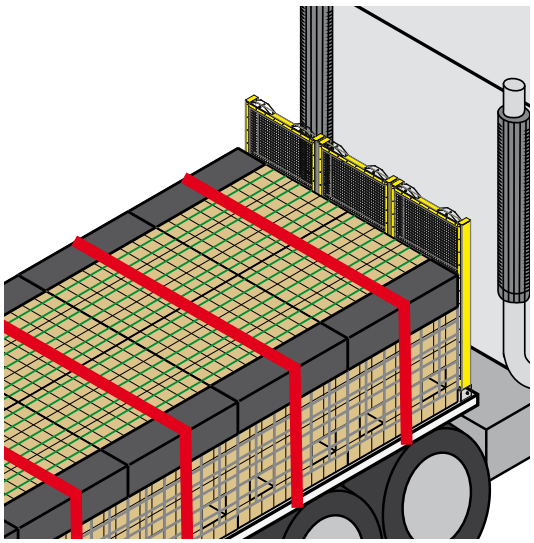
- Test that headboards meet the forces in the load restraint Performance Standards.
- When designing **rated headboards**, take multiple loading cases into account.
- Test the forces that headboards can withstand. When used as a full containment blocking solution, the headboard must withstand forces equal to 80% of the weight of the load.

Figure 378 Headboards relied upon for all forward restraint must restrain the load at 0.8 g



- If the load is tied down, the sum of the forward restraint from the tie-down and the headboard should withstand forces equal to 80% of the weight of the load. In the case that tie-down is sufficient to restrain the load at 0.5 g, the headboard should be sufficient to restrain the load at 0.3 g – *Figure 379*.

Figure 379 Headboards used with tie-downs can safely restrain heavier loads than when used without tie-downs



BARRIERS

WHAT ARE BARRIERS?

Barriers are movable blocking devices, also known as "intermediate headboards".

WHEN TO USE BARRIERS

- Use barriers when there are gaps between loads along the length of the truck and the rear part of the load needs to be blocked in the forward direction.
- Use barriers to restrain the rear part of a load that is separated into two parts to maintain correct axle weight limits.

HOW TO USE BARRIERS

- Make sure that the barrier is loaded against the freight – *Figure 380* and *Figure 381*.
- Barriers are usually placed against the load after loading; chains are then applied to lash the barrier.
- Make sure that the barrier and its support chains are strong enough to block the forward forces from the load.
- Chain the barrier to the tie rails on both sides, near the top and bottom.
- Barriers can restrain the load against all the forward forces or act together with tie-downs to provide all of the forwards restraint.

Figure 380 Load against barrier

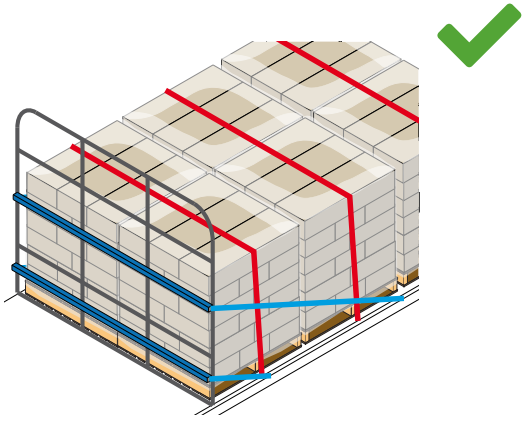
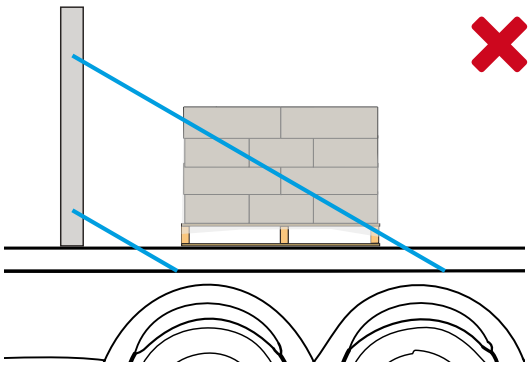


Figure 381 Load not against barrier



WEBBING

WHAT IS WEBBING?

Webbing is a lightweight restraint system used throughout the transport industry.

Webbing assemblies include load-rated webbing material with specified stitching and sewing patterns, together with end fittings, tensioning devices and a rating tag.

Webbing assemblies with either attached or in-line ratchet winches must comply with Australian Standard AS/NZS 4380 Motor vehicles – Cargo restraint systems – Transport webbing and components.

The lashing capacity is displayed on each assembly that complies with the relevant Australian Standard – *Figure 409*.

The lashing capacity of a webbing assembly does not equal the pretension force. Typical lashing capacity for a 50 mm webbing strap is 2,000 kgf, whereas pretension is only 300 kgf.

You cannot just add webbing lashing capacity to match the mass of the load. See the Tie-down worked examples for how to work out the number of lashings you need.

Do not use webbing assemblies that do not comply with AS 4380 for load restraint purposes because they can have much lower ratings.

WHEN TO USE WEBBING

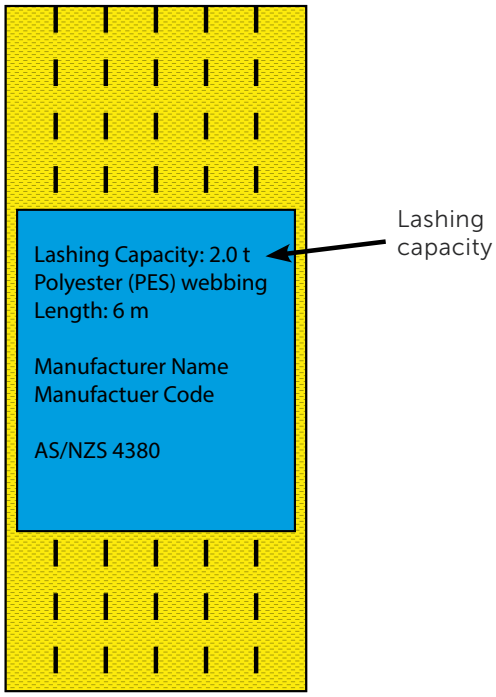
Use webbing to restrain:

- palletised goods
- loads that can settle or deform during transport (e.g. bags and sacks)
- loads that can damage easily from lashings
- loads that don't have sharp edges.

Webbing is more elastic than chains or steel strapping. Webbing will retain some of its initial tension during transport if a load deforms slightly or settles.

Do not use webbing assemblies with chemicals or at high temperatures without referring to the manufacturer's instructions.

Figure 409 Example of webbing label



HOW TO USE WEBBING

Webbing assemblies

- ✔ Make sure that webbing assembly components have an adequate lashing capacity for the load.
- ✖ Do not use webbing strap that has any knots in it.
- ✖ Do not use straps that are joined by knots or any other means that are not approved by the manufacturer.

Attaching webbing straps

- ℹ Tensioners can be attached to the vehicle by a truck winch or an in-line hand ratchet – *Figure 410* and *Figure 411*.
- ✔ Clip truck winches onto tie rails or slide them into special tracks under the coaming rails – *Figure 411*.
- ✔ Attach in-line tensioners (hand ratchet winches or over-centre buckles) to tie rails using a webbing strap and hook.

Figure 410 In-line hand ratchet

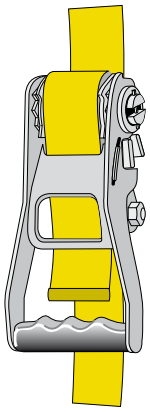
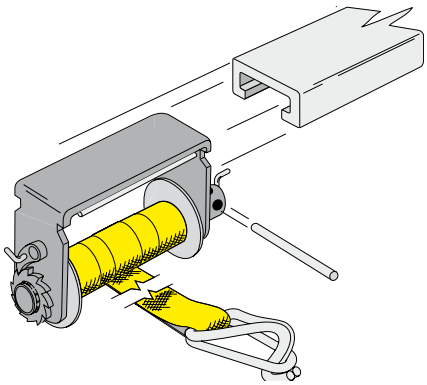
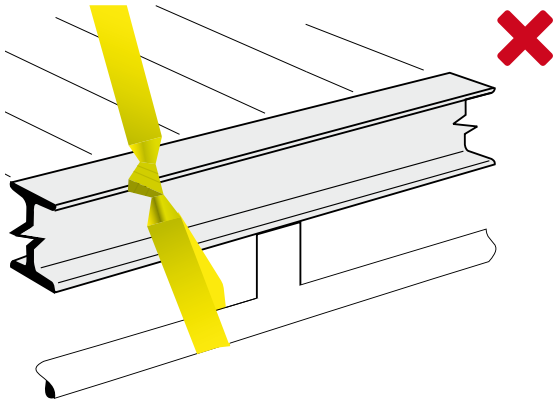


Figure 411 Truck winch into rail



- ✖ Do not use knots to attach webbing strap to tie rails – *Figure 412*.

Figure 412 Knots cannot be used with webbing



How to protect webbing straps

- Always check for sharp edges and rough and high friction surfaces because they prevent the lashing tension from equalising on both sides of the load –*Figure 413*.
- Corner protectors, sleeves or other packing material should be used where lashings and loads contact each other, especially on sharp or abrasive loads – *Figure 413*.
- Smooth, rounded corner protectors enable high tension on both sides of the load.
- Longer, rigid corner protectors are also useful in distributing the load across compressible or bendable products – *Figure 414*.

Figure 413 Webbing strap can be cut by sharp edges

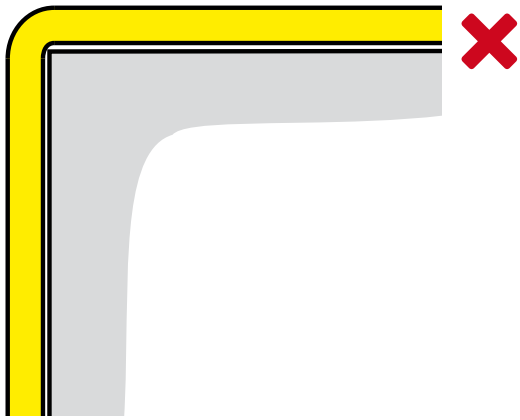
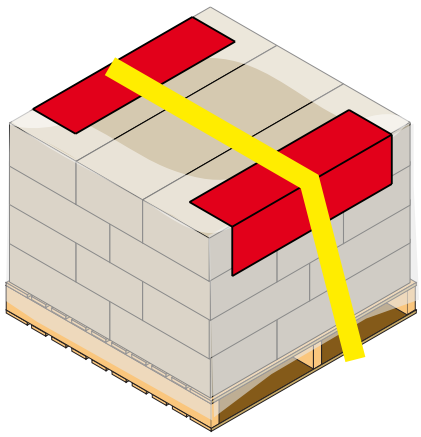


Figure 414 Rigid corner protectors distribute the load across the pallet



Tensioning webbing straps

Webbing straps are tensioned using either attached clip-on sliding winches, in-line tensioners or geared winches.

The amount of tension produced by a truck winch or hand ratchet depends on the length of the handle, how large the diameter of the webbing spool becomes during tightening, and the number of ratchet teeth.

Hand ratchets that operate by pulling the handle downwards will normally produce much more pretension (600 kgf) than push-up ratchets and standard truck winches (300 kgf) – *Figure 415*.

Loop the strap over a standard triangular end fitting to obtain higher tensions; the lashing capacity can be doubled and the pretension increased by an extra two-thirds – *Figure 416*.

For effective pretension when tensioning hand ratchet winches, make sure there are at least one and a half turns of strapping on the spindle, and no more than three.

Using long lashings makes it easier to obtain high tension consistently (the 'draw in' length between each click of a webbing ratchet does not increase the tensions as much as it does on a short lashing).

Make sure the strapping is wound evenly across the drum of the winch or ratchet.

The effectiveness of the tensioner decreases significantly as the thickness of the layers of webbing increases – *Figure 417*.

During your journey, you should regularly check and re-tension your webbings as needed.

Figure 415 High pretension "pull down to operate" ratchet

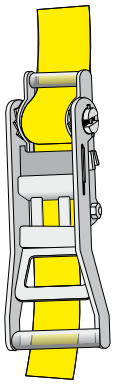


Figure 416 High pretension tie-down

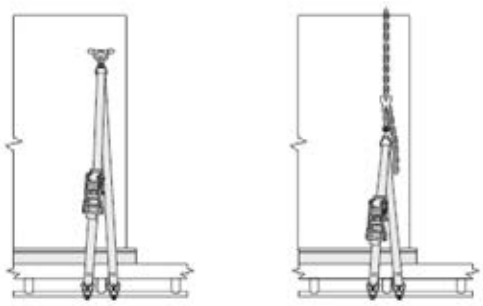
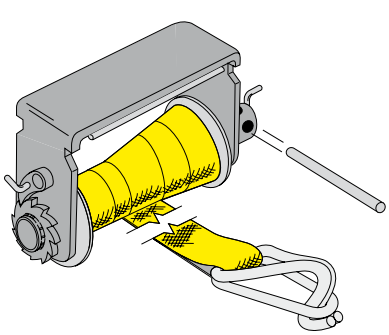
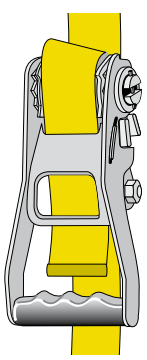


Figure 417 Webbing layered unevenly



Winch drum

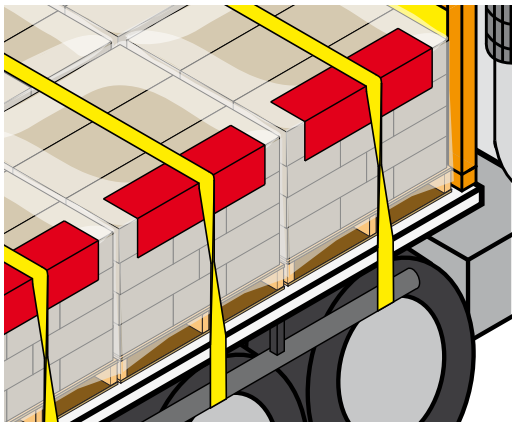


Ratchet drum

WHAT TO LOOK FOR WHEN USING WEBBING

- Check there are no knots or twists in the strapping.
- While webbing straps should not be excessively twisted, a half-turn may help to prevent vibration and flapping – *Figure 418*.
- Check strapping is not attached to anchor points using knots.
- Look out for webbing that appears furry because this indicates the webbing is worn and can lead to broken load-bearing fibres may be broken.
- Look out for any damage caused by cuts and abrasions, particularly where the webbing contacts the load and the coaming rails.

Figure 418 Webbing with half a twist tying the load



CHECKLIST FOR CERTIFIERS AND DESIGNERS

- When assessing the serviceability of webbing and attachments in relation to AS4380, if any of the following conditions exist, replace the webbing or attachment:
  - Webbing weakened by 10% or more of its original minimum breaking strength by any of the following:
    - wear, damage or stitching failure caused by excessive loading, knotting and bending
    - exposure to chemicals, including acid and alkaline solutions and organic solvents
    - exposure to high temperatures
    - prolonged exposure to sunlight or ultraviolet light (fibres will appear hairy). Webbing that appears hairy or furry indicates the webbing is worn, and may indicate load-bearing fibres are broken.
  - Webbing repaired in a manner not approved by the manufacturer
  - Any attachments (tensioner, hook and keeper, etc.) weakened by 10% or more, or prevented from functioning by wear, damage or corrosion.

Figure 419 Worn webbing example