

## SECTION 5 LOAD SECURITY & SAFETY

---

- 5.1 Safety
- 5.2 Load Stability
- 5.3 Load Movement
- 5.4 Load Distribution
- 5.5 Door & Hatches
- 5.6 Container Seals
- 5.7 Tie-Down Points & Lashings
- 5.8 Baulking & Chocking
- 5.9 Chains
- 5.10 Dunnage
- 5.11 Strops (or Load Binders)
- 5.12 Steel Strapping
- 5.13 Nets & Tarpaulins
- 5.14 Twistlocks
- 5.15 Stanchions
- 5.16 Curtainside Equipment

### 5.1 SAFETY



Building a safe operation means being conscious of safety every day in every way.

**Think Safe** is a commitment to make sure people stay safe, right down the line, and to cut out damage and delays.

**Safety** is paramount in all freight handling.

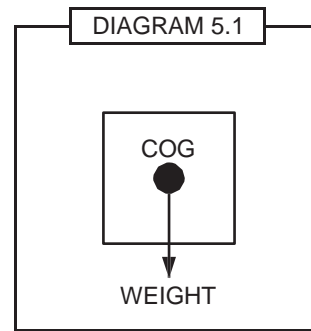
**Think Safe, Behave Safe** and **Watch Out for the Safety of Others**—fellow workmates and the public at large. This will ensure that no lives or limbs are put in jeopardy.

**Think Safe** means safe loading, good stowage and increased customer satisfaction.

Load stability is all about **weight** and **gravity**.

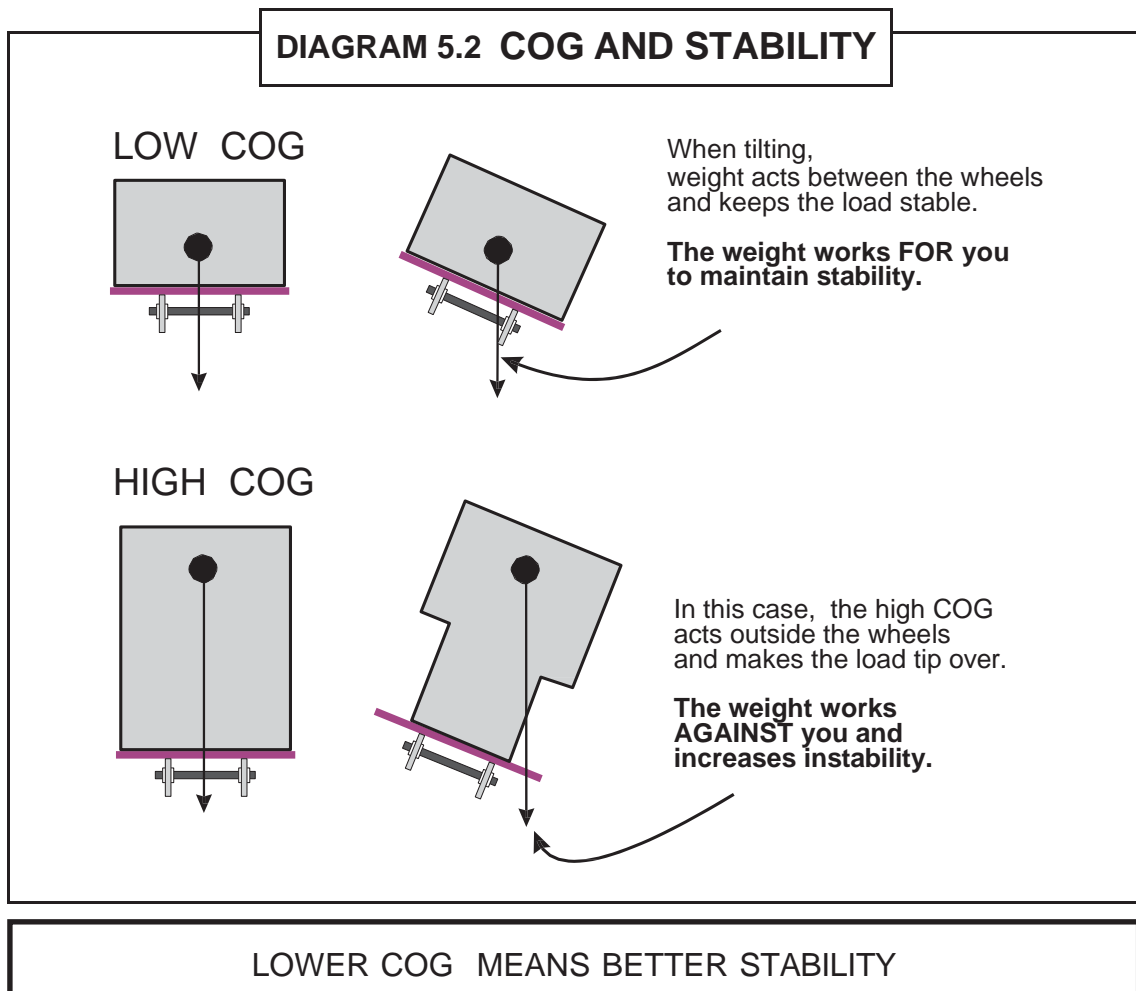
The weight of an object is a downward force which acts through the **centre of gravity** as shown in Diagram 5.1.

The weight of the freight can help keep the freight stable. It can also make the freight unstable and fall over.



## THINK STABILITY

- ➔ Keep the COG as **low** as possible. A low COG increases stability, as shown in Diagram 5.2.



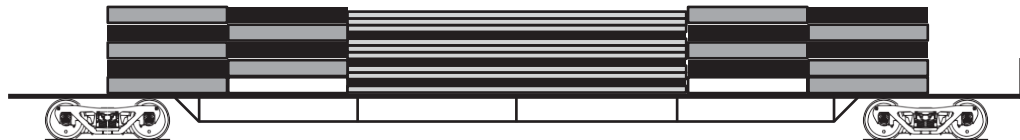
- ➔ Remember that wagons tilt when travelling round curves, so the load may be stable when stationary but might topple over in transit.

Loads **MUST NOT** move when in transit.

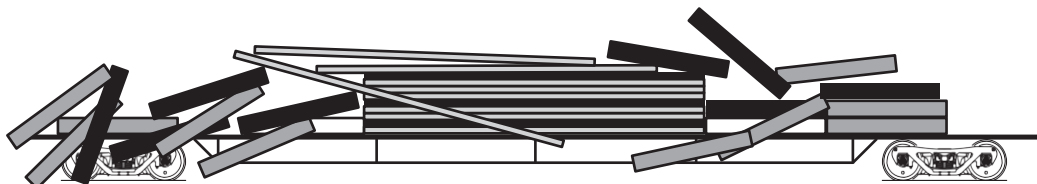
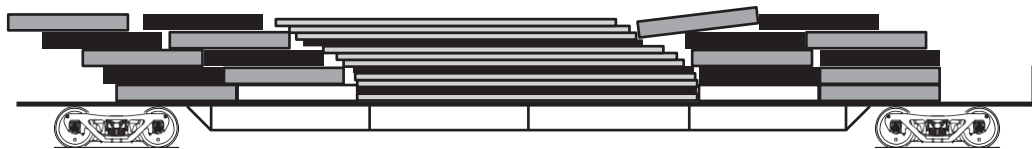
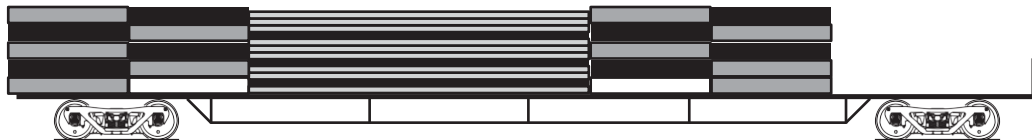
They must be restrained either individually or in combination so as to **prevent movement** under normal travelling conditions.

The following examples show what happens when loads are **not secured properly**:

A neat and tidy load that started like this...



... could end up like any one of these:



Restraints to stop movement can be provided using lashings, chains, baulks, nets, air bags etc.

- ✓ Provide **extra restraints...**
- ➔ When loading on **slippery surfaces**.
- ➔ When loading **steel on steel** (see Section 13 of this Manual).
- ➔ When loading **manufactured boards**, e.g., hardboard (see Section 18.2 of this Manual).

The remainder of this Section gives more details about restraining loads in a secure

### DO...

- ✓ Stay **within** wagon **and** axle weight limits. See Diagram 5.4 'Check Axle Loading'.
- ✓ Stay within the **size limitations**
- ✓ Keep COG low.
- ✓ Position the load for **ease of removal**, i.e., put **last off** freight **on first**.
- ✓ Balance the load **evenly**. See Diagram 5.3 'Balance the Load Evenly'.

### DO NOT...

- ✗ light loads.
- ✗ **DO NOT** load at one end only (unless loading centrally is impossible).
- ✗ **DO NOT** load on one side only.

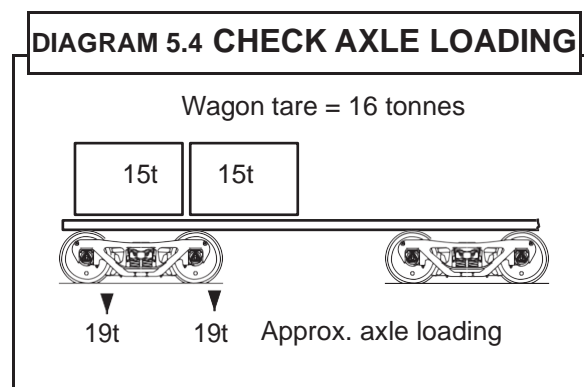
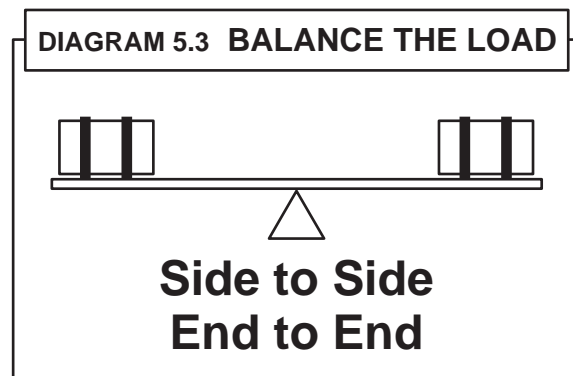
Diagram 5.5 illustrates these points.

### CHECK AXLE LOADING

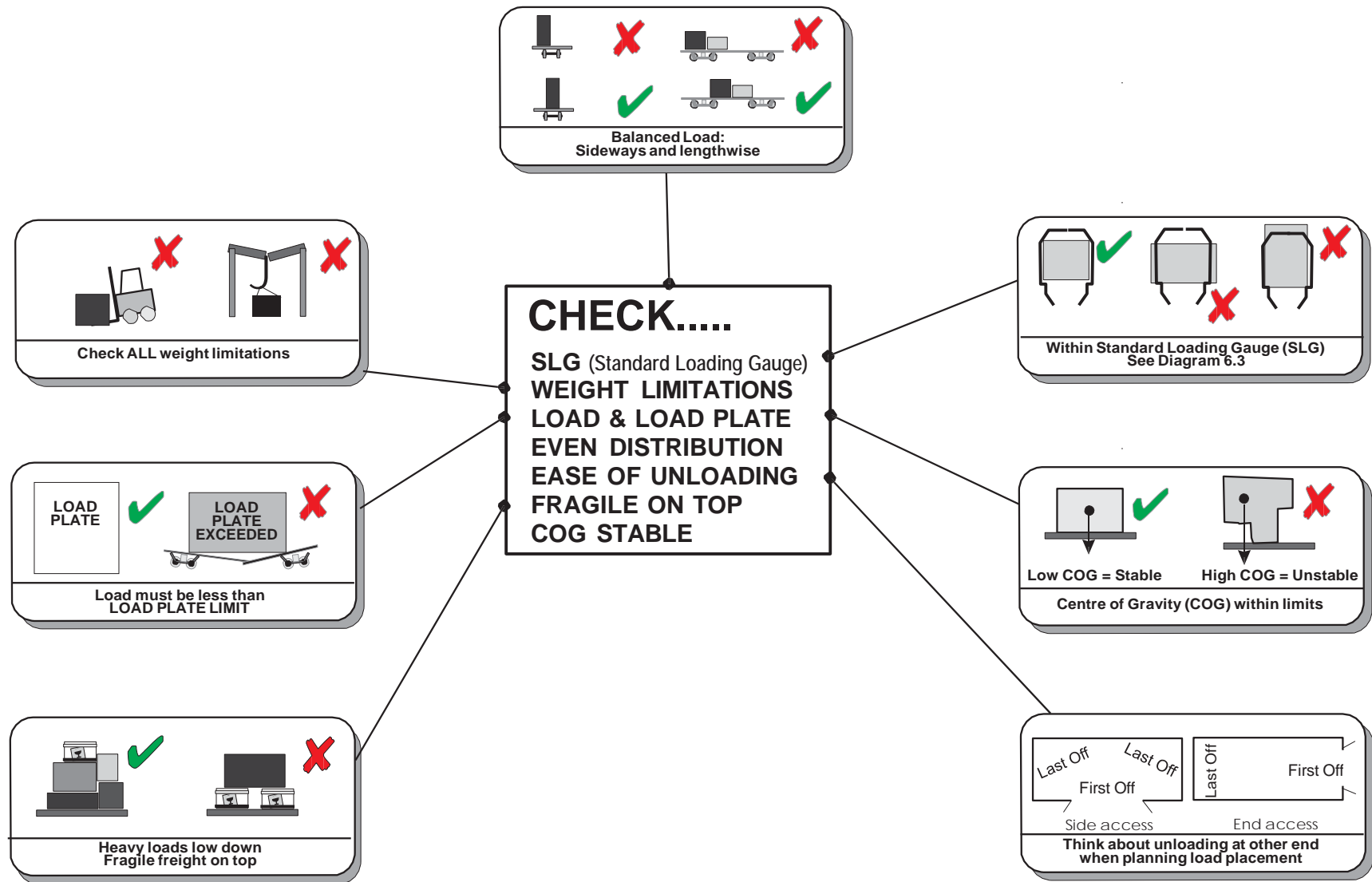
A load might be within the overall weight limit for one wagon, but if placed at one end, it might exceed the **axle** limit.

For example, take two containers each weighing 15 tonnes and place them on one wagon whose tare is 16 tonnes. The combined weight is 46 tonnes. This is within the overall wagon limit.

But the axle loading would be similar to Diagram 5.4. For 16 tonne axle routes (see Diagram 22.6) loads like that shown here would exceed the axle limit.



**DIAGRAM 5.5 LOAD DISTRIBUTION CHECKLIST**



All doors, hatches, covers, flaps etc. on containers, wagons or any form of transportation unit **MUST** be properly **CLOSED** and **SECURED**.

This applies to all containers, wagons and any form of transportation unit, whether empty, partly loaded or full.

### **Before Loading Containers, Wagons or any Form of Transportation Unit, DO...**

- ✓ Check that all door locking mechanisms are undamaged, intact and fit for purpose

Containers with damaged, faulty or missing door locking mechanisms, **MUST NOT BE LOADED**. If a KiwiRail owned container requires repair contact the nearest KiwiRail office or Customer Service Centre on 0800 351-351.

### **Closing and Securing Side Opening Containers, DO...**

- ✓ After closing side opening container doors, check that ALL doors are FULLY latched and that door guides (top and bottom) are located in their channels. **DO NOT** despatch containers that cannot be PROPERLY secured—they must be 'bad ordered' and repaired before use.
- ✓ Ensure that an approved container seal is securing at least 1 locking bar per **DOOR PANEL** (4 seals per side opening container)
- ✓ Check that cable ties are **NOT** used as a replacement for a broken latch



**ALL 4 locking bars require seals, 1x lock bar per door panel (examples circled)**

### **Closing and Securing End Opening Containers, DO...**

- ✓ Ensure that one seal is securing the **OUTER** door lock bar - the seal is either positioned on the handle or at the base of the lock bar
- ✓ Check that cable ties are **NOT** used as a replacement for a broken latch



*1 seal, in **EITHER** circled location is required*

If required for load security and/or cleanliness, security seals should be applied immediately after closing.

### **Before despatch, DO...**

- ✓ Check that all doors, hatches etc are **closed**.
- ✓ *Check that all container door handles are seated correctly in the door catch, the door handle retainer / latch is lowered, and an approved seal is securing the container*
- ✓ **'THINK SAFETY'**

**5.5 DOORS & HATCHES (cont)****Where doors and hatches etc cannot be closed *and secured*, DO...**

- ✓ Immediately **INFORM** your supervisor, nearest KiwiRail office, or the Customer Service Centre on 0800 351-351
- ✓ **Mark** the wagon, *container, or transportation unit* as follows: 'NTR'.  
NTR means **NOT TO RUN**.

**DO NOT...**

- ✗ **DO NOT** load the wagon, container or transportation unit.



## 5.6 CONTAINER SEALS

Seals must be attached to all:

- ➔ Container Doors
- ➔ *Container Door panels for side opening containers*

Only approved seals are to be used, these are:

- ➔ Transit Bolts
- ➔ Cable Ties
- ➔ Padlocks
- ➔ Shippers Seals



Transit Bolt



Cable Tie



Padlock



Shippers Seal

## 5.7 TIE-DOWN POINTS & LASHINGS

Lashings include chains and strops (webbing). All methods of securing, lashing and tying a load are only as strong as the tie-down points and the strength of the lashings.

**Danger:** Ropes **MUST NOT** be used

**Tie-down points** must be able to resist movement in all directions, i.e.,

- ➔ Forward or backward;
- ➔ Sideways;
- ➔ Up and down.

### DO CHECK...

- ✓ That the tie-down points cannot move.
- ✓ That the tie-down points will not come loose in transit.
- ✓ That the tie-down points are strong enough for the type of load being restrained.

### IF TIE-DOWN POINTS ARE NOT GOOD ENOUGH...

- ➔ Seek advice from your supervisor.
- ➔ Use additional means of securing the load. For example, place the load in a corner or against the headboard, or use extra chocks, cradles or dunnage/gluts.

**Lashings** must be strong enough to secure the load. A lashing that breaks in transit can, potentially, cause serious problems.

### RULES FOR SATISFACTORY LASHING

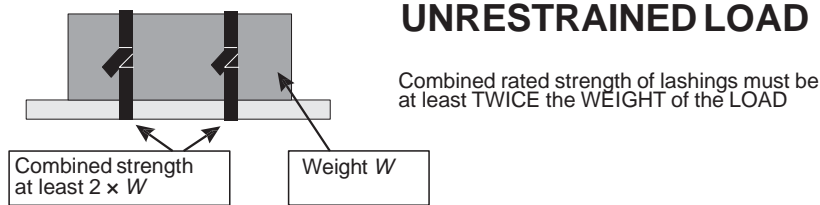
For chains (and steel wire) the rated strength shall be equivalent to, but not more than, the specified minimum breaking strength.

For strops, (webbings) the rated (assembly) strength shall be equivalent to, but not more than, half the breaking strength.

- ➔ **Unrestrained loads:** Combined rated strength of lashings must be at least **twice** the weight of the load.
- ➔ Loads **restrained** against headboards or end walls: Combined rated strength must be at least equal to the weight of the load. See Diagram 5.6.

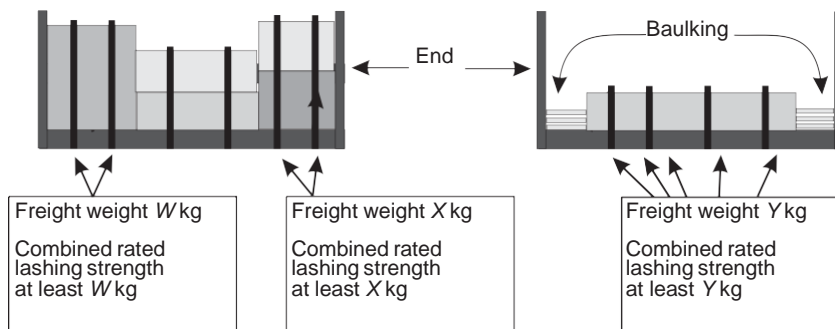
Note: The lightweight lashing points ('crinkle bars') fitted to some wagons are mainly intended for securing tarpaulins. They have load rating of only 1.25 tonnes. They can be used to secure items using ropes or 38mm commercial webbing strop assemblies. They are not suitable for use with securing chains or 50mm webbing strops.

**DIAGRAM 5.6 MINIMUM LASHING STRENGTHS**



**LOAD RESTRAINED AGAINST ENDS**

Combined rated strength of lashings must be at least EQUAL to the WEIGHT of the LOAD



**5.8 BAULKING & CHOCKING**

Chocking is the technique of using blocks, wedges and chocks to secure a load.

Where possible, loads should be secured against solid walls, ends or headboards. However, this is not always possible since it might produce an unbalanced load.

Chocking should, where possible, be in addition to other methods of obtaining load security.

**WHEN CHOCKING, DO...**

- ✓ Check that the chocking cannot work loose or move.

For chains (and steel wire) the rated strength shall be equivalent to, but not more than, the specified minimum breaking strength.

The standard railway bond chains fitted to wagons have a rated strength of 10 tonnes. They are designed to be loaded through the winch scroll only. The end lug that the long chain is attached to is not a load anchor point.



### WRONG

A loaded wagon should NOT look like this. The lug at the end of the chain has no restraint rating



### CORRECT

The chain on the loaded wagon should look like this, the chain is wrapped around the main shaft of the tensioner (winch scroll). This gives a restraint rating of 10 tonne

## RULE

Chains must not be loose in transit. When not in use, chains must be:

- ➔ Laced across the wagon deck (1st option);
- ➔ Layered into serviceable chain boxes, free of ballast, with the last link slotted into the locking slot (2nd option);
- ➔ Stowed along or across the deck of flat top wagons with stanchions, with the end secured and the chain taut so that it will not move in transit. (3rd option).

### DO...

- ✓ Tension the chains up from both sides..
- ✓ Use tyre dunnage on the edges under the chains when securing plate or flat sheet metal.

### DO NOT...

- ✗ **DO NOT** load any freight when tensioning hooks are missing.

## 5.10 DUNNAGE

Dunnage is used to separate loads from each other, and from the load platform. It provides protection for the freight, and reduces any damage that the load might inflict on the load platform.

### DO...

- ✓ Use the same thickness under each piece of freight.
- ✓ Use dunnage with the maximum possible width.
- ✓ Use single layers of thicker dunnage rather than double layers of thinner dunnage.
- ✓ Secure the dunnage to the freight if there is any chance of movement in transit.

See later sections in this Manual for dunnage requirements for different types of freight, e.g., Section 13 for metallic product.

### AVOID...

Loose dunnage between loads and between the load and the load platform.

## 5.11 STROPS (or Load Binders)

For strops, the rated (assembly) strength shall be equivalent to, but not more than, half the breaking strength.

Strops, or load binders, have several major advantages for lashing loads to the load platform:

- ➔ They have quick-fastening and release mechanisms.
- ➔ They have built-in tensioning mechanisms.
- ➔ They can not damage freight as easily as chains can.
- ➔ They do not tighten or slacken in response to moisture.

### RULES

- ➔ Strops must demonstrate compliance with AS/NZS 4380
- ➔ Strops must be at least 38 mm wide.
- ➔ Strops must be secured across the wagon deck when not in use.

## 5.11 STROPS (or Load Binders) continued

### DO...

- ✓ **Inspect** every piece of webbing **every time** before using it.

### DO NOT...

- ✗ Use strops that are knotted
- ✗ Use strops that are twisted more than half a turn. Half a turn is allowable to prevent vibration or flapping

## 5.12 STEEL STRAPPING

Steel strapping (banding) is often used to unitize loads.

- ➔ Steel strapping is not acceptable for use as primary load restraint for general freight.
- ➔ There are a variety of commercially produced strapping products in use and the strength rating of the system is not identified in a standard manner<sup>1</sup>, making it difficult to assess that a load is adequately secured.
- ➔ Steel strapping performance is subject to variations in tooling, end finishing and operator skill.
- ➔ Steel strapping which comes loose in transit cannot be re-tensioned.
- ➔ Steel strapping is not included in the Land Transport New Zealand Truck Loading Code as a “standard” means of primary load restraint for similar reasons.

High tensile steel strapping has a low securing rating compared to chains or strops.

- ➔ A typical strop might have a securing rating of about half that of a webbing strop, so a very large number of straps would be required to secure a heavy load.

Steel strapping may be approved as primary or significant load restraint for specific regular ongoing traffic.

- ➔ Approval would involve calculations and / or physical tests that prove that the securing system meets the requirements of Section 5.6 of this code. It would require processes to be in place at the loading site to ensure that strap quality, tool maintenance and operator training are controlled.

**Note:** In view of the cost of setting up and operating such an approval scheme, this approach can only be adopted in exceptional cases where conventional securing methods cannot be used and traffic volume and consistency justifies such an investment.

Approved loading schemes for specific products will be documented in an M9204 loading quick guide. If no quick guide document exists, the loading scheme is not approved.

1 - The timber packaging industry has been encouraged by NZTA to develop a standard way of identifying strapping, but to date this has not happened.

**DO...**

- ✓ Use nets for light, fragile top storage where additional security is needed.
- ✓ Use tarpaulins for protection.
- ✓ Use tarpaulins to contain bulk loads in open-top wagons.

**DO NOT...**

- ✗ **DO NOT** use tarpaulins to secure the load. Secure the load by approved methods.

**5.14 TWISTLOCKS**

Most purpose-built rail wagons have specially designed locking mechanisms to secure the load during transportation.

These mechanisms are called **twistlocks**.

**DO...**

- ✓ Always check that twistlocks have been secured before despatching the load.
- For details on loading and securing containers, see Section 12.

**5.15 STANCHIONS****DO...**

- ✓ Ensure stanchions are put in place for all unenclosed loads on flat deck wagons. This will provide a restraint in case the load should shift in transit.

**DO...**

- ✓ Ensure that side curtains are properly secured and tensioned.

**DO NOT...**

- ✗ **DO NOT** use tarpaulins to secure the load. Secure the load by approved methods.
- ✗ **DO NOT** use side curtains alone to secure loads travelling interisland.

Load bearing curtains (as fitted to a number of wagons and container types) may only be relied on as the primary load restraint where the load is the one the wagon or container was specifically designed and tested to handle.

Where other load types are transported in a curtainside wagon or container, the load must be secured using strops or chains in accordance with standard freight securing requirements.

**Controlled Loading Trials:**

Are required in order to approve curtainside equipment for a load type it was not originally designed or previously approved for.

**Loads in Curtainside Wagons and Containers - Background document**

Some wagons and containers are fitted with load bearing side curtains. These provide good access to the load space while retaining good weather protection for the load. They may also form part or all of the load restraint system for the wagon or container. In most cases, these curtain side wagons and containers were designed for specific products and testing was carried out to ensure that the specific loads did not move in transit.

Some of these wagons and containers are now used in general freight traffic. In some cases it may be acceptable to carry products restrained by only the curtains. If the curtain is not in direct contact with the load, extra restraints will be required, even if the weight is less than the rated load for the curtain.

Curtains cannot restrain loads they are not touching and as a result they can allow entire loads or parts of loads to move sideways far enough to make the wagon unstable or out of gauge before stopping further load shift. Unsecured general loads need to be carefully monitored and, if significant movement is occurring in transit, extra restraints used.

Note: **Loads restrained by curtains only are not permitted to travel on the Interisland ferries.**



## Basic Curtain Ratings for Rail Operation Only

Many of the load bearing curtains on KiwiRail wagons and containers were manufactured by Structurflex. The load bearing capability of these curtains is provided by the built-in webbing straps. The spacing of these straps (typically between 500-700mm) affects the curtain rating. Structurflex tests have shown that a single strap can safely carry a distributed (i.e. full height) load of 723kg. Maximum design lateral acceleration on rail is 0.3g. This means each strap can restrain  $0.723 \times 0.3 = 2.4$  tonnes of product.

Structurflex curtains typically have a load rating plate attached to one of the end tensioner poles. The load rating is usually expressed as 1200kg/m, which will calculate out to give the same result as the counting straps approach. Other common KiwiRail curtain suppliers (Polyweld and YJTC) use equivalent technology and certify their products to the same rating.

Note: The Road Transport legislation allows no more than 100mm of curtain deflection under a sideways acceleration of 0.5g. This reflects the concern that curtains can allow loads to move significantly in transit. However curtain contact with the load and/or some deflection around the load is essential to the curtain developing an effective restraining force. New Zealand curtain manufacturers claim that it is not practical to achieve the road requirement with a hand tensioned curtain system and continue to rate their products on strength alone, with responsibility for meeting the requirements of the legislation falling on the operator.

100mm nominal curtain deflection is acceptable for rail transport.

Weight limit for common curtain side wagons and containers				
Vehicle	Approved Unsecured Load	Body capacity (tonne)	Number of Straps per side	Total curtain capacity (tonne)
GXT (including previous GCT & GCM designations)	Palletised Domestic Freight	20.0	11	26.4
TSD, TSF, TSH, TSL, TSM	Specific Dairy Products. Parachute strops or air bag also required	26.3 (TSM has max rating)	11	26.4
ZHC	Palletised Domestic Freight	38.0	22	52.8
ZK	Paper Reels, Baled Pulp	41.0	22	52.8
ZWT (2x GWT on IA wagon)	Palletised Domestic Freight	23.8 per GWT	11 per GWT	26.4 per GWT
ZWX & ZWF (Prototype and production versions of GWF on 50' CFT wagons)	Palletised Domestic Freight	47.7	26	55.4
ZXF (GCF on UK wagon)	Palletised Domestic Freight	35.0	24	51.5

In all cases, the curtain capacity exceeds the load capacity of the vehicle. Therefore for these approved products only, loading up to the wagon body load capacity is acceptable using the curtain as the primary load restraint, noting:

- ➔ Controlled loading trials are required in order to approve curtain-side equipment for a load type it was not originally designed or previously approved for.
- ➔ The unsecured load must not exceed 2.4 tonne per curtain strap. Thus heavy items must be separately stropped and secured.
- ➔ The total load must not exceed the lower value of the load capacity of the wagon or container.
- ➔ Curtains are best suited to restraining uniformly distributed full height loads. The load must be packed so gaps are minimised and so the load cannot move, topple or make the wagon unbalanced.
- ➔ The curtain cannot restrain loads it is not in contact with. Such loads must be separately stropped and secured.
- ➔ Small items must be unitised with strapping or shrink-wrapping to ensure that individual parts of the load cannot move. This is particularly important for loads such as wood sheets where the sheets must be prevented from slipping over one another and spreading.
- ➔ Curtains, straps and buckles must be in good condition, and all straps present and properly secured.
- ➔ If items are found to have moved significantly in transit, securing arrangements must be reassessed.