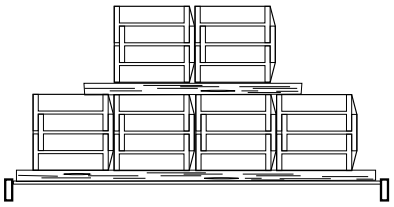
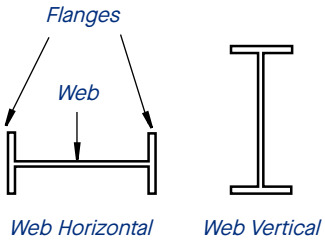
Load Restraint Guideline
Structurals

SS

1. This Guideline applies for:

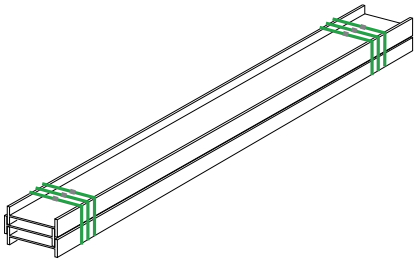
- Steel sections, referred to as "Structurals", which include:
  – Universal Beams (UB's) and Columns (UC's);
  – Channels and Large Angles.
- Structurals with mill scale finish, known as "black steel", on hardwood dunnage (assumed friction co-efficient μ = 0.40).
  Note: If steel is painted or galvanised etc., it will have a lower friction co-efficient and additional restraints may be required. Advice should be sought from BlueScope Steel - Logistics.
- Transporting structural steel sections **Web Horizontal**, the preferred method, as most customers store product with the web horizontal. The non-preferred method is Web Vertical. Both methods require the same number of restraints and dunnage.





2. Essential Requirements

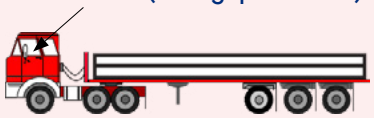
- ✓ Every bundle is strapped to OneSteel or Smorgon Steel standards (minimum two groups of three straps) and strapping is protected from damage (refer Section 4.3).
- ✓ Every bundle is in contact with dunnage, chains and/or adjacent bundles (refer Section 4.1).
- ✓ At least one chain is to be belly wrapped around any layer where there are small bundles that need to be restrained against other bundles.
- ✓ Dunnage shall be 100 × 100 mm hardwood (refer Section 3.1).
- ✓ The number of restraints must comply with Table 1 below.



Notes on Table 1:

1. ***Minimum 2 chains for all loads**, both chains to be belly wrapped if chain angle flatter than 45 degrees.*
2. *If load is all **angles** or **unbundled** product **all chains must be belly wrapped**.*
3. *Chain strengths have been down rated to allow for bending of chain links over flanges.*
4. *The table gives limits for 8 mm transport chains of 3.0 tonnes force Lashing Capacity.*
5. *For 7.3 mm chains of 2.3 tonnes force Lashing Capacity, the allowable limit is one chain per 3.5 tonnes of product.*

Table 1. Number of Chains Required

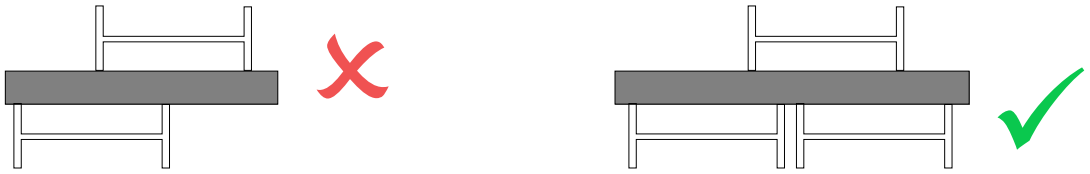
Trailer Configuration	No. of 8mm Chains
Load NOT blocked against designed headboard 	**1 chain per 5.2 tonnes** *or part thereof* including 1 belly wrapped chain per 13 tonnes *or part thereof*
Load blocked against designed headboard (max gap 200mm) 	1 chain per 10.5 tonnes *or part thereof* including 1 belly wrapped chain per 13 tonnes *or part thereof*

3. Dunnage

3.1 Horizontal Dunnage (Base and Intermediate)

To prevent dunnage splitting, the edge of any structural should NOT be located closer than 20 mm to the end of the dunnage.

To prevent dunnage failure, no structural should be supported on an over-hanging piece of dunnage.



To prevent dunnage being weakened and or breaking:

- **A single or top layer of structurals** must be supported by at least **4 lengths of dunnage.**
- **Lower layers of structurals** must be supported by at least **5 lengths of dunnage.**

Dunnage should be evenly spaced so that flexing of the load is controlled. This helps prevent beams "walking out" of the load on long trips.

Dunnage shall be 100 × 100 mm square hardwood, refer to the BlueScope Steel - Logistics Load Restraint Guideline *"Dunnage Requirements"*.

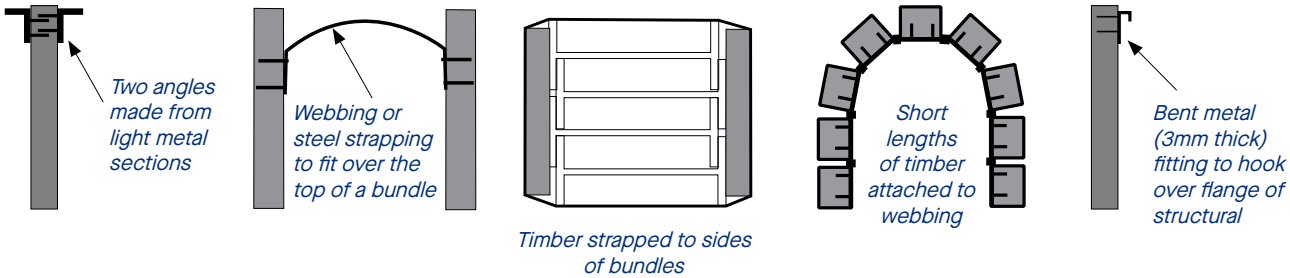
3.2 Vertical Dunnage

This is required where a load has to be gapped to allow customer unloading by crane and slings. Vertical dunnage should be designed:

- To allow placement on loads without the driver having to get onto the truck; and
- To ensure it does not rotate or slip away from its position during travel.

Up to three pieces of vertical dunnage should be placed between each bundle, with one in the middle and one at each end. Five concepts for vertical dunnage are shown below.

Another alternative, not shown, is *Special SRM Rope Dunnage*, refer to BlueScope Steel - Logistics Load Restraint Guideline *"Merchant Bar Bundles"* for more details.

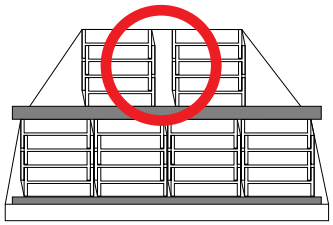


4. Additional Information

4.1 Avoid Dangerous Gaps in Loads

To prevent the load sliding forward into the cabin, or off the truck, loads must be arranged to:

- Avoid any significant gaps between bundles in the top layer;
- Avoid situations where there is no direct downward pressure on top of the lower bundles.

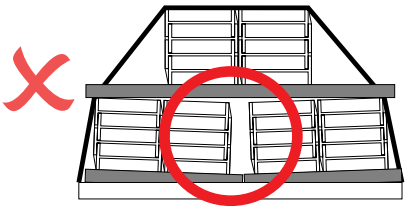


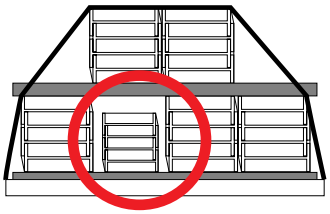
Gap in Top Layer

If the vehicle is cornering, the top bundles may move sideways and the chains may become loose.

Sloped Dunnage and a Gap

Middle two bottom bundles are unrestrained and if the dunnage is wet, sliding will occur easily.



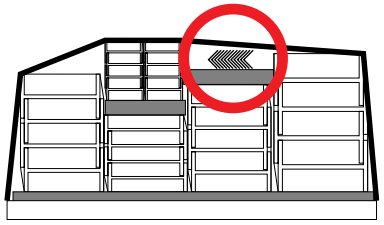


Bundle Only Resting on Dunnage

Bundle is unrestrained forwards.

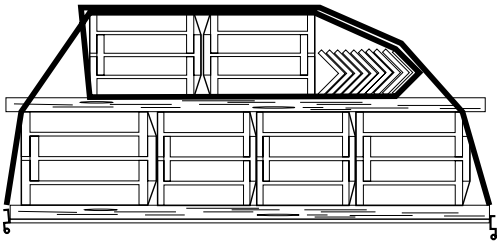
Bundle With Gap at Side(s)

Bundle is unrestrained as it has no contact with a chain or dunnage from above.



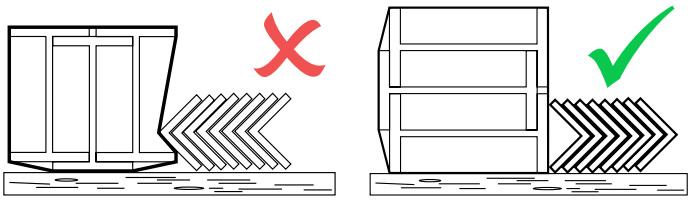
4.2 Restraint of Loose bundles

These bundles may need to be restrained by using one or more belly wrapped chains. For the situation shown at right, belly wrapping is around the top layer so that it clamps the bundle of angles to the structurals alongside it.



4.3 Protecting Bundle Strapping from Damage

To ensure the strapping around bundles is protected, position bundles to minimise damage (as shown right) or through the use of vertical dunnage.



4.4 Length Limits when Transporting Sections Web Horizontal

To ensure the structurals do not become permanently bent, some sections must be supported in the centre or on other stiffer sections.

For flat top semi-trailers up to 14.7 metres long this is generally not an issue. However for drop deck and extendable trailers it can be of concern and further advice should be sought from BlueScope Steel Logistics.

5. Summary of Restraint Systems for a Full Load (26 tonnes)

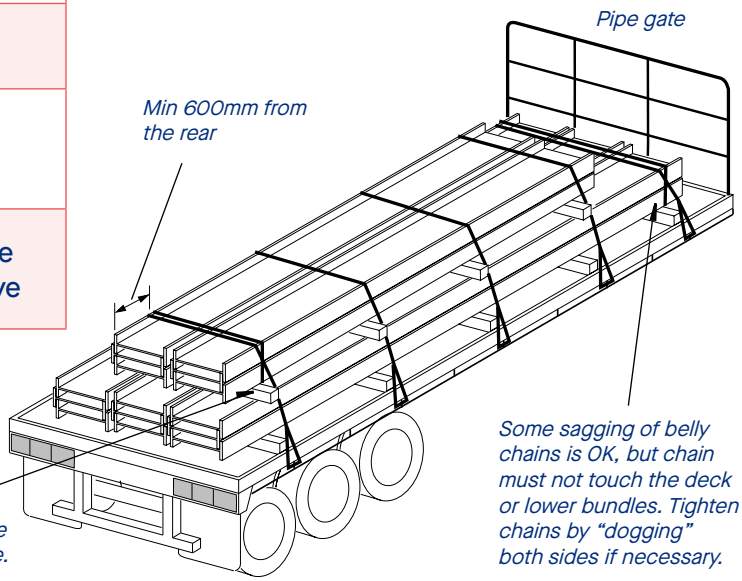
(For part loads refer to Table 1 on Page 1)

5.1 Trucks with Light Front Gates

	No Gaps*	With Gaps
Number of 8mm Chains#	**5**	**5**
Number of Belly Wrapped Chains	**2**	**5**
Number of Dunnages (See page 2)	5 base 4 above	5 base 4 above

Notes:
** Loads with vertical dunnage are equivalent to no gaps.*
 # If using 7.3mm chains, 8 chains are required.

This example shows a load with no gaps with one restraint belly wrapped near each end of the load.



5.2 Trucks with a Designed Headboard (as certified by an Engineer)

	No Gaps*	With Gaps
Number of 8mm Chains##	**3**	**3**
Number of Belly Wrapped Chains	**2**	**3**
Number of Dunnages (See page 2)	5 base 4 above	5 base 4 above

Notes:
If using 7.3mm chains, 4 chains are required.

This example shows a load with no gaps with one restraint belly wrapped near each end of the load.

For loads where bundle lengths vary significantly, extra chains may be required to ensure each bundle has a chain within 3 metres of each end.