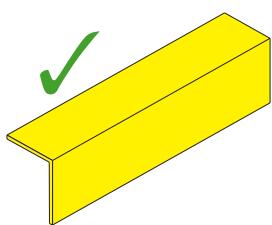


This Guideline:

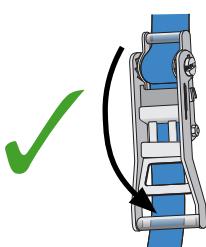
- Provides an engineering system for the restraint of bulk loads of GBMA products, transported by road in Australia.
- Covers: loose and palletised sheet product with a minimum of 15 sheets, palletised cornice product, steel framing and palletised (compounds, bags and buckets) packed to meet the NTC performance standards and the NTC load restraint guide.

Load Restraint Equipment and Key Requirements:

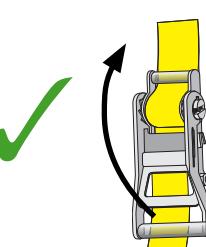
-  All Webbing straps shall comply to AS/NZS 4380, with less than 10% wear.
-  50mm straps or larger, may be used for **tie down** over freight with **Push Up ratchets** (300kg resulting average pretension over the load).
-  50mm straps or larger, may be used for **tie down** over freight with **Drum winches** (300kg resulting average pretension over the load).
-  50mm straps may be used for **tie down** over freight with **Pull Down ratchets** (600kg resulting average pretension over the load).
-  50mm straps may be used for **cross over** lashings with **Pull Down ratchets** (600kg resulting average pretension over the load).
-  Stability of vehicles and product stacks can be impacted by high load heights.
-  Drum winches are not suitable for tensioning of Cross over straps.
-  Any single package must have a minimum of 15 sheets.
-  Do not leave items loose on the vehicle. Always secure within a box or crate.
-  Do not use chains.
-  Steel pallets must have Industrial rubber or rough sawn timber material placed under them to remove the steel on steel low friction surface contact.
-  For loads with multiple layers, the dunnage between each layer should be aligned vertically.
-  Timber dunnage may not have rounded corners.
-  Throwing webbing is a manual handling risk. Use caution when applying lashings and check the other side of the trailer is clear when throwing lashings.
-  Loads should be blocked against a suitably engineered headboard/surface wherever possible or cross over lashings (see page 7).
-  All packaged items must be unitised to meet the Performance Standards of the NTC Load Restraint Guide.



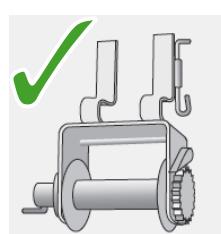
Corner protectors
shall be used under all
webbing straps



Pull down ratchet
600kg average
pretension over load.

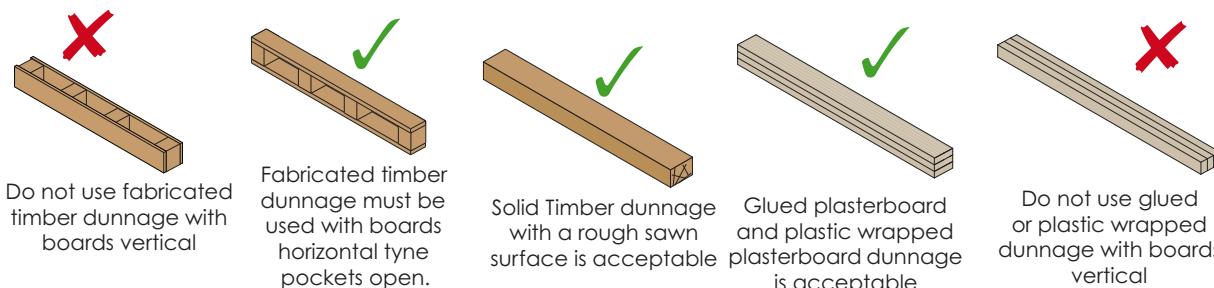


Push up ratchet and common Drum Winch
300kg average pretension over load

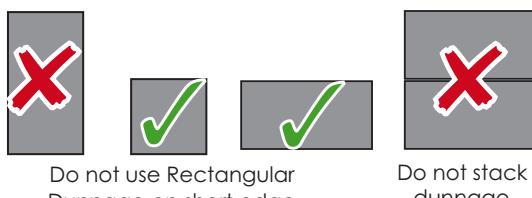


Tensioner Types and application for restraint

Lashing configuration		Tie Down	Cross Over Strap
Tensioner type	Drum Winch		
	Push Up Hand Ratchet		
	Pull Down Hand ratchet		



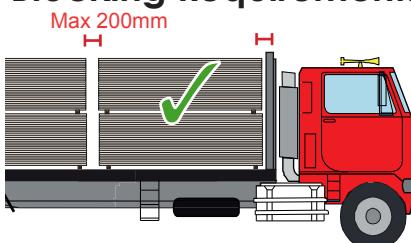
Dunnage Configuration



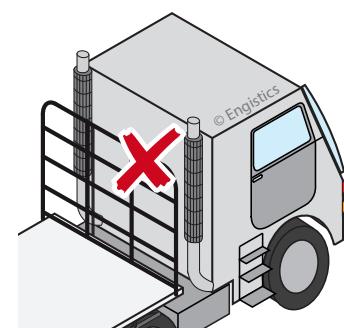
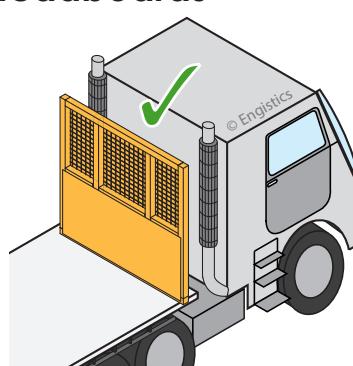
Plasterboard Dunnage Condition



Blocking Requirements - Headboards



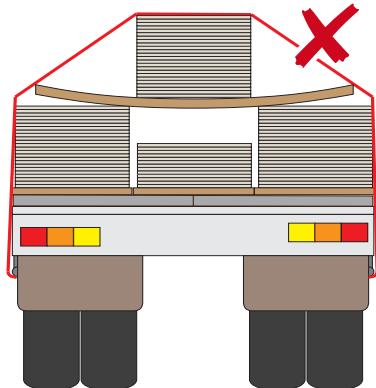
Headboards must be suitably engineered to 30% of payload



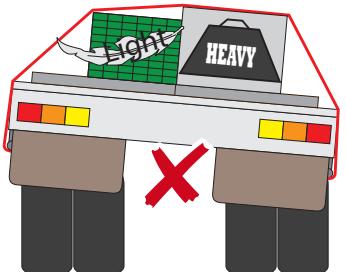
This document provides load restraint guidance aligned with the Performance Standards stipulated in the current edition of the NTC Load Restraint Guide. Methodology in this document developed by RPEQ, CPEng 3121238 for the GBMA. Effectiveness of the load restraint systems can only be achieved when all aspects of this document are adhered to in full. Additional requirements may be necessary under some conditions that are outside the scope of this guideline. The information contained in this guideline is confidential to and remains the property of GBMA and Engistics. Any changes to this guideline must be approved by Engistics, to ensure system performance.

Load Configurations - Sheet Product

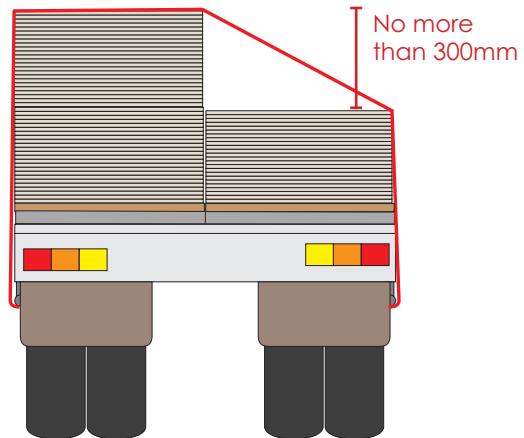
Do not bridge dunnage



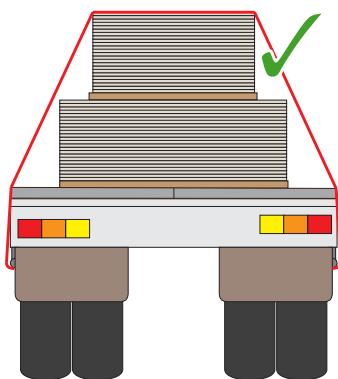
Avoid Imbalanced Loads



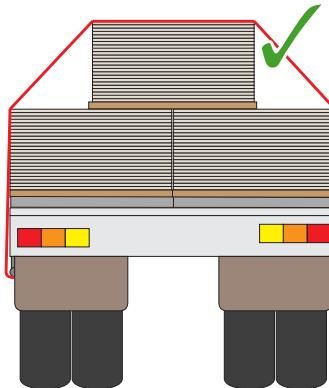
Two Abreast packs maximum height difference is 300mm



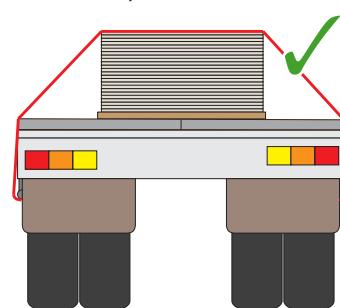
Stack narrow packs on top of wide packs



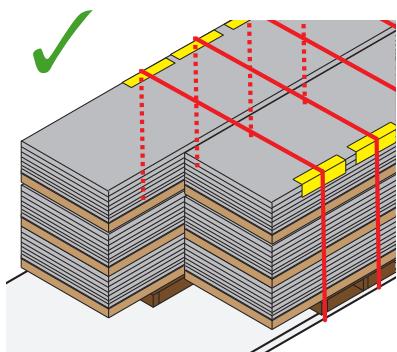
Pyramid stack loads of 3 bundles



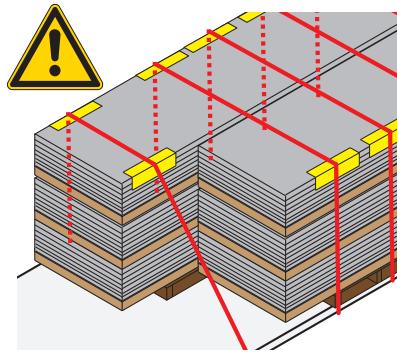
Load single packs centrally on the deck



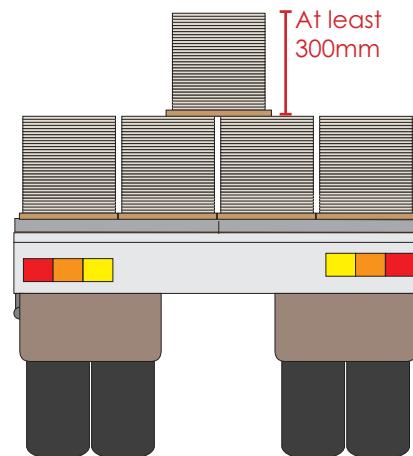
Lashings must be applied to all stacks across the deck



Lashings applied over part of the load are not counted in total lashing requirements in tables page 9



Top pack on 3 or more abreast must be at least 300mm high



Key Assumptions:

Static Friction of all materials of 0.4 or greater when packed or loose.

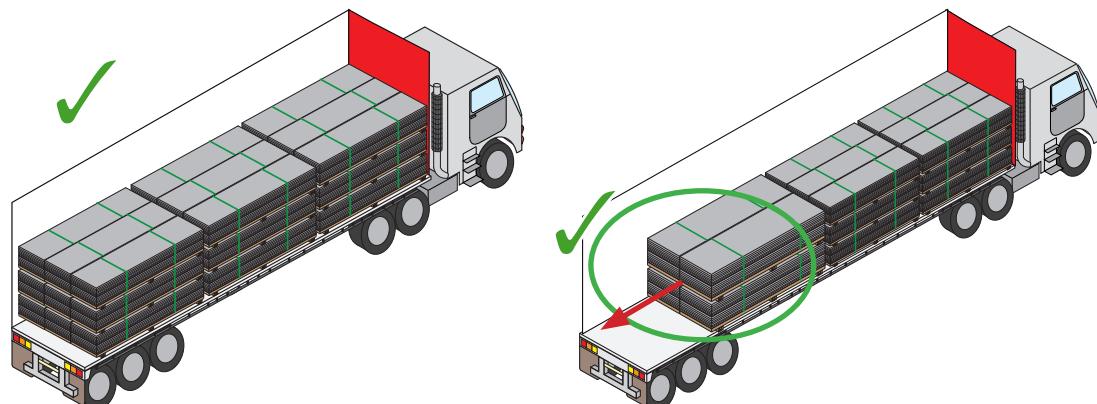
Webbing average tension of 300kg or 600kg over the load for standard or High Pretension ratchets respectively

Headboards are rated to 30% of total load mass or greater

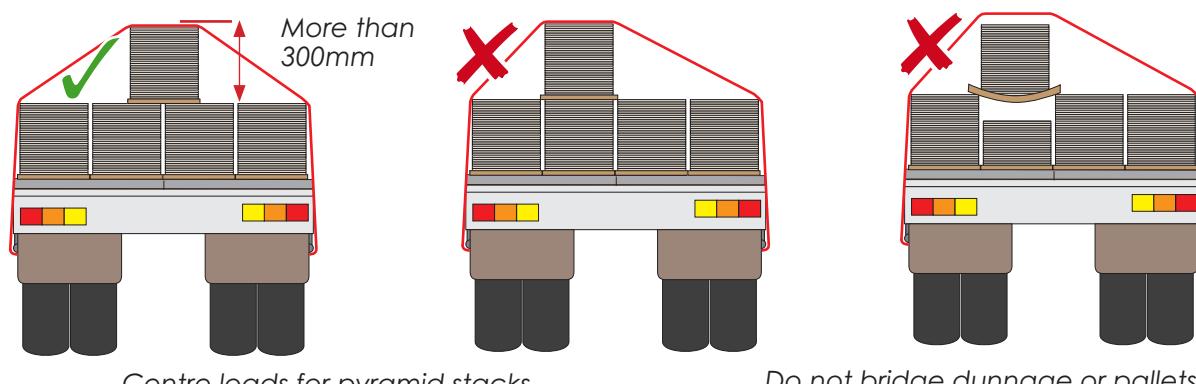
Products are packed to NTC performance standards

Load Configurations - Sheet Product : 3 or more across deck

- ✓ All stacks more than 2 Abreast must be blocked to an Engineered Headboard.
- ✓ All stacks more than 2 Abreast must be blocked rearward by a Rear wall of a Tautliner or a 2 abreast stack of product.
- ⚠ Maximum height limits apply to multi abreast product stacks.
- ⚠ Top pack of a pyramid stack must be at least 500mm high inclusive of pallet or dunnage.

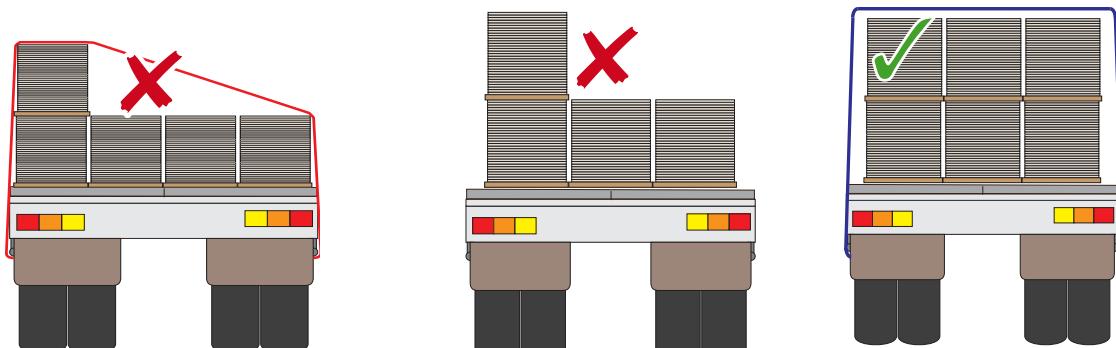


Multi abreast loads with more than 2 abreast must be blocked rearwards by 2 abreast stacks or Tautliner rear wall



Centre loads for pyramid stacks

Do not bridge dunnage or pallets

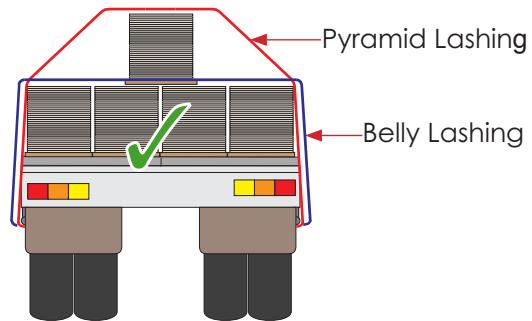
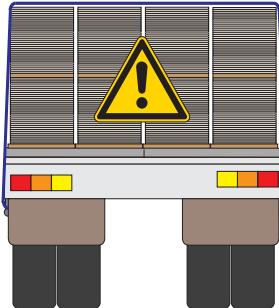


Multi abreast Pyramid loads must be centrally loaded

3 or more packs across must be blocked front and rear

Load Configurations - 3 or more across deck

- Multi abreast loads can be flat top or pyramid loaded.
- All stacks must be blocked to Engineered Headboard and lashed per the Tables 1 and 2.



- Pyramid stacks will require belly lashings and additional lashings over the top pack per table 1

Table 1: Blocked (Headboard):

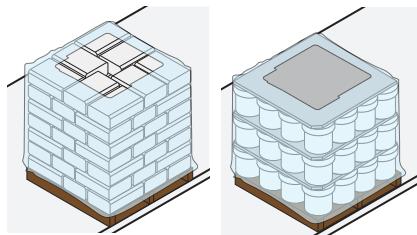
	Stack Mass Restrained	Required Number of Tie Down Lashings per stack on the vehicle						
		Pyramid Lashing	Belly Lashing	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Max stack height above deck
								0.9
	0 - 2,000 kg	2	2	2	2	2	2	0.9
	2,001 - 4,000 kg	2	2	2	2	2	2	1
	4,001 - 6,000 kg	3	2	3	2	3	2	1.2
	6,001 - 7,000 kg	4	2	4	2	4	2	1.2
	7,001 - 9,000 kg	5	3	5	3	5	3	1.4
	9,001 - 11,000 kg	6	4	6	4	6	4	1.5
	11,001 - 13,000 kg	7	4	6	4	6	4	1.6

Table 2: Blocked (Headboard):

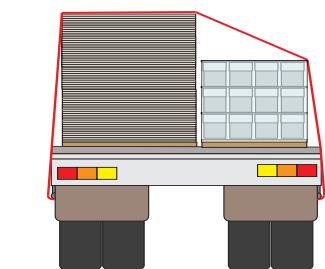
	Stack Mass Restrained	Required Number of Tie Down Lashings per stack on the vehicle (Lashing Angle)		Max stack height above deck
		Push up ratchet / Drum winch	Pull Down Ratchet	
				0.9
	0 - 2,000 kg	2	2	1
	2,001 - 4,000 kg	2	2	1.2
	4,001 - 6,000 kg	3	2	1.2
	6,001 - 7,000 kg	4	2	1.2
	7,001 - 9,000 kg	5	3	1.4
	9,001 - 11,000 kg	6	3	1.5
	11,001 - 13,000 kg	6	3	1.6

Load Configurations - Mixed loads

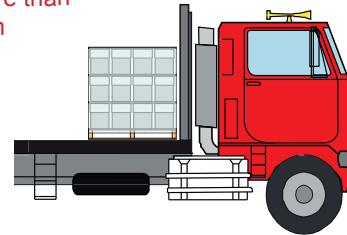
! Compound product must be packed to meet the NTC performance standards



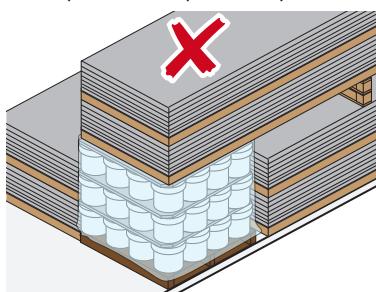
! Maximum height difference across the truck is 300mm



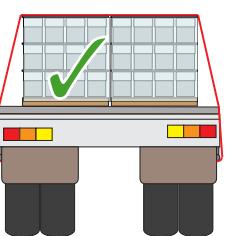
✓ Block compound product wherever possible



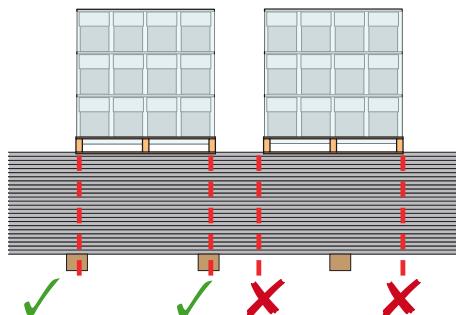
Do not stack sheet product on top of compound product



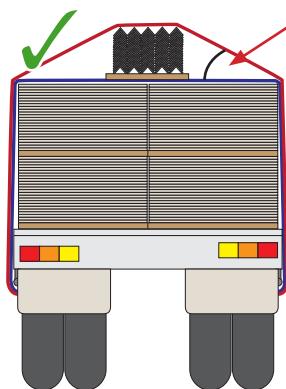
Load pallets maximum two abreast



Pallets stacked on loose sheet product - bearers must align with the supporting dunnage



Load Configurations - Palletised Cornice Product and steel packs



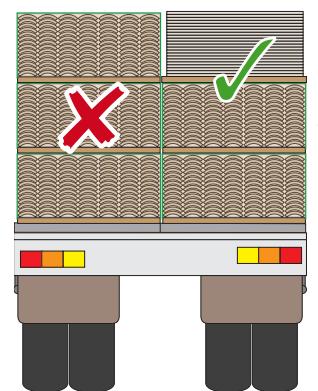
! Angle for determining restraint lashings for steel packs

Steel packs should be blocked to Headboards loaded centrally and restrained with the tables on page 9 using the angle shown.

Flat product should be secured separately also using tables on page 9

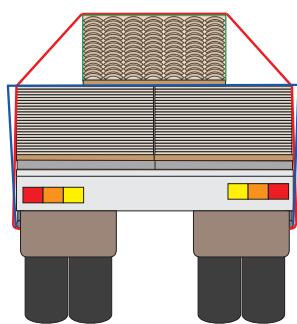


Do not stack cornice more than two packs high.
Palletised sheets on top of cornice are ok.



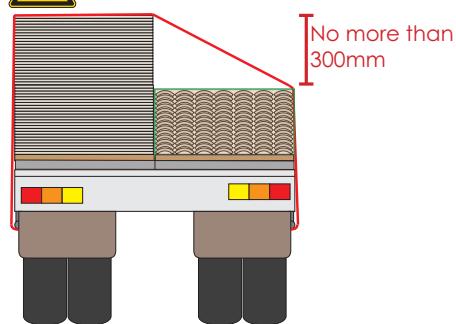
✓ Stack cornice packs on top of sheet packs

! Do not stack loose sheet product on top of cornice product



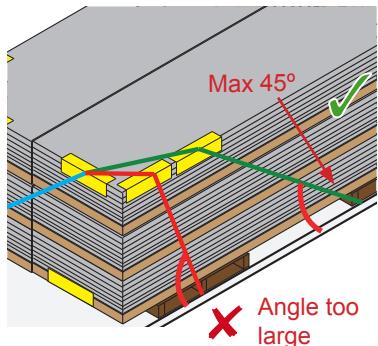
! Crush Hazard

! Maximum height difference across the truck is 300mm



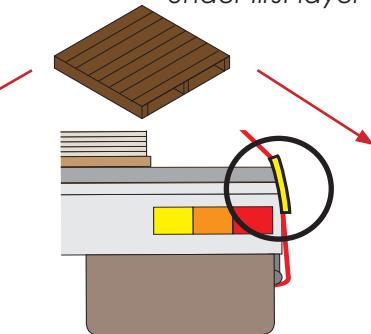
Blocking With Crossover Straps using Pull Down ratchets- Palletised Sheet Load

Key Elements:

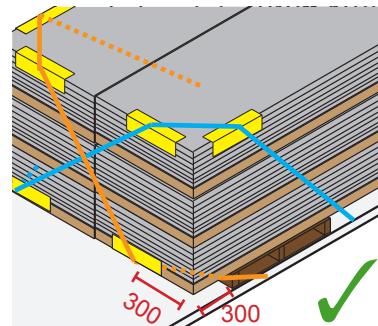


Maximum angle of crossover lashings to horizontal is 45°

Raise load by placing pallet under first layer

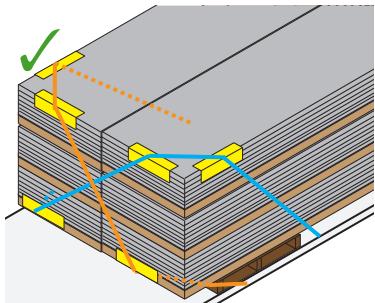


Wear sleeves to protect webbing on coaming rail

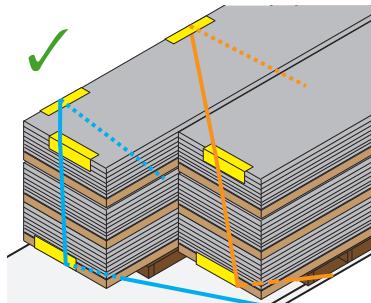


Set lower crossover strap approx. 300mm back and across from outer corner

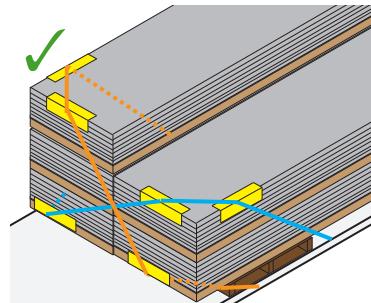
Permissible Arrangements:



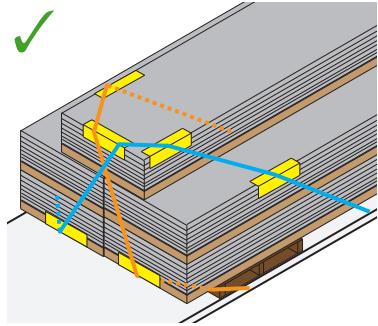
Same height, no offset



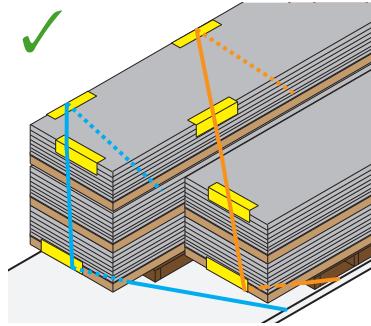
Same height, offset



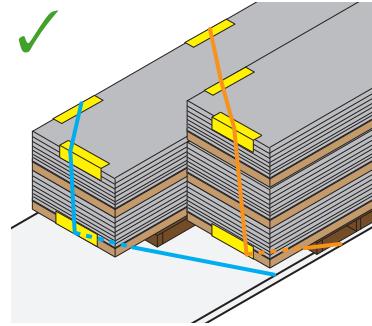
Different height, no offset



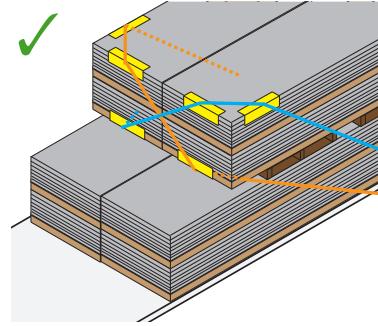
Pyramid stacked, no offset



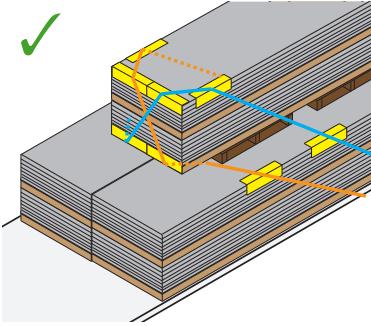
Different height, offset drivers side



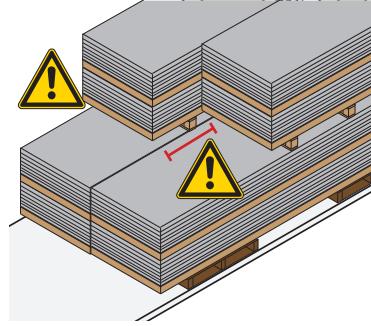
Different height, offset passenger side



Stacked, upper offset, flat face



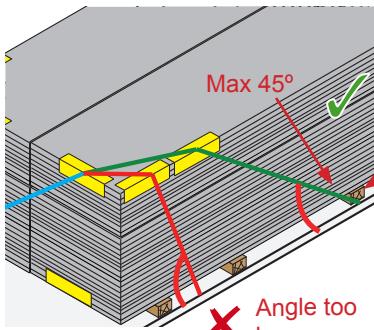
Stacked, single upper offset



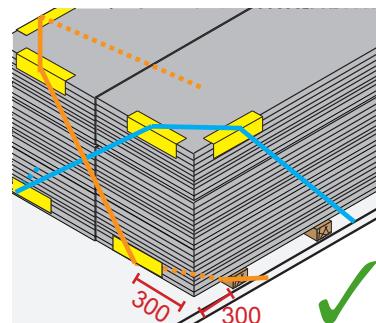
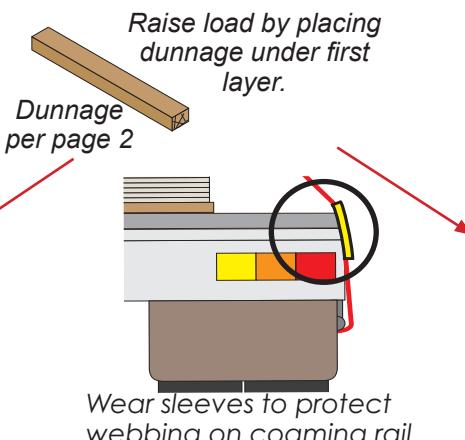
Do not apply cross over lashings to this configuration.
Lash as an unblocked load per table 3.

Blocking With Crossover Straps using Pull Down ratchets- Loose Sheet Load

Key Elements:

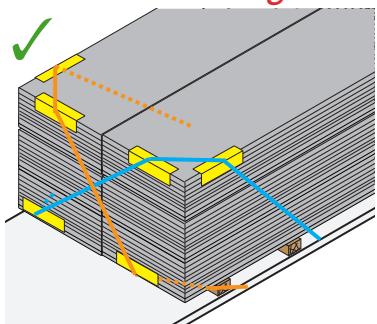


Maximum angle of crossover lashings to horizontal is 45°

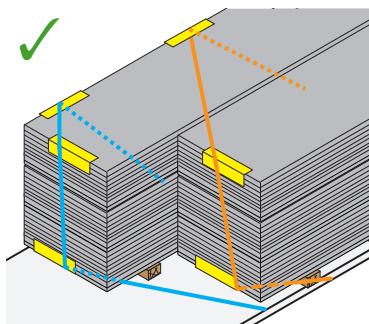


Set lower crossover strap approx. 300mm back and across from outer corner

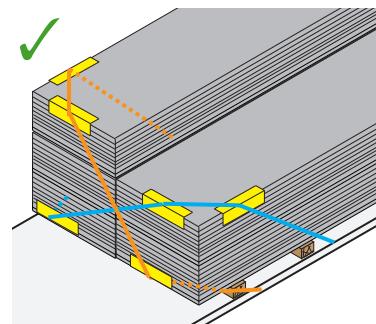
Permissible Arrangements:



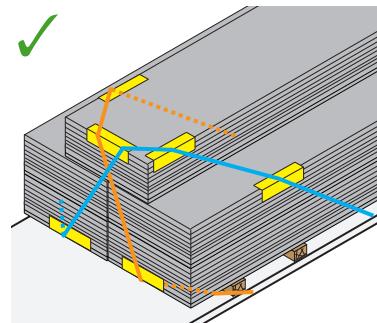
Same height, no offset



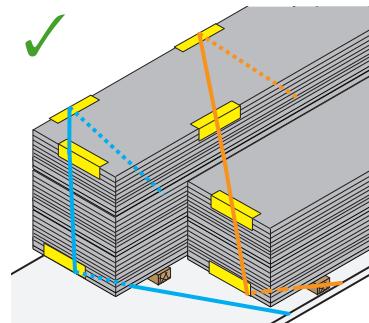
Same height, offset



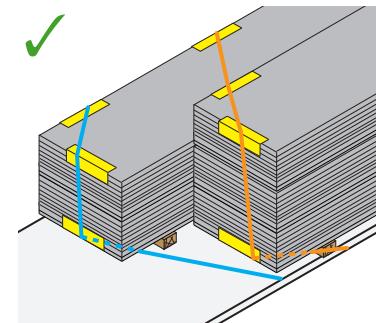
Different height, no offset



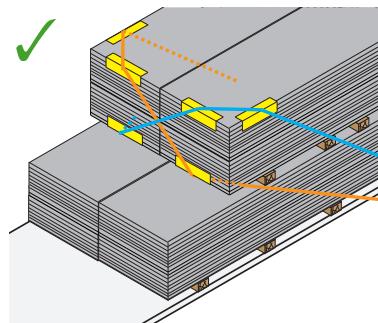
Pyramid stacked, no offset



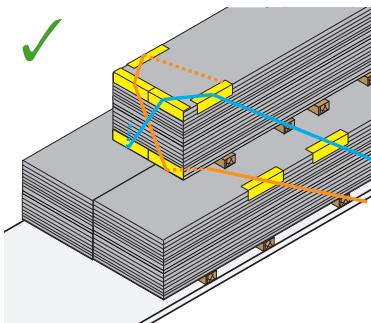
Different height, offset drivers side



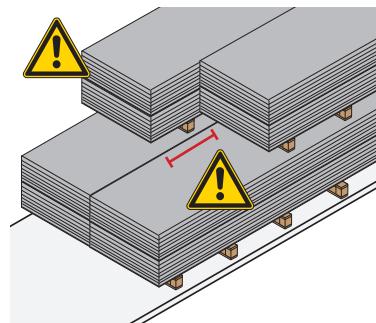
Different height, offset passenger side



Stacked, upper offset, flat face



Stacked, single upper offset



Do not apply cross over lashings to this configuration.
Lash as an unblocked load per table 3.

Tie Down Lashing Requirements

Note: Any single package must have a minimum of 15 sheets.

Table 3 : Unblocked Configuration (*= impractical)

Stack Mass restrained	Lashings per stack two Abreast loads		Lashings per stack single file loads					
	 (81 - 90°)		 (61-80°)		 (46-60°)		 (30-45°)	
	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet
0 - 2,000 kg	4	2	4	3	5	3	7	4
2,001 - 4,000 kg	8	4	8	5	10	6	14*	8
4,001 - 6,000 kg	11	6	12*	7	15*	8	20*	11
6001 - 8000 kg	15*	8	16*	9	19*	11	27*	15*
8,001 - 10,000 kg	18*	10	20*	11	24*	13*	34*	19*
10,001 - 12,000 kg	22*	12*	22*	13*	Load Configuration not possible		Load Configuration not possible	
12,001 - 14,000 kg	25*	14*	24*	15*				
14,001-15,000kg	27*	15*	27*	16*				

Table 4: Blocked Configuration (2 Crossover Straps): (*=impractical)

Stack Mass restrained	Lashings per stack two Abreast loads		Lashings per stack single file loads					
	 (81 - 90°)		 (61-80°)		 (46-60°)		 (30-45°)	
	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet
0 - 2,000 kg	2	2	2	2	2	2	2	2
2,001 - 4,000 kg	3	2	3	2	4	2	2	2
4,001 - 6,000 kg	4	3	4	3	6	4	7	4
6001 - 8000 kg	6	4	6	4	9	5	14*	8
8,001 - 10,000 kg	9	5	9	6	13*	7	20*	11
10,001 - 12,000 kg	13*	7	13*	8	Load Configuration not possible		Load Configuration not possible	
12,001 - 14,000 kg	16*	9	16*	10				
14,001-15,000kg	18*	10	20*	11				

Table 5: Blocked Configuration (Headboard):

Stack Mass restrained	Lashings per stack two Abreast loads		Lashings per stack single file loads					
	 (81 - 90°)		 (61-80°)		 (46-60°)		 (30-45°)	
	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet	Push up ratchet / Drum winch	Pull Down Ratchet
0 - 2,000 kg	2	2	2	2	2	2	2	2
2,001 - 4,000 kg	2	2	2	2	2	2	4	2
4,001 - 6,000 kg	3	2	3	2	4	2	5	3
6001 - 8000 kg	4	3	4	3	5	3	7	4
8,001 - 10,000 kg	5	3	5	3	6	4	9	5
10,001 - 12,000 kg	6	3	6	4	Load Configuration not possible		Load Configuration not possible	
12,001 - 14,000 kg	7	4	7	4				
14,001-15,000kg	7	4	8	5				