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Preface

This Code of Practice was prepared by the Loading of Rail Freight Development Group, overseen by the ARISO Safety and Operations Standing Committee.

The major changes in this edition are as follows:

- (a) Clarification of accountabilities between rail infrastructure managers (RIMs) and rolling stock operators (RSOs);
- (b) Review and update of recommendations and requirements; and
- (c) Updating and alignment of normative and informative references documentation.

Objective

The objective of this Code of Practice is to aid Australian RSOs to describe common practice for loading of freight on rail vehicles.

This Code of Practice describes commonly accepted good practice relevant to operation on Australian railways (with the exception of sugar cane and light railways). It is advisory in nature and does not impose mandatory requirements unless expressly adopted or referenced by an operator. Operators may adopt this Code of Practice in whole or in part.

The scope of this Code of Practice is limited to the loading of rail freight only.

Compliance

There are four types of provisions contained within Australian Standards developed by ARISO:

- (d) Requirements.
- (e) Recommendations.
- (f) Permissions.
- (g) Constraints.

Requirements – it is mandatory to follow all requirements to claim full compliance with the Standard. Requirements are identified within the text by the term ‘shall’.

Recommendations – do not mention or exclude other possibilities but do offer the one that is preferred. Recommendations are identified within the text by the term ‘should’.

Recommendations recognize that there could be limitations to the universal application of the control, i.e. the identified control is not able to be applied or other controls are more appropriate or better.

For compliance purposes, where a recommended control is not applied as written in the standard it could be incumbent on the adopter of the standard to demonstrate their actual method of controlling the risk as part of their WHS or Rail Safety National Law obligations. Similarly, it could also be incumbent on an adopter of the standard to demonstrate their method of controlling the risk to contracting entities or interfacing organisations where the risk may be shared.

Permissions – conveys consent by providing an allowable option. Permissions are identified within the text by the term ‘may’.

Constraints – provided by an external source such as legislation. Constraints are identified within the text by the term ‘must’.

ARISO Standards identify known hazards relevant to the railway industry. Appendix I provides a non-exhaustive list of hazards relevant to the scope of this Standard.

Appendices in ARISO Standards may be designated either “normative” or “informative”. A “normative” appendix is an integral part of a Standard and compliance with it is a requirement, whereas an “informative” appendix is only for information and guidance.

Commentary

Commentary *C Preface*

This Code of Practice includes a commentary on some of the clauses. The commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a box. The commentary is for information and guidance and does not form part of the Code of Practice.

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Section 1 Scope and general

1.1 Scope and application

The purpose of this document is to provide RSOs and consignors with requirements and recommendations for the loading, restraint and securement of a wide range of freight commonly transported on rail vehicles.

The retention and proper configuration of loading in or on rail vehicles is critical to ensure safe transit and the prevention of damage to rail infrastructure, other rail traffic, infrastructure and persons.

RIMs and RSOs may require compliance with the requirements and recommended practices of this document for track access or transport of loading.

Compliance with the requirements and recommendations of this document will:

- (a) provide a significant level of uniformity in loading practices and procedures used on the interstate network, providing a greater level of confidence and acceptance of loads by RSOs and RIMs;
- (b) minimize the incidence of load shifts and the subsequent delays to trains and the delivery of goods, thereby increasing train performance and reducing costs;
- (c) significantly reduce the risk of adverse dynamic performance and the derailment potential of vehicles due to overloading and uneven load distribution, reducing maintenance costs and potential recovery and reparation costs;
- (d) reduce the risk of injury to persons and damage to loads, rolling stock and infrastructure;
- (e) reduce the costs to RIMs, operators and consignors associated with the above aspects; and
- (f) form an acceptable part of a rail safety management plan.

Incorrect load positioning and distribution, and/or inadequate load restraint and securement, can result in train delays and the creation of hazardous transit conditions.

The consequences of these conditions can be:

- (g) unacceptable eccentric or uneven loading laterally (side to side) or longitudinally (end to end) leading to poor vehicle dynamic performance;
- (h) overloading of a vehicle with the risk of damage to or failure of bearings, wheel sets, wagon structure, fittings and infrastructure;
- (i) unacceptable axle loads, producing excessive forces in the track structure;
- (j) movement of the load during transit, affecting load distribution, load outline and infrastructure clearances, including possible loss of the load from the vehicle;
- (k) increased potential for injury to loading and unloading staff, and persons on passenger platforms, or on or near the running lines;
- (l) increased potential for damage to adjacent vehicles, other loads or track-side infrastructure; and/or
- (m) increased potential for damage to loads due to dynamic behaviour (e.g., hunting, etc.).

The document should be used by RSOs and others engaged in the loading of freight, as the basis for the development of internal practices, procedures and training programs.

1.2 General

This document is presented in two parts:

- (a) The body of the document outlines the principles, and provides minimum requirements and recommendations for loading, restraint and securement systems, and the responsibilities of RSOs and freight forwarders, consignors and manufacturers in regard to adequate packaging and securement which are common to all kinds of loads.
- (b) Appendices A–H contain product-specific requirements and recommendations for the loading of a large range of products commonly transported by rail.

1.3 Application

The requirements and recommendations of this document are intended to be applied, or used as the basis to develop procedures, for the loading and securing of rail freight operating on the Australian rail network.

This document does not cover the design or performance requirements for fittings and attachments used for the restraint and securement of loads.

RSOs are responsible for the placement and securement of loading and compliance with the RIM's requirements.

RIMs are responsible for defining loading outlines, axle loads and other interface issues, and for the authorization of special and out of gauge loads. RIM requirements should be in line with the recommendations of this document.

Some operations, such as work trains and the movement of materials at low speed over short distances, do not present the same level of risk as the usual carriage of general freight. In those cases, where an RSO and RIM are of the opinion that all the securement provisions of this document might not be necessary, they shall assess the particular operation using risk analysis standards in accordance with the Office National Rail Safety Regulator (ONRSR) Guideline *Safety Management System* (2019).

RSOs should assess all aspects of the transport task under review to evaluate the associated risks, and to determine the most appropriate and practical method of loading and securement.

Where an RSO plans to carry out loading using products or procedures that are not in accordance with this document, the operator should consult their track access agreement with the RIM to determine loading processes. Where changes are required, the RSO's change management procedure should be followed for acceptance by the RIM. Otherwise, the RSO should undertake a risk assessment, the decision should be documented and the RSO takes full responsibility for that decision.

The operator should use suitably qualified staff and use reasonable care to evaluate the transport requirements and associated risks to determine the most appropriate and practical method of loading and securement.

1.4 Normative references

The following documents are referred to in the text in such a way that *some* or all of their content constitutes requirements of this document:

- AS 4615, *Series R freight containers*
- AS 7508, *Track Forces and Stresses*
- ONRSR, *Guideline Safety Management System* (2019)

- National Transport Commission (NTC), *Australian Code for the Transport of Dangerous Goods by Road & Rail (2024) (ADG)*

NOTE:

Documents for informative purposes are listed in a Bibliography at the back of the Standard.

1.5 Defined terms and abbreviations

For the purposes of this document, the following terms and definitions apply:

1.5.1

ADG

Australian Dangerous Good Code

1.5.2

belly strap

restraint applied between tiers of loading to prevent lateral or rotational movement of an upper tier relative to the tier below

1.5.3

bolster

structural load-support member fitted to a rail vehicle or container base, used to support, locate or distribute the weight of a load and to provide an interface for load restraint or dunnage

1.5.4

container base

platform-based container or rail vehicle without permanent sides, fitted with securing points for the carriage of freight

1.5.5

cradle

purpose-designed support structure fitted to a rail vehicle or container to locate, support, and stabilize a load by restricting rolling, lateral movement, and rotation during transit.

Note 1 to entry: The cradle forms part of the load support system but does not, by itself, provide full restraint.

1.5.6

CSC

container safety convention

1.5.7

dunnage

material used to support, separate, protect or restrain loads

1.5.8

end overhang

portion of a load that extends beyond the end sill or boundary of the carrying vehicle

1.5.9

fender wagon

rail vehicle positioned adjacent to a vehicle carrying an overhanging load to manage clearance and relative movement during transit

1.5.10

fifth wheel position

specific mounting point on a flatcar stanchion or deck where a semi-trailer's kingpin locks

1.5.11

fixed load

a load which, once loaded and secured, is not subject to change in shape, configuration or position during transit

1.5.12

inter-box connector (IBC)

removable securing device used to connect and restrain two containers together in a double-stack configuration

1.5.13

loose load

load that is not inherently self-supporting and relies on restraint and securement systems to prevent movement during transit

1.5.14

OEM

original equipment manufacturer

1.5.15

ONRSR

Office of the National Rail Safety Regulator

1.5.16

palletized

load that has been placed on one or more pallets for handling, storage, restraint and transport as a single unit

1.5.17

primary restraint

principal load-securing system intended to resist dynamic forces encountered during normal network operations

1.5.18

rail infrastructure manager (RIM)

As defined in Rail Safety National Law.

1.5.19

rolling stock operator (RSO)

As defined in Rail Safety National Law.

1.5.20

rail transport operator (RTO)

As defined in Rail Safety National Law.

1.5.21

standing instruction

documented pre-approved authorisation for the regular movement of a specific non-conforming load under defined conditions

1.5.22

UN Number

four-digit code assigned by the United Nations to identify specific dangerous goods or articles for safe transport

1.5.23

unitising

process of bundling, strapping or otherwise combining multiple items into a single load unit to improve stability, handling and securement

General rail industry terms and definitions are maintained in the ARISO Glossary. Refer to:

<https://www.ARISO.com.au/glossary/>

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Section 2 Vehicle selection and condition

2.1 Vehicle selection

Common types of loading should be matched to specialized vehicles designed for a particular product.

Where specialized vehicles are unsuitable or unavailable, the vehicles should be appropriate for the task and selected on the basis that they can be used appropriately and safely for the journey and the task for which they are used.

In selecting a vehicle, the RSO shall assess the following:

- (a) Type of product.
- (b) Composition of the load.
- (c) Mass of the load.
- (d) Height of centre of gravity above rail.
- (e) Axle load restrictions.
- (f) Method of loading and unloading.
- (g) Method of securing the load.
- (h) Vehicle availability.
- (i) Type of service required (e.g., fast freight or slow freight).
- (j) Dimensions (i.e. length, width, height).
- (k) Load volume.
- (l) Product decomposition rate.
- (m) Dangerous goods.
- (n) Length of journey.
- (o) Weather requirements (e.g., protection, etc.).
- (p) Security of the load (i.e. protection from theft and vandalism).

Bulk products, if transported other than in special purpose vehicles, shall be packaged to ensure transport in general purpose vehicles is safe.

2.2 Vehicle condition

The vehicle shall be in an acceptable condition for regular use in accordance with the RSO's inspection requirements. It shall not have any condemnable faults or defects that preclude it from operating on the intended service.

The vehicle floor or support surface shall be free of grease, dirt, debris or other contaminants that can adversely affect the placement or stability of the loading. It should be structurally adequate and free of protrusions or obstructions that can cause wear or damage to the loading.

In open and covered vehicles, internal fittings intended for the attachment of lashing equipment and other restraining devices shall be in good condition, structurally sound and not protrude beyond the inner face of the walls.

In open and covered vehicles, loads shall be able to be positioned and secured so that they will not be damaged or lost when the doors are opened or closed.

Doors, locking devices and operating mechanisms shall be in good operating condition to reduce the risk of operator injury and load loss or damage. Refer to RSO's inspection requirements.

Section 3 Loading outline, dimensions and mass limits

3.1 Maximum dimensions

Dimensions of the loading shall not exceed the maximum permissible for the particular vehicle and route to be traversed. See Clause 2.2 and RIM's requirements.

Maximum dimensions of any load are governed by:

- (a) the loading outline for the particular route;
- (b) type of load (loose or fixed);
- (c) type of platform container to be used;
- (d) vehicle dimensions and configuration;
- (e) lifting equipment at origin and destination (e.g., fixed gantries or mobile cranes, etc.);
- (f) securing equipment and/or methods available;
- (g) stability of the load; and
- (h) height of centre of gravity on rail.

RIMs prescribe the maximum permissible dimensions and outlines for various types of loading for the routes and sections in their jurisdiction.

For unrestricted transit, loading is required to comply with the limitations described in Clause 3.2 to Clause 3.4 and any additional RIM's requirements. Loading which does not comply with the prescribed dimensions or outlines is classified as out of gauge and shall be referred to the RIM or otherwise handled in accordance with the relevant procedures.

3.2 Loading outlines

3.2.1 Fixed loads

Fixed loads are those which, when loaded and secured onto a rail vehicle, are effectively free from any change of shape, configuration, geometry and position during transit.

Typical fixed loads include:

- (a) enclosed box-type containers, including tank, refrigerated and curtain sided;
- (b) open-top containers; and
- (c) platform-based containers with collapsible bulkheads.

3.2.2 Loose loads

Loose loads are those which are not effectively prevented from movement relative to the vehicle during transit by reason of their nature, construction or methods of support, restraint and securement.

These include:

- (a) rolled steel sections, bars, billets and long fabrications;
- (b) pipes, tubing, poles, etc.;
- (c) logs or timber in packs, bundles or loose;
- (d) palletized products;
- (e) rubber-tyred vehicles;

- (f) any loading on container bases, platform containers, platform-based containers with collapsible bulkheads, transflats (container bases without permanent sides), flat vehicles or open wagons where the load cannot be fastened to the support base and/or the vehicle; and/or
- (g) any loading which can be placed on a vehicle in a way which results in unevenly distributed loads on the vehicle or its bogies.

3.3 Loose loading outlines

Operators shall conform to the loose loading outlines specified by RIMs in the relevant route standards.

An example loose loading outline for the interstate and broad gauge networks is shown in Figure 1.

Another example, for Adelaide to Darwin or Perth, is shown in Figure 2.

Loose loading which exceeds the outline shall be classified as out of gauge. Out-of-gauge loading shall be permitted to travel only with approval by the RIM.

An out-of-gauge load may be accepted only where it is non-divisible or it is impractical to reduce it to within the permissible outline. See Section 7 for specific requirements for the acceptance and transport of out-of-gauge loads.

Loose loads should be unitized (i.e. bundled and strapped together) in suitably sized groups to minimize the risk of separation and outline infringement.

If unitized loose loading exceeds the outline, it should be separated where possible and re-bundled so that it conforms to the prescribed outline.

Dimension-measuring tools should be used to verify that the overall dimensions of any loose or non-standard loads departing a rail terminal is within the maximum loading outline for the rail corridor/s they will travel on prior to transport.

Examples of measuring tools can include but is not limited to:

- (a) telescopic measuring poles;
- (b) laser distance measurers; and
- (c) measuring tapes.

These tools can improve measurement accuracy and help reduce the risk of out-of-gauge loads being transported on the rail network.

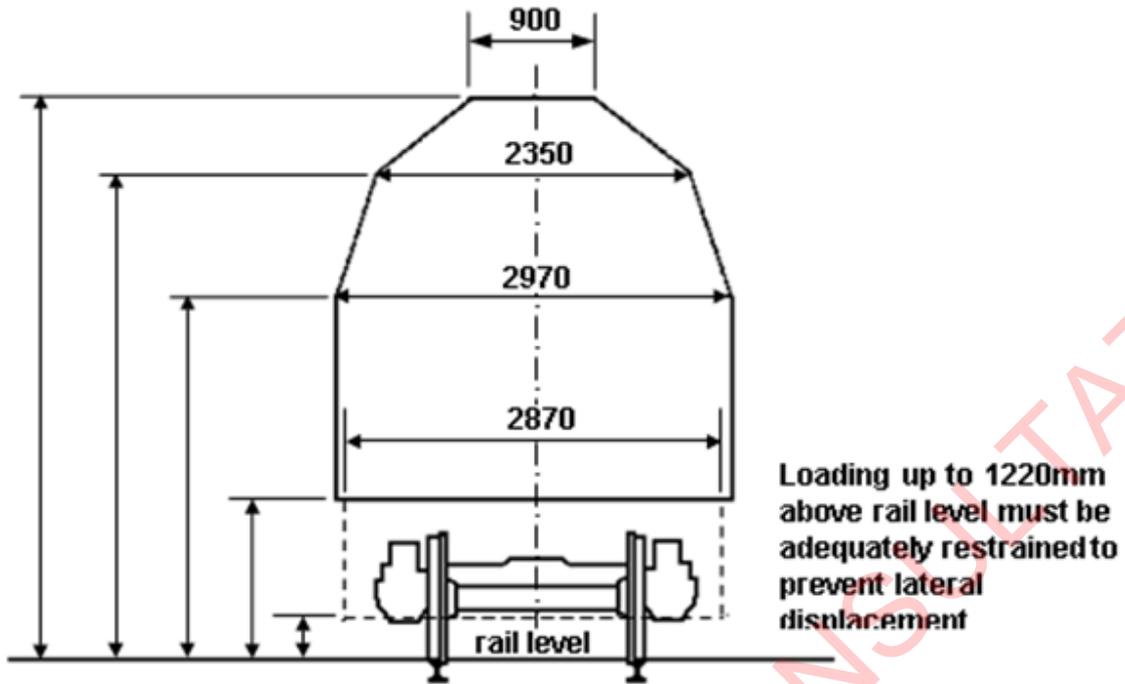


Figure 1 Loose loading outline – All ARTC corridors

Figure 1 and Figure 2 are examples only; Always refer to the relevant route standards as published by the relevant RIM.

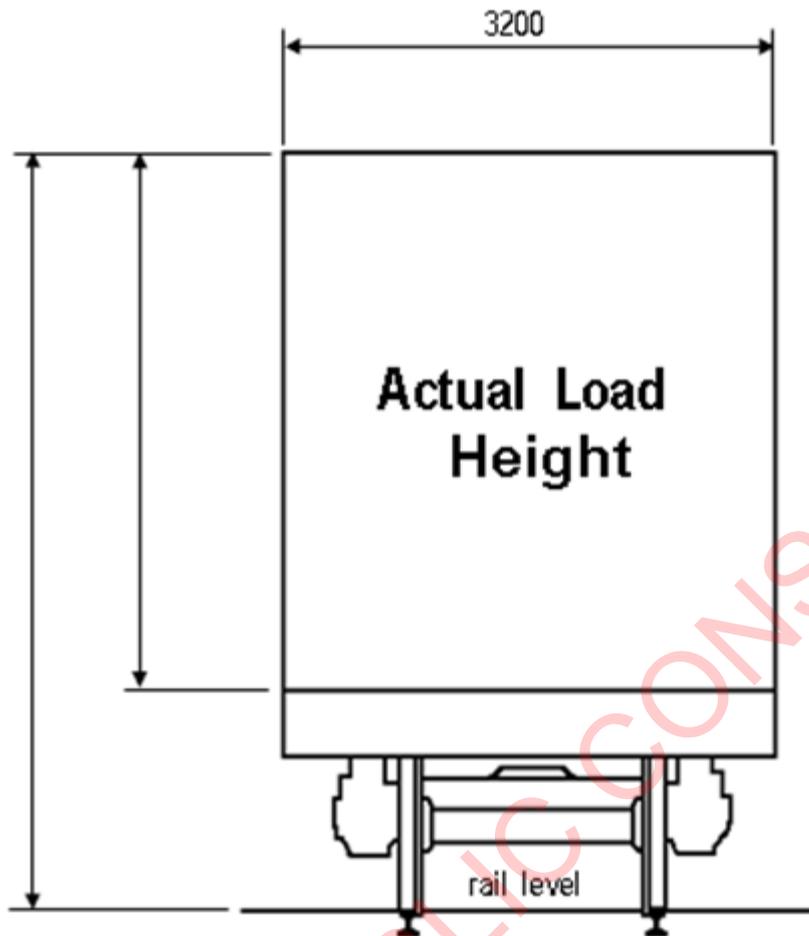


Figure 2 Loose loading outline. Adelaide to Alice Springs or Perth

3.4 Container (ridged) loading outlines

For fixed loads, permissible outlines applicable to different routes are described in AS 7507.

Confirmation by the applicable RIM should be sought to advise of the appropriate rolling stock outline or container loading profile where permitted to operate.

3.5 Maximum mass or volume

For articulated vehicles, operators shall supply a loading diagram for the vehicle that gives several typical combinations; These shall be used to distribute the loading so that the vehicle mass, axle loads and bogie mass differential limits are not exceeded.

The total mass or volume of the load should not exceed the prescribed maximum carrying capacity for the vehicle/platform on which it is loaded. This includes all attachments (e.g., dunnage, restraint and support elements, etc.) which are not part of the vehicle's normal equipment.

An excess may be permitted subject to the approval of the RSO and/or RIM.

The maximum capacity is shown on the vehicle data panel or on a relevant loading diagram.

3.6 Maximum axle loads

The maximum axle loads prescribed by the RIM for the vehicle/bogie combination, route and service speed should not be exceeded.

Excess axle loads shall be submitted to the RIM for approval.

In some cases, a small overload may be permitted subject to approval by the owner, RSO and RIM. This will generally result in a reduction in the allowable track speed of the train to which the vehicle is attached.

3.7 Loading distribution

3.7.1 General

Operators should endeavour to achieve optimum utilization of a vehicle's carrying capacity without exceeding the permissible loading outline, gross mass, axle loads or mass distribution limitations as prescribed by the RIM.

3.7.2 Longitudinal position of load

The loading differential between front and rear bogies shall not exceed the rate/specified value for that vehicle. A RIM may, in some circumstances, prescribe the maximum permissible variation between adjacent bogies in the same vehicle.

NOTE:

Articulated wagons are also subject to this bogie mass differential limit (not just single platform wagons), noting that all adjacent bogies are across the entire articulated wagon.

3.7.3 Lateral position of load

RSO's shall ensure loading limits are within the values detailed in AS 7508 and that necessary approvals are obtained by the RIM.

The position of the load should also be adjusted so that the mass is distributed as evenly as possible across the width of the vehicle/container, thereby providing reasonably equal wheel loadings on the same axle. This is particularly important in the case of eccentric or unbalanced loads. A comparison of the various spring/suspension deflections can be used as a general indication of transverse and longitudinal load positioning.

3.7.4 Centre of gravity height of wagon and load

The height above rail of the centre of gravity, or centre of mass, of the loaded vehicle should not exceed the limits prescribed for the allocated route or service. The position of the loading should be set so that the transverse location of the centre of mass is as close as possible to the track centreline.

For the interstate routes, the height above rail level of the combined centre of mass of the vehicle and its load shall not exceed the limits set in Table 1 without a special authorization from the RIM.

Table 1 Network Gauge Height Limits

Network Rail Gauge	Height above
standard gauge	2,650 mm
narrow gauge	2,000 mm
broad gauge	2,900 mm
double stacked trains on any gauge	2,500 mm

Note that freight vehicles that are susceptible to overturning can require lower centre of mass limits. These conditions can include:

- (a) those that operate in high wind conditions;
- (b) areas of the network with cant deficiency;
- (c) large side areas (e.g., double-stack container wagons); and/or
- (d) subject to other dynamic effects.

3.8 Long loads

3.8.1 General

Vehicles should be selected so that the load can fit within their overall length and be retained within the side and end walls, stanchions, bulkheads or other load retention devices. This is particularly important with long items such as steel, timber, pipes and fabricated assemblies.

3.8.2 Loads that are longer than the carrying wagon

Permitted overhangs include:

- (a) loading that extends more than 150 mm beyond the end sill or furthest boundary member of any vehicle shall be assessed by the operator on a case-by-case basis;
- (b) where the length of the loading extends beyond the above limits, a cover or fender vehicle should be positioned next to the vehicle on which the load is transported.
- (c) simulation or calculation-based approach may be used as an alternative to dynamic kinematic testing in accordance with AS 7507.

Approval of the RIM is required for overhanging loads if the load will extend beyond the normal swept outline of the carrying vehicle during transit.

There shall be no overhang at the articulated ends of platforms of articulated vehicles because of the reduced clearance provided between adjacent platforms.

3.8.3 Use of fender wagons

Where the load overhangs both ends of the carrying vehicle by more than 150 mm, a fender vehicle shall be provided at both ends.

Depending on the length of the overhanging load, the fender vehicle may also carry loading. Use of the fender vehicle is illustrated in Figure 3.

The height above deck of overhanging loads should be checked before departure to determine that there is sufficient vertical clearance between the load and the fender vehicle(s) to accommodate the relative movement occurring between vehicles during transit. Additional dunnage (see Clause 4.9) or packing could need to be inserted under the load to provide the necessary clearance.

In general:

- (a) long items overhanging the ends of vehicles have more end swing on curves than the carrying vehicle itself. While they may be within the loading outline on straight track, the width of the overhanging portion shall be checked and reduced if necessary, so that it remains within the outline swept by the vehicle;
- (b) there should be at least 100 mm clearance between the load and the deck of the fender vehicle for overhangs of up to 5 m;

- (c) the clearance should increase proportionately up to 200 mm for overhangs of 10 m;
- (d) allowance should be made for deflection of the suspension system on the carrying vehicle when determining the amount of clearance and the required packing or dunnage;
- (e) allowance should also be made for the flexibility of the load to allow for bounce during travel; and
- (f) the bogie nearest the overhanging end carries a greater proportion of the load mass than if the load was symmetrically placed, particularly if the load overhangs at one end only. Accordingly, care should be taken with regard to loading on the nearest bogie so that it does not exceed the allowable limits for axle load or the permissible variation between bogies (see Clause 3.7).

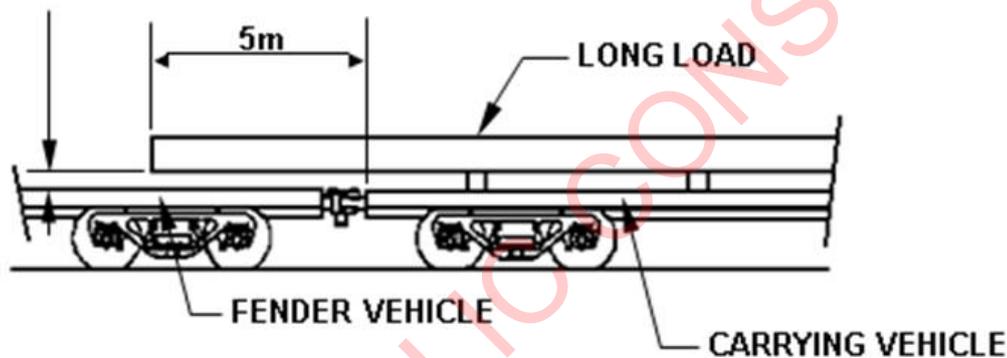


Figure 3 Overhanging loads

3.9 Loading in open and covered wagons

3.9.1 Vehicle condition

The vehicle shall be structurally sound with no damage to or failure of the underframe, floor, walls, doors or stanchions that could damage the loading or impede the proper restraint and retention of the load.

Doors and door mechanisms, where used, shall be fully functional, able to be operated easily and effectively hold the doors in the closed position.

Before loading is placed in an open or covered vehicle, the recommendations given in Clause 2.2 should be checked.

3.9.2 Loading

In addition to the relevant requirements and recommendations of Clause 2.2, the following applies:

- (a) Loading should be distributed as evenly as possible across the vehicle floor and conform to the operator's wagon loading charts and guidelines.
- (b) Loading should be positioned and/or restrained so that it will remain within the vehicle and not be damaged when doors are closed or opened or during unloading operations.

- (c) Chocks placed between the base of the load and the walls of the vehicle should be used to restrain machinery and cased items that do not occupy the full floor space.

In open wagons, where the load is secured only by the side and end walls, loading shall not extend above the side and end walls. The only exception is for containers or large items with at least 2/3 of their height below the top of the walls. If loading was to extend above the side walls, it still shall be within the outline of the loading diagrams.

Commentary C3.9.2

Steel coil is an example of a large item that can be secured by only the side and end walls. Clause 2.2 and Section 3 provide guidance on best practice to load so as to avoid imbalanced loading.

Section 4 Restraint and retention systems

4.1 General principles

Restraint and retention devices together form the load securement system and are used to fix the load in position on the carrying vehicle.

The securement systems function is to restrain the load through preventing relative movement between the load and the vehicle, and to retain the load on the vehicle during normal transit. This is to minimize the risk of separation from the vehicle in the event of adverse conditions (e.g., collisions, derailments, etc.).

Securement systems, including fastening, attachment and adjustment components, should be suitable for the load being carried and should incorporate components that are of adequate strength to fulfil the securement function.

Requirements for various components are given in clauses 4.6, 4.7 and 4.8.

Restraint and retention systems should not cause damage to the loading during either placement, securing, transit or release before unloading.

Components not in use should be removed or secured in place so that they cannot move during transit and cause an unsafe or unacceptable situation.

Dunnage should be used as necessary to support, separate or restrain loads (see Clause 4.9).

4.2 Restraint

Loads should be restrained in accordance with the general principles in *NHVR Load Restraint Guide* (2025) noting that it is intended for road, not rail transport. Rail has different acceleration requirements and loading for rail transport should be calculated in accordance with Clause 4.6.3 of this document and validated.

The purpose of restraint systems and components is to prevent the load from moving relative to the vehicle in either the longitudinal (lengthwise), lateral (sideways) or vertical planes.

Restraint can be provided by friction, the vehicle structure, specific attachments or a combination of these.

Frictional forces between the load and the vehicle deck or floor can provide some resistance to horizontal movement. In general, however, friction is insufficient to adequately restrain a load under the dynamic forces experienced in transit and should be supplemented by other means.

Restraint systems include:

- (a) structural elements, in which the restraint is provided by fixed or adjustable parts of the vehicle structure (e.g., bulkheads, stanchions, braces, walls, etc.);
- (b) non-structural restraints such as wooden chocks, braces and packing that can be placed in position and fastened to the vehicle during loading;
- (c) flexible elements, such as chains, ropes, steel straps or webbing straps; and
- (d) specialized fittings or attachments (e.g., container fittings of various types, removable brackets, etc.).

4.3 Retention

Retention devices are used to retain the loading on the vehicle, generally by preventing vertical movement in addition to longitudinal and lateral restraint.

The retention function may also be incorporated into the restraint system.

Retention systems include the types of equipment listed above for restraint and may also include other special components fitted after loading.

4.4 Load protection

Most loading, other than enclosed containers, requires protection from physical and environmental damage. Physical damage is often the result of incorrect loading and/or securing methods, practices and procedures.

Where flexible securement devices pass over the load, particularly at sharp or abrupt edges or corners, adequate protection should be provided for the load and the securing device (e.g., strap, rope, etc.).

This protection may be in the form of:

- (a) sleeves or fittings of synthetic material (e.g., nylon, etc.);
- (b) natural or synthetic fibre packing;
- (c) special purpose metal fittings; or
- (d) other suitable devices.

4.5 Common components

4.5.1 Flexible components

Flexible components include the following:

- (a) Chains.
- (b) Load binders.
- (c) Load-screws/turnbuckles.
- (d) Synthetic webbing straps with ratchet winches.
- (e) Clamps.
- (f) Bolts.
- (g) Rope and cordage.
- (h) Steel strapping.

4.5.2 Container securing devices

Containers are generally secured to the vehicle using specialized proprietary securing devices of two general types. Either a spigot type which fits into the opening in the container corner fittings or a fence or bracket type which encloses the outside of the container corner fittings.

Both types may be permanently fixed to the vehicle or removable.

Where the vertical coverage between the vehicle or restraint structure and the container is 240 mm or more, no vertical restraint is required (see Clause 4.8.8 and Figure 5).

Removable spigot types are the most common now in use.

Spigot-type devices may have automatic, semi-automatic or manual operation, and are usually referred to as twistlocks.

Well wagons typically use a fixed spigot with no vertical restraint because the walls of the well portion are deep enough to provide sufficient retention under normal conditions.

The fence bracket type may incorporate a horizontal pin or key that engages with the hole in the side or end of the corner casting to provide vertical restraint.

A twist-lock device with spigots on the top and bottom, commonly known as an inter-box connector (IBC), of the base plates is used to secure two containers together in double-stack configuration.

More detail on container securing devices is given as follows:

- (a) Rotating spigot fittings (twistlocks) – see Clause 4.8.6
- (b) Fixed spigot devices – see Clause 4.8.7.
- (c) Container fence brackets – see Clause 4.8.8.

4.6 Minimum strength requirements

4.6.1 General

Securement systems and their attachment to the vehicle and/or the loading shall be capable of withstanding the forces normally experienced in transit and shunting movements without exceeding the yield stress in any component.

Minimum strength requirements for components are prescribed to minimize the risk of failure, damage to the load, container, vehicle, track and infrastructure, and for the protection of railway and other personnel and members of the public.

4.6.2 Applied loading

The minimum accelerations for which load securement systems (other than container securing devices), lashing equipment and components should be designed are:

- (a) longitudinal 2 g;
- (b) vertical 1 g; and
- (c) lateral 1 g.

The above accelerations should be applied to the mass of the anticipated loading, and the required aggregate strength of the securement systems determined from the result. The load placed on any component due to the above accelerations should not exceed the safe working load of that component.

Alternative values of acceleration may be applied where the train operator can demonstrate that the alternative values are safe and fit for purpose for that particular application.

Specific strength requirements together with use and care recommendations for restraint and retention devices are given in Clause 4.8.

4.7 Unacceptable methods and procedures

The following methods and procedures of loading and securement shall not be accepted and include, but are not restricted to, the following:

- (a) Use of sisal and manila ropes for any form of primary load securement, except where specially approved by the RSO or RIM.
- (b) Use of steel strapping other than that given in Clause 4.8.4.
- (c) Loads presented as out of gauge which can be readily divided to comply with the gauge.
- (d) Loose loads which have not been unitized, or palletized loads that have not been correctly secured to the pallet or secondary support base.
- (e) Curtain-side (tautliner, etc.) containers and trailers without separate internal load restraint systems or cargo barriers.
- (f) Loading which extends beyond the vehicle or container side walls and ends by greater than the maximum permissible amount prescribed in this document without special authority.
- (g) Knots in chains or webbing straps.
- (h) Chains not attached to the vehicle using correct terminal fittings (e.g., shackles, hammerlocks, etc.) of equivalent strength to the chain.
- (i) Free ends or tails of chains and webbing straps not adequately secured or prevented from dragging or projecting over the sides or ends of the carrying vehicle.
- (j) Strapping or securing systems not adequately protected against chafing where they contact the load.
- (k) Securing devices not correctly tensioned or used inappropriately.
- (l) The use of tarpaulins as the only means of load restraint or securement.
- (m) The presentation for transport of dangerous goods that is not in accordance with the requirements of the *Australian Code for the Transport of Dangerous Goods by Road & Rail (2024) (ADG)*.

Transport of railtainers, transflats and similar equipment shall not be accepted where:

- (n) the load is not prevented from protruding through the side or end gates or bulkheads; and
- (o) loading is not adequately secured to the support base or structure.

4.8 Common components – Standards, use and care

4.8.1 Chains and fittings

Chain performance should meet the following:

- (a) Chains used as part of load-securing assemblies should comply with the minimum requirements of AS 2321 (i.e. short link chain for lifting purposes, Grade L, P or T) or AS/NZS 4344.

- (b) The link-material diameter should not be less than 8 mm, and the safe working load not less than 20 kN. To avoid the use of non-conforming chain for load restraint, the links should be marked at regular intervals with the material grade or other quality identification.
- (c) Higher tensile chain that is specially developed for lashing purposes and with mechanical properties superior to those of Grade P may be used.

Use of chains:

- (d) Chains should not be used where the material or surface finish of the load is likely to be damaged by contact with the chain or its attachments, or by the application of tension to the chain assembly. Soft packing should be used wherever it can prevent surface damage to the load.
- (e) Chain assemblies should be attached to rigid anchor points or fittings using shackles or equivalent components. Side bars normally used for tying down tarpaulins are not adequate securing points.
- (f) Chains should not be attached or shortened using knots. Shackles, claws or hooks of appropriate strength rating should be used. Hooks and shackles when used should engage only one link of the chain.
- (g) Free ends (tails) of chains should not be left loose but secured to prevent them from moving, falling over the edge of the vehicle, dragging or causing damage to the loading. They should be secured by tying with wire, shackles or rope.

Chain assemblies not being used for load restraint should be:

- (h) securely placed in storage recesses or compartments where these are provided; or
- (i) placed across the vehicles deck and secured to the vehicle or a similar chain at the other end with loose ends secured against movement.

Chains used in chain assemblies should be visually inspected by loading staff on each occasion they are used.

Chains should be taken out of use and removed from service for replacement or repair, if they have links that:

- (j) are stretched or collapsed;
- (k) are twisted, bent or cracked;
- (l) have cracked welds;
- (m) are worn so that the material diameter is less than 90% of the original;
- (n) show corrosion, nicks, gouges, cuts or similar damage with a depth of more than 10% of the original material diameter; and/or
- (o) show signs of exposure to excessive heat.

Condemned items should be identified and adequately marked in accordance with the RSO's quality control procedures.

When chains are removed from the vehicle, or released from the loading, they should be positioned so that they do not present a hazard or obstruction to persons, equipment or loading, and are not likely to be run over or otherwise damaged.

Use and care of load-binders and turnbuckles strength includes the following:

- (p) Load-binders and turnbuckles should have a safe working load equivalent to that of the chain with which they are used.
- (q) Before attaching and tightening, the chain should be stretched so that all links are free and fully extended. Load-binders should be extended and the claw(s) engaged firmly with the chain links, and the handle closed to tighten the binder.
- (r) Loose chain should be secured to prevent movement, and the handle wired in the closed position to prevent it from opening in transit.
- (s) To avoid injuries when an extension bar is used to close the load-binder, caution should be used when closing and opening the handle.
- (t) Load-binders and turnbuckles should be lubricated regularly, preferably with a lubricant that will not attract or retain contaminants.
- (u) Chain hooks and claws on binders, turn-buckles, pearlinks and chain grabs should not be spread or distorted, or so worn that they are not capable of applying the required tension to the chain, or of maintaining that tension in transit.
- (v) Component parts should be taken out of service if they are bent, distorted, cut or gouged. They should not be repaired by welding.

NOTE:

The terms load binders, turnbuckles, chain hooks, claws and pearlinks are all common transportation terminology and not needing definition for the purposes of this document.

4.8.2 Webbing straps and attachments

Synthetic webbing straps are used with ratchets, winches or similar tensioning devices to secure loading, and are less likely to damage loading than chains or steel strapping.

Webbing should be not less than 50 mm wide and should be in accordance with the requirements of AS 1353.1 or *Load Restraint Guide* (2025). Tensioning devices should have a safe working strength equivalent to the webbing with which they are used.

Webbing assemblies should be adjustable in length, incorporate a tensioning device, and have suitable end fittings such as a hook and keeper.

The hook and keeper should be made of steel and should be suitable for attaching to suitably designed wagon attaching bars and fittings.

Rubbing plates should be provided where there is a risk of chafing or abrasion where the webbing passes through the hook or keeper.

When using webbing straps:

- (a) straps should be positioned across the load so that they are not twisted. Straps should be fitted so that they are square across the vehicles (i.e. at 90° to the vehicle sides). Webbing straps should not be knotted;
- (b) edge protection pieces or corner pieces should be placed on all sharp or abrupt edges and corners to protect the webbing against abrasion;
- (c) webbing straps should not be used on loads with a temperature greater than 150°C; and
- (d) tensioning devices shall be used in accordance with the relevant tensioning device instructions.

Care of webbing straps and attachments includes the following:

- (e) Winches should be lightly lubricated at regular intervals.
- (f) Webbing should be in good condition. Any webbing found with cuts, chafing, fraying or abrasions that exceed 10% of the width of the strap should be taken out of service and replaced.
- (g) Stitching should be sound and the ends of the webbing should be correctly sealed.
- (h) Webbing should be inspected on both sides for its full length, moving protective sleeves if necessary.
- (i) Straps contaminated with grease, oil, fuel or acids should be cleaned with detergent and hot water or a high-pressure cleaner.

4.8.3 Ropes and cordage

Ropes used for lashing and other securing purposes should be of a quality complying with the minimum requirements of *Load Restraint Guide* (2025).

Ropes should be manufactured from a light resistant (i.e. UV stabilized) synthetic material selected from the following (listed in order of preference):

- (a) Polypropylene film.
- (b) Polypropylene mono- or multi-filament.
- (c) Polyester filament.
- (d) Polyamide (nylon) filament.
- (e) Other approved material possessing equivalent strength and abrasion resistance.

Ropes should not be less than 12 mm nominal diameter and have a minimum breaking strength of 18.3 kN.

Sisal and manila natural fibre ropes of the specified minimum diameter do not comply with the minimum strength requirements and should not be used as original equipment or for primary load restraint, except in special circumstances as agreed by the RSO.

4.8.4 Steel strapping

Steel strapping should not be used as a means of primary load restraint and its use requires the approval of the relevant RSOs. It may be used for supplementing other primary restraints provided that objective evidence of its successful use for that purpose is supplied to the RSO.

Steel straps are commonly used for securing nested container bases, steel products, ingots, bars, pipes, timber, machinery and similar loading.

The only steel strappings acceptable for use as a primary means of load securement are lashing and lifting strap with have characteristics of at least equivalent to, or better than, those shown in Table 2.

Appropriate seals (crimps seals) and crimpers shall be used with the correct specified strapping. Steel strapping manufacturer requirement concerning seals and crimpers are strictly to be followed.

Table 2 Details of Primary Restraint Straps

Type	Size (mm)	Colour (Nominal – may differ depending on suppliers)	Min. tensile strength, kN	Elongation	Min. joint strength
Lashing strap	31.7 x 1.12	Black	37.3	6-8%	

Lifting strap	31.7 x 1.45	Grey unwaxed	50.5	6-8%	45.3kN @2000kg lift
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The following grades of steel strapping in Table 3 should be used only for bundling or unitising loads and should not be used for primary restraint:

Table 3 Details of Bundling or Unitising Straps

Type	Size (mm)	Colour (nominal – may differ between manufacturers)	Min. tensile force kN
Normal strength	19.0 x 0.80	Black	14.6
	31.0 x 0.80	Black	24.4
High strength	19.0 x 0.80	Brown	19.2
	19.0 x 0.87	Brown	20.8
	19.0 x 0.97	Brown	23.2
	19.0 x 1.20	Brown	28.7

This strapping is referred to elsewhere in this document as black or brown steel strapping.

In the absence of a complete specification for steel strapping elsewhere in this document, use the smallest size given in Table 2 or Table 3 for the colour stated.

When applying strapping:

- (a) steel strapping should be applied only with vertical or horizontal orientation. Where the location of anchor points or the load shape requires straps to be applied at an angle, two straps should be applied diagonally in a cross pattern;
- (b) steel straps should not pass over sharp edges and should not be twisted;
- (c) anchor rails or attachments should be not less than 24 mm in diameter;
- (d) Figure 4 shows the preferred method of positioning and tensioning steel straps, with the straps tensioned and sealed at the top of the load. Tensioning and sealing of straps at the side of the load is permissible provided that adequate space is available and sufficient force can be applied to the load. In some instances it can be necessary to tension two straps simultaneously to achieved the required result. The preferred method of securing steel straps to anchor bars is to use the tail as a protector; and
- (e) all steel strap projections and unused portions should be cut off and removed. Strap ends should not project beyond the vehicle outline.

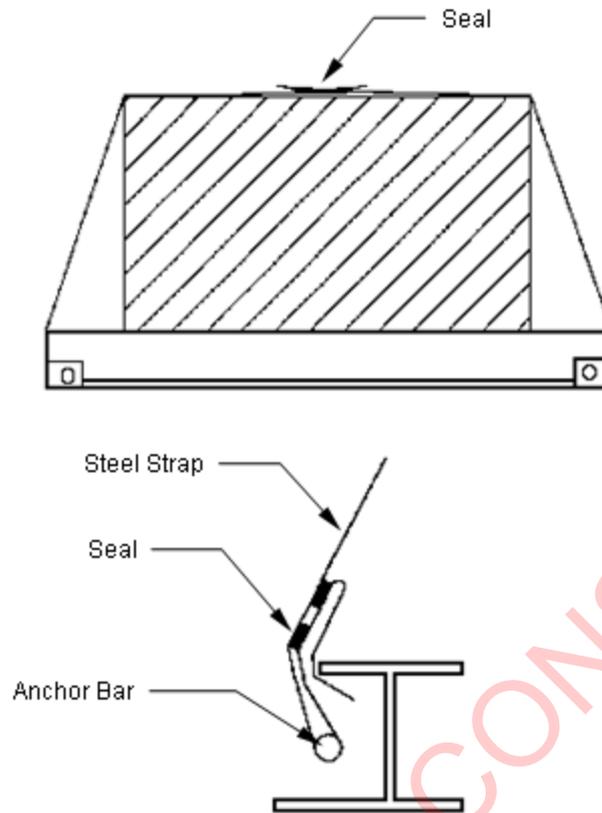


Figure 4 Positioning of straps

Strapping systems should be a proven combination of strap material, tensioning and sealing tools. Refer to manufacturer's advice and recommendations.

Important features to be factored include:

- (f) the number of straps required to secure the load against static and dynamic forces experienced in transit;
- (g) the number of seals used;
- (h) effectiveness of the seal crimping;
- (i) the applied tension;
- (j) joint strength; and
- (k) sequence of application of the straps.

Heavy-gauge grit-lined seals are used to provide a strong and shock resistant joint. Pneumatic tensioners assist in providing an equal tension on all straps. Refer to manufacturer's recommendations for use and application.

4.8.5 Container fittings – General

The construction, installation and operation of the various types of container fittings should be included in the training requirements of loading and unloading staff.

Descriptions and specific requirements for containers are given in Appendix A.

4.8.6 Rotating spigot container fittings

Twistlocks are securing fittings with rotating spigots that have enlarged heads. These are used to secure a container to a rail vehicle and come in several different types.

All twistlocks shall be inspected and maintained in accordance with OEM requirements and specifications.

The specifications and design loads for these fittings include the following types:

- (a) Fixed twistlocks are welded or bolted to the vehicle structure and cannot be removed or repositioned to allow for containers of different sizes.
- (b) Retractable (hinged) twistlocks are pivoted at one side below the deck, allowing them to swing downwards when the support is released and so be retracted below the deck when longer containers are loaded.
- (c) Retractable (pop-up) twistlocks are assembled into a generally cylindrical housing, which is permanently attached to the vehicle structure. They are retracted vertically.
- (d) Removable or portable twistlocks are a replaceable type, and can be removed, relocated on a vehicle, transferred to another vehicle, or used to connect two containers together in double-stack configuration. In the latter mode they are generally referred to as IBCs. Removable twistlocks are usually inserted into appropriate cut-outs in the vehicle deck or supports. They are secured in position by rotating the complete assembly.

Restraint in the lateral and longitudinal directions is provided by the twistlock body engaging the aperture in the corner fittings. Vertical restraint is provided by rotating the spigot so that the underside of the spigot head lies across the internal opening in the corner fitting.

Removable fittings can also be manually operated to lock and unlock, semi-automatic with manual unlocking, or fully automatic (self-releasing and engaging).

Manually operated twistlocks are locked and unlocked manually, usually by operation of a handle or lever.

Automatic twistlocks have no operating handle or lever. The spigot is designed in such a manner that the force exerted by a container being loaded or unloaded is sufficient to operate the rotating spigot to engage or release.

4.8.7 Fixed container spigot devices

Securing devices with fixed spigots should be used only where the fitting is not required to provide vertical restraint, such as at the bottom of well wagons or with high fence type brackets.

Fixed spigots are usually permanent and are welded to the vehicle structure or the bracket base plate.

4.8.8 Container fence brackets

These devices are often referred to simply as corner brackets.

They comprise a base plate with a means of connection to the vehicle structure, and a vertical element aligned with one side and one end of the base plate. This provides lateral and longitudinal restraint to the corners of the container. The base plate may also be fitted with a fixed spigot.

If the height of the vertical face of the restraint elements is 240 mm or more, no additional vertical restraint device is required. In other cases, vertical restraint should be provided by a horizontal pin or key that engages the holes in the side or end of the corner casting and can be secured in the applied position.

A typical fence bracket is illustrated below in Figure 5.

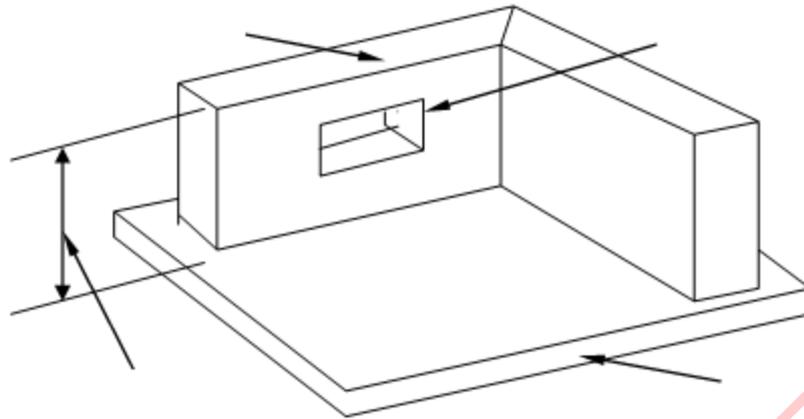


Figure 5 Typical corner or fence bracket for containers

4.8.9 Steel wire rope

Steel wire ropes made up as straps or slings are suitable for securing some loads when used with the correct end fittings (e.g., thimbles, shackles, etc.) and with appropriate tensioning devices.

Steel wire ropes used for load restraint should comply with AS 3569.

Eyes in the rope ends shall be fitted with thimbles of the correct size for the rope.

Ends shall be secured by splicing or by rope/cable clamps.

Cable clamps shall be of the correct size for the rope being used and comprise at least three clamps spaced at intervals equal to six times the rope diameter.

Eyes without thimbles shall not be used for load restraint purposes.

Relevant Standards for fittings include:

- (a) Shackles – AS 2741;
- (b) thimbles – AS 1138, and
- (c) shank hooks and large eye hooks (maximum 60 t) – AS 3777.

4.8.10 Care of ropes

Loading staff should inspect ropes before each use. Wire ropes should be free from rust, not be creased and have no exposed broken wires or strands which can cause serious injury to personnel.

In any rope length equivalent to 10 rope diameters, the number of visible broken wires should not exceed 10% of the total number of wires in the rope.

Requirements for the maintenance, handling, storage and inspection of wire ropes are given in AS 2759.

Care is required when tensioning and releasing steel wire ropes because of their capacity to store large amounts of elastic energy. Rope failures can be extremely dangerous to adjacent personnel or equipment.

4.9 Dunnage

Dunnage is used to support, separate or restrain loading, and may consist of a range of different materials (e.g., timber beams and wedges, or rolled sections, synthetic blocks, etc.). Dunnage should be

square or rectangular in cross-section to minimize the risk of roll-over in transit and loosening of securing elements (i.e. straps, chains, etc.). Where rectangular dunnage is used, it should be positioned with the shortest side vertical.

Timber dunnage should be in good condition, and wherever practicable, be secured to the vehicle or support structure. Intermediate layers of dunnage should be chocked or otherwise secured in position to prevent lateral movement and the risk of creating an out of gauge condition. For specialized vehicles, the dunnage restraint should be incorporated into the vehicle structure.

Dunnage used at the bottom and between tiers of loading (e.g., steel billets and sections) should be of a thickness to provide the necessary separation in one layer. A single layer should be used instead of multiple layers of dunnage. It should be capable of supporting without failure all the loading placed above it.

Where dunnage consists of more than one layer, the layers should be secured together to prevent separation during transit.

If there are two or more layers of loading, dunnage between each layer should be placed vertically above the dunnage below.

Dunnage that is used to provide restraint against lateral and longitudinal movement should not cause damage to the loading.

Dunnage should be positioned as near as is practicable to the securing elements or over other substantial cross members. It should be positioned to provide maximum support of the loading, and to minimize the stresses in the vehicle structure. Accordingly, support dunnage for long items (such as steel slabs, billets, sections and timber) should be located as close as is practicable to the bogie centres.

Section 5 Operator requirements

5.1 General requirements

RSOs have a responsibility, which should not be delegated to other parties, to develop and implement practices and procedures that will ensure that loading is transported securely and safely to its destination.

5.2 Load securement

The acceptance and safe adequate securement of all loading that they transport.

Provision of vehicles that are appropriate to the particular loads presented for transport, that are in a condition suitable for service and that do not present a hazard to the load, infrastructure or to staff engaged in loading, unloading, train operations or to any other person.

5.3 Restraint and securement devices

Provision of all devices and equipment necessary to restrain and secure loading on their vehicles.

Provision of equipment that is suitable for the loading, has adequate strength and is in a condition acceptable for use.

Procedures for regular and adequate inspection, maintenance and replacement of securement equipment and components.

5.4 Loading outline

Ensuring that loading that exceeds or infringes the permissible outlines applicable to the type of loading and the routes over which it will travel is not transported, unless it has a valid out of gauge approval issued by the RIM (see Section 8).

Ensuring that all loading that is suspected of being close to or outside the applicable outline is investigated by the RSO.

5.5 Mass distribution

Maintaining a check on all loading to verify that it does not exceed any of the mass, distribution or capacity limits and that any load that infringes those limits is adjusted or transferred.

Ensuring that the mass of any load is checked against consignment notes or weigh-bridge data and re-distributed if necessary.

Section 6 Consignor requirements

6.1 General requirements

Consignors have a responsibility, which should not be delegated to other parties, to present loading that can be adequately secured and restrained and will not present or create a hazardous condition during loading, unloading or transit.

6.2 Packaging

Consignors of loading (including forwarding agents, suppliers and manufacturers where applicable) should ensure that the loading is packaged in a manner that is suitable and acceptable for rail transport.

Packaging shall comply with the requirements of the ADG.

Packaging requirements include adequate protection and retention of the contents during transit, and compliance with the prescribed maximum dimensions that will allow the load to fit within permissible loading outlines.

Consignors should be familiar with the requirements of this document and confer with the relevant RSO regarding specific requirements for the type of loading, loading and unloading methods, and securement.

Packaging should provide protection for the loading against damage due to restraint and securement systems, incidental physical contact and weather effects. Where necessary, loads requiring weather protection should be adequately packaged prior to presentation or covered with tarpaulins or similar items.

Where practicable, loose loads shall be unitized or stabilized before presentation for loading.

6.3 Suitability for transport vehicles

Consignors should consult with the RSO(s) concerned regarding the class or type of vehicle to be used to ensure that their loading is capable of being safely transported by that type or class of vehicle.

Loading should be packaged and presented in a configuration that is compatible with the structure, attachments, restraint and securement requirements of the rail vehicle/container on which it is to be carried.

Loads shall not exceed the lifting and handling capacity of the loading and unloading equipment, nor the load or dimensional capacity of the transport vehicle.

6.4 Condition

All loading should be in a condition that is acceptable to the RSO. Loading should be in a condition that will enable it to:

- (a) remain adequately restrained and secured during transit;

- (b) not change configuration, orientation or dimensions during transit;
- (c) not present a risk of injury to loading and unloading staff or other persons; and
- (d) not present a risk of damage to rolling stock, equipment, attachments, infrastructure or environment.

Gates shall be fit for purpose and be adequately restrained (see Figure 6) so that they do not become dislodged from their home position.

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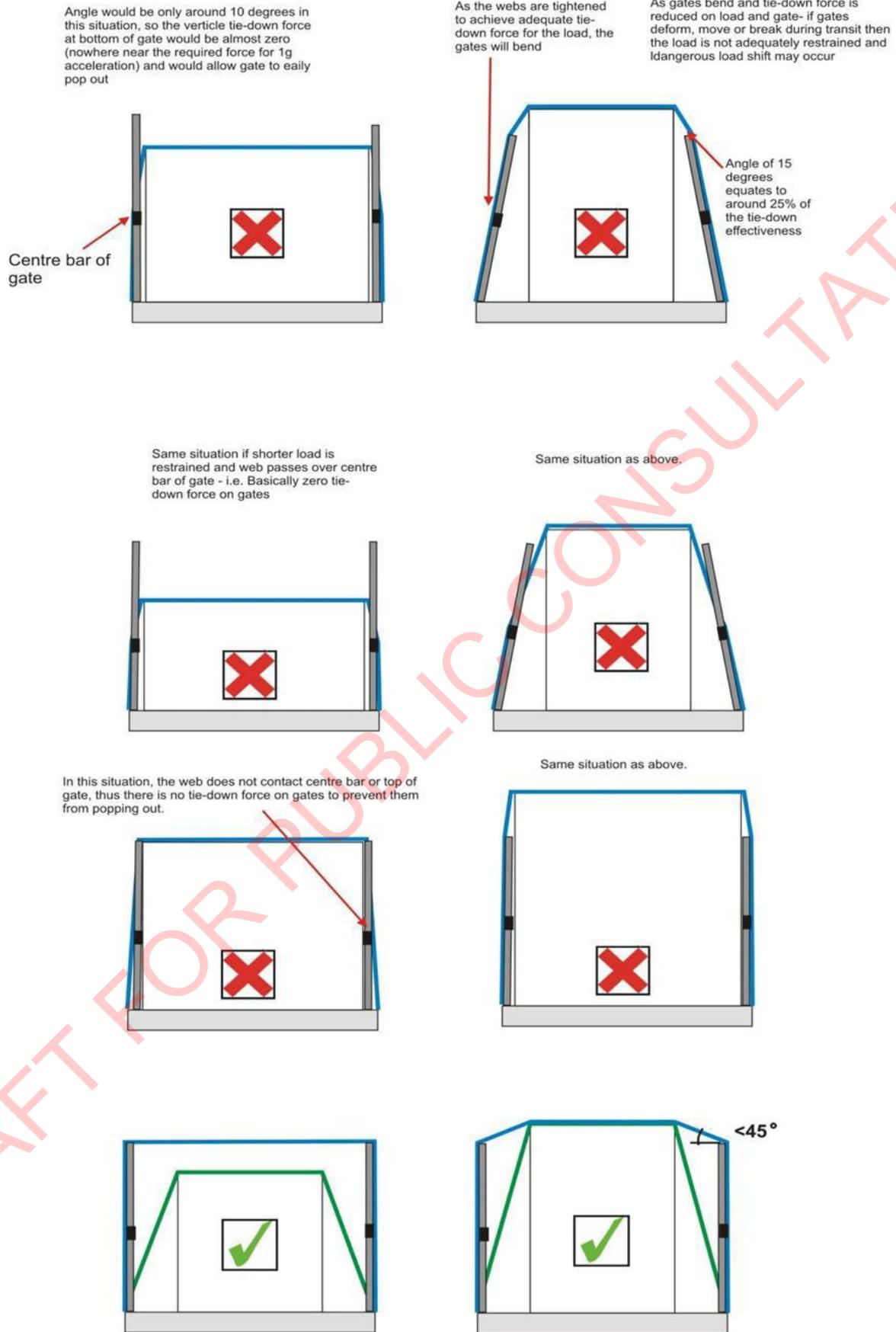


Figure 6 Recommended restraint of load within side gates.

6.5 Securement and restraint

Consignors have a responsibility to provide loading which is suitable for the restraint and securement systems fitted to the vehicle used for transport. This is particularly relevant in the case of loading that is presented on secondary support elements such as pallets, container bases, transiflats, etc. (see Appendix A.6, Appendix D.5 and Appendix D.6).

High-volume, low-density packaging is particularly susceptible to the effects of wind and vehicle dynamics and this aspect should be assessed when determining the method of packaging, wrapping and securement.

Loading which has been unitized and/or placed on secondary support elements (such as copper sheets or pipe bundles on pallets) should also be adequately secured to those elements before being loaded onto the rail vehicle.

Consignors or freight forwarders are responsible for the provision and application of all secondary securement systems, such as those used for unitizing, bundling, palletizing, and the securement of loading inside containers.

Consignors are responsible for the correct positioning and adequate securement of loading in containers, including the provision of cargo barriers where required.

6.6 Load distribution

Loading personnel will usually determine the final position and mass distribution of a load on a rail vehicle. However, consignors should assist and endeavour to package consignments so that the load on the rail vehicle will be distributed laterally and longitudinally as evenly as is practical and within the allowable limits prescribed by the RIM. This reduces the risk of imbalance or overloading of the lifting equipment.

Even load distribution by the consignor is particularly important in the case of containers and similar enclosed loads where the internal load distribution is not readily visible or accessible.

Loading elements should be positioned so that the total load is evenly distributed over the floor of the container or rail vehicle.

Section 7 Acceptance of loading

7.1 Responsibility

Acceptance of general loading for transport by an operator is primarily the responsibility of the RSO at the originating location.

Out of gauge and overweight loads shall be referred to the RIM for investigation and approval before acceptance is given. See Section 8.

Both the operator and the consignor have a responsibility with respect to the transport of dangerous goods, including the identification of such goods and the preparation of the necessary documentation. All dangerous goods accepted for transport shall comply with the requirements of the ADG.

7.2 Load data

Consignors should provide advice about loads to the operator in advance of presentation for transport. This advice should be provided sufficiently prior to arrival at the loading point to enable the necessary arrangements to be made for acceptance, loading, transit and unloading.

The following aspects should be used as a guide for the information to be provided:

- (a) General description of the load

- (b) Quantity
- (c) Mass
- (d) Length
- (e) Width
- (f) Height
- (g) Packaging
- (h) Any special or unusual features or requirements
- (i) Security requirements
- (j) Restraint requirements
- (k) Weather protection
- (l) Consignee
- (m) Origin and Destination
- (n) Date and time for despatch
- (o) Consignor and contact person
- (p) Dangerous goods information
- (q) Centre of gravity (all planes)

Where a consignor is aware that a particular load is or might be out of gauge, eccentrically loaded or overweight, or otherwise require special handling, they should consult with the RSO well in advance of the intended date of transport to enable adequate evaluation and planning to be undertaken.

7.3 Condition

Loading should not be accepted unless it is in a condition suitable for transport. Loading should be in a condition that will enable it to:

- (a) remain adequately restrained and secured during transit in accordance with Section 4;
- (b) not change configuration, orientation or dimensions during transit;
- (c) not present a risk of injury to loading and unloading staff or other persons;
- (d) not present a risk of damage to rolling stock, equipment, attachments, infrastructure or environment;
- (e) remain intact during transit; and
- (f) retain important load identification data such as hazardous-chemical labels, etc.

7.4 Dangerous goods

Consignors shall inform the RSO if a load contains dangerous goods in accordance with the ADG.

Dangerous goods shall be transported in accordance with all requirements of the ADG.

The consignor shall provide dangerous goods declarations to the RSO for all loads containing dangerous goods and should provide and attach all the required labelling and warning and advice signage (e.g., placards and class labels). For the regular transport of dangerous goods in bulk, such as liquids or compressed gases in rail tank wagons, the RSO may agree to supply the signage for the vehicle.

Persons involved in the transport of dangerous goods shall comply with their responsibilities as prescribed in the latest issue of the ADG.

Dangerous goods code requirements in respect to separation of loads are the responsibility of:

- (a) the consignor, freight forwarder or manufacturer for separation within a container, load or consignment; and
- (b) the RSO, for separation of loads on a vehicle, and between vehicles within a train.

7.5 Out of gauge loads

Out of gauge loads shall not be accepted for loading unless an out of gauge certificate has been issued by relevant RIM(s). Section 8 specifies the requirements for out of gauge loads.

Section 8 Non-conforming loads

8.1 General requirements

8.1.1 Definition

Non-conforming loads are those that do not comply with the requirements of Section 3 and Section 4, for reasons of dimensions, mass, load distribution, method of securement or similar aspects.

They include the following:

- (a) **Oversize or out of gauge loads:** An out of gauge load is any load whose dimensions, when loaded onto a rail wagon, exceed the permissible limits for the intended routes as prescribed by the loading outlines illustrated in Section 3.
- (b) **Excessive axle load:** Excessive axle load is a situation when the vehicle's gross mass or mass distribution causes the axle load of the vehicle to exceed the limits prescribed by the RIM(s) for the routes to be travelled.
- (c) **Eccentric loads:** Eccentric loads are those loads whose dimensional or mass characteristics may be classified as non-conforming and, unless corrected or adjusted, result in:
 - (i) infringement of the applicable loading outline(s); and/or
 - (ii) an axle load in excess of the permissible limits; and/or
 - (iii) unacceptable variations in mass distribution or wheel loads.
- (d) **Vehicle overload:** Vehicle overload occurs when the mass of the loading, or its placement on the vehicle, exceeds the marked or nominated carrying capacity, but the vehicle is within the axle load limits permitted for the intended routes.
- (e) **Non-approved loading and restraints:** Non-approved loading and restraints are those securement assemblies or components that do not comply with the requirements of Section 4.
- (f) **Load shifts in transit:** Load shifts in transit occur when all or part of a load moves in transit and results in infringement of the loading outline and/or mass distribution limits.

Limits for axle loads, overloading and uneven mass distribution are set by the relevant RIM.

8.1.2 Assessment

If a consignment is presented for transport and there is doubt or concern regarding its conformance with the requirements of this document or general acceptability, the RSO should be immediately notified to arrange an inspection and assessment.

Consignors wishing to present loading that they know, or suspect might be non-conforming should consult with the RSO well in advance of the intended date of transit.

They should provide all relevant details of the load, including:

- (a) type;
- (b) dimensions;
- (c) mass;
- (d) configuration;
- (e) securement;
- (f) origin;
- (g) destination; and
- (h) any special requirements for loading, unloading, securement and protection.

All non-conforming loads should be reviewed, investigated and inspected by the RSO and RIM in accordance with the requirements of this section. Where prior notice of such loading is provided the related train movements should be planned and programmed in advance of receipt of the loading.

8.1.3 Correction and adjustment

Where a non-conforming load is not authorized or approved for travel, the load shall be removed and as appropriate either:

- (i) placed on another more suitable vehicle;
- (j) repositioned on the vehicle;
- (k) separated where possible into acceptable components;
- (l) redistributed; and/or
- (m) re-secured.

8.1.4 Authorization

The RSO should process consignors' enquiries and make an initial assessment before consulting with the RIM. Final authorization for transport of loads that are out of gauge or result in excessive axle or wheel loads is the responsibility of the relevant RIM.

Authorization of vehicle overloads, non-conforming restraints and the correction of load shifts is principally the responsibility of the RSO, provided that the loading conforms in all other respects.

8.2 Out of gauge loading

8.2.1 Assessment and authorization

The RIM is ultimately responsible for the final review of out of gauge loads and the assessment of their acceptability for transport by rail. The requirement during transit to pass and cross other trains, some of which can also be transporting out of gauge loads, should be assessed.

The RIM is responsible for the issue of the necessary approval or acceptance documentation, and for prescribing any special conditions that are required for rail transport after consultation with the operator.

Except for those out of gauge loads transported regularly understanding instructions in accordance with Clause 8.2.2, paragraph 4, each out of gauge load is to be assessed and approved individually, regardless of whether similar or identical loads have been approved in the past.

The authorization shall include any special conditions, requirements or restrictions placed on the movement.

The RSO shall not permit any loading, other than containers, which exceeds the loose loading outline (Figure 1 or Figure 2 as applicable), being despatched unless it has the necessary authority.

Container loading that complies with the container outline applicable to the routes to be traversed is acceptable without an out of gauge authority.

8.2.2 Documentation

Acceptance and approval for transport of a special or out of gauge load should be in writing in the form of an authority to travel. This authority shall include any and all special requirements, restrictions and conditions related to the intended movement. Refer to the RIM for detailed operational requirements for the transport of out of gauge loads.

Approval documents should be forwarded to the appropriate person(s) of the RIM and the RSO responsible for train planning and operations.

Train crews shall be advised of the presence of out of gauge load on their train prior to departure and at crew changes in transit.

Out of gauge loads that are regularly carried on scheduled services (e.g., wide steel plate, multi-level car carriers, etc.) may be transported under standing instructions that prescribe the special requirements and conditions. These instructions should be published in the RIM's working timetables or similar documents.

8.2.3 Route acceptance

Before any authority is issued for an out of gauge load to travel over any route, the RIM at the origin shall consult with the other RIMs on the route to confirm that the load is acceptable for transit across the whole of the intended route.

The requirement during transit to pass and cross other trains, some of which can also be transporting out of gauge loads, should be assessed.

8.2.4 Inspection in transit

The RIM(s) should assess all aspects of the intended loading, particularly clearance with the infrastructure over the complete route and the risk of displacement during transit.

Based on those findings, the RIM should determine whether the load should:

- (a) be conveyed on a normal scheduled service;
- (b) be conveyed on a special train;
- (c) be accompanied for the full journey by a person with appropriate experience in the transit of special loads;
- (d) be inspected by train crews or local staff in transit, and
- (e) travel without inspection for the duration of transit.

8.3 Excessive axle load

8.3.1 Identification

Identification and correction of excessive axle load(s) is primarily the responsibility of the RSO. Excessive axle loads should be identified and corrected or approval obtained from the RIM prior to departure from the location at which the excess is identified. Note that the gross mass itself is not necessarily an

indication of the axle load. The incorrect positioning of a load on a vehicle can cause the axle load to exceed the permissible limits on only one bogie of a vehicle while the gross mass can be within allowable limits.

A RIM can have in-track equipment installed to detect excessive axle loads along the route. Axle loads should be initially assessed for:

- (a) mass of the load;
- (b) distribution of the load (lateral and longitudinal);
- (c) gross mass of the loaded vehicle; and

The indicated gross mass and an assessment of the spring or suspension deflection can be used to provide a preliminary indication of excessive axle load. Doubtful cases should be re-positioned where reasonably practical or placed over a weighbridge or other weighing device to provide an acceptable measurement.

8.3.2 Authorization

Authorization and/or approval for excess axle load is the sole responsibility of the RIM(s) for the route(s) over which the vehicle will travel. See Clause 8.1.4. Application for travel with excess axle load shall be made to the RIM. Approval will typically result in a reduction in the authorized track speed for that particular vehicle and the train to which it is attached and/or a restriction on the routes or line segments to be travelled.

Note that in some circumstances a small excess may be approved by a RIM under a standing instruction. The limits for any such excesses are usually listed in the RIM's train operating procedures.

8.4 Vehicle overload

8.4.1 Identification

The RSO has primary responsibility for identification of an overload vehicle, although the RIM may also have equipment or procedures in place that detect vehicle overloads. Overloads should be corrected or adjusted before departure from the originating location wherever this is possible and reasonably practical.

Vehicle overload will typically be indicated by the mass of the loading as provided by the consignor or, in the case of bulk commodities, by the volume (level) of the product on the vehicle. It may also be indicated by evaluating the deflection of the vehicle suspension.

8.4.2 Authorization

Where all other aspects of the loaded vehicle conform to the requirements of this document, the RIM may authorize transit of an overloaded vehicle.

Such authorization shall as a minimum requirement assess the:

- (a) vehicle design, construction and current condition;
- (b) type of load and its position or distribution on the vehicle.;
- (c) method of securement;
- (d) dynamic performance of the vehicle; and
- (e) track condition and permissible axle loads on the route;

A RIM that authorizes transit of an overloaded vehicle shall accept full responsibility for any consequences of that overload.

8.5 Non-approved securement

8.5.1 General

Non-approved securement is that which does not comply with the requirements of Section 3 and Section 4 above.

Consignors wishing to use non-approved securement shall provide the RSO(s) with full details of their proposal. They shall justify their selection by providing objective evidence of their successful use by others in a similar loading configuration or by demonstrating in conjunction with the RSO their acceptability using an assessment of the particular transport requirements and an evaluation of the risks involved.

8.5.2 Authorization

The RSO may authorize the use of non-approved securement devices or components where it is of the opinion that their use is acceptable.

8.6 Load shifts

8.6.1 General

Load shifts generally occur in transit and are typically caused by incorrect securement devices or procedures, poor dynamic performance of the carrying vehicle or unsuitable positioning of the load.

Load shifts result in conditions that can otherwise be classified as out of gauge, excessive axle loads or undesired load distribution.

8.6.2 Adjustments

Load shifts shall be adjusted to conform to permissible requirements as soon as they are detected, whether at a terminal, intermediated location or during transit.

Where the load is improperly secured, it shall be effectively secured before any further train movement takes place.

Where a load shift cannot be corrected at the place at which it is detected, the RSO shall contact the RIM for directions.

Where a load shift is authorized for movement to a location where adjustment is possible, the movement shall be undertaken with caution, factoring in the type of defect, the infrastructure and any other trains to be passed or crossed.

Appendix A Containers (Normative)

A.1 General

Unless where otherwise prescribed, Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

A.2 Container types

Containers transported by rail in Australia are of three basic types of construction and configuration:

- (a) ISO 1496 Standard containers and their Australian equivalent (International sizes).
- (b) Australian Standard domestic (R-series) containers AS/NZ 4615.
- (c) Australian domestic special containers.

Commentary CA.2

There are ISO 10855 type containers, known as offshore containers, that are not suitable for rail transportation as they might not meet the testing requirements for rail.

A.2.1 ISO standard containers

Standard containers manufactured to ISO 1496 and AS/NZS 3711 are constructed to be capable of being transported in a variety of modes, including multiple stacking on ships. See Appendix Clause A.3 for more detail. The container framework includes a substantial base and corner fittings at every corner.

They are essentially self-supporting when loaded, so that the base does not rest on the deck of the rail vehicle or on the lower container in double stack configuration.

ISO containers are identified by the international registration and ID codes on the sides and/or ends of the container. Dimensions for containers can be found in ISO 1496 or AS/NZ 4615.

They include the following container types:

- (a) General purpose container – General cargo containers are totally enclosed, waterproof and have rigid roof and walls. They are intended to be suitable for the transport of cargo of the greatest possible variety.
- (b) Closed vented/ventilated container – Closed vented/ventilated containers are similar to a general purpose container but were specifically designated for carriage where ventilation, either natural or mechanical (forced) is necessary.
- (c) Open top container – Open top containers are similar in all respect to a general purpose container except that it has no rigid roof but may have a flexible and movable or removable cover. They may have movable or removable top end transverse members above their door.
- (d) Thermal container – Thermal containers can be insulated (no device for cooling or heating), refrigerated (without power supply i.e. using ice/liquefied gas as mean of cooling) or mechanically heated/refrigerated with an internal (integral type) or external/removable equipment (port hole type).
- (e) Tank container – Tank containers consist of an open structural framework enclosing a cylindrical tank. They are used for the transport of liquids, gases and other bulk commodities.
- (f) Dry bulk container – Dry bulk containers are designed for the carriage of dry solids in bulk without packaging.

- (g) Flat-rack or platform base container – Flat-racks are platform-based containers with fixed or collapsible bulkheads.

Their definition and specification can be found in ISO1496 and AS/NZS 3711.

Commentary CA2.1

Platform containers as described in A.2.1 can include flatracks and transiflats.

A.2.2 Australian standard domestic (R series) containers

These containers are similar in type and construction to ISO containers, built in accordance with AS/NZS 4615. They are suitable for transport by road and rail but are restricted to use within Australia:

- (a) The container width is increased to 2.5 m to accommodate two standard Australian pallets that are 1,165 mm wide. The body of the container extends approximately 30 mm beyond the side face of each corner fitting.
- (b) Containers may be up to 14.6 m in length. For containers longer than 12.2 m, the corner fittings for securement and lifting should be positioned at the 12.2 m locations.
- (c) They have corner fittings at all four corners of the top and bottom frames and are suitable for top or bottom lifting. The corner pillars connecting the top and bottom frames, the longitudinal roof rails and the base frames are similar in size to the corresponding members of ISO containers.

A.2.3 Australian domestic special containers

These containers are not constructed to be self-supporting; the lower surface of the base frame is generally flush with the bottom of the corner fittings so that the mass of the container can be applied directly to the vehicle deck. They are typically constructed with significantly smaller structural framing than ISO or standard domestic containers and are usually marked not to be top lifted.

Commonly used types are listed below:

- (a) Transiflats are a 12.2 m or 18.3 m thin base with securing fittings at each corner, and provision for lifting by grapple arms. They are usually fitted with removable side and end gates and cross ties or bows to hold the gates in position.
- (b) Railtainers are similar to Transiflats except that they are only 6.1 m long.
- (c) Tautliner containers are platform-based containers, generally with fixed ends and roof. They are fitted with flexible curtain sides and typically do not have longitudinal roof rails.
- (d) Half and three-quarter height containers are used principally by freight forwarders for specific products. They are either 6.1 m or 12.2 m long, 2.5 m wide with a height between 1.0 m and 1.8 m. They have full sides and ends and are generally fitted with top and bottom corner fittings to allow double stacking.
- (e) Some half-height containers and some flat base containers with end bulkheads are fitted with substantial corner pillars and fittings so that they are suitable for double stacking.

A.3 Manufacturing standards

The following list of container manufacturing standards is provided for the information of freight forwarders.

The relevant ISO standard for the original construction of containers is ISO 1496.

Australian domestic containers, ISO equivalent, are constructed and tested in accordance with the requirements of AS/NZS 3711.

Domestic R-series containers are designed, constructed and tested in accordance with the requirements of AS 4615.

A.4 Certification

A.4.1 Structural certification

All containers presented for rail transport shall be certified as structurally acceptable for service.

All certification of new containers shall be undertaken by a certifying engineer, who shall be a professional engineer eligible for corporate membership of the Institution of Engineers Australia and who has relevant experience and competence.

Containers that have been damaged and repaired shall be examined and recertified or rejected by a certifying engineer or by a person who is qualified as a container inspector by the Institute of International Container Lessors (IICL).

Containers that have been structurally modified (i.e. windows, doors, etc.) should also be recertified.

A.4.2 Data plates

All containers shall be fitted with a current data plate.

ISO and domestic standard containers shall possess a current container safety convention (CSC) safety approval plate.

R-series containers shall possess a current compliance plate in accordance with the requirements of AS 4615.1.

Containers carrying dangerous liquids in bulk shall possess a current:

- (a) CSC;
- (b) Regulations concerning the International Carriage of Dangerous Goods by Rail; or
- (c) International Maritime Organization compliance plate.

A.5 Acceptance for Transport

A.5.1 Responsibility

The primary responsibility and authority for the acceptance or rejection of containers when presented for rail transport lies with the RSO.

Inspection should be limited to a visual examination of the exterior of the container (including checking the presence of a current valid compliance plate) to avoid unnecessary delay.

A more detailed inspection should be performed if the external examination indicates the presence of potentially unsafe conditions.

The principal purpose of the inspection is to determine if the container is in a safe condition and suitable for rail transport without an obvious risk of damage to the container, its loading, the rail vehicle, infrastructure, environment or injury to staff or the public.

A.5.2 Physical condition

All containers presented for rail transport should be in good structural and mechanical condition, with all attachments, fittings and auxiliary equipment in good working order. RSOs reserve the right to refuse the loading and transport of any container that is assessed to be unsafe or unsuitable to be carried.

The following faults are grounds for the rejection of containers:

- (a) Fractures, distortion or corrosion of any part of the structural load-bearing frame that can affect the integrity of the container and its ability to withstand the loads experienced in transit.
- (b) Damage to load restraining or protection components (e.g., walls, floor, roof, etc.) which can result in damage to, or displacement of, the loading.
- (c) Distortion of the frame resulting in overall dimensions and configuration not in compliance with the tolerances prescribed by the construction standards.
- (d) Damage or misalignment of doors, hinges, seals, closing and securing mechanisms, surrounds, etc. which can reduce security or retention of the load (including susceptibility to water damage).
- (e) Improperly constructed or secured side walls or panels on platform containers (including loose or damaged tarpaulins and other coverings).
- (f) Mechanical or electrical faults on refrigerated containers, leaking fuel tanks or pipework, damaged or missing components including electrical equipment covers, connection cables, etc.
- (g) Spilt or leaking product, leaking valves or venting on tank containers, missing or incorrect emergency information panels.
- (h) Out-of-date compliance plate.
- (i) Any other readily identified faults or irregularities that can reduce the ability of the container to safely reach its destination and retain and protect its contents.

A standard fault checklist should be used for inspection and fault recording. The form should be used as an inspection guide and completed only if the visual inspection reveals faults that result in the container being rejected. The completed form should be retained at the terminal and the consignor advised of the reasons for the rejection. A format for a typical fault recording form is given in Appendix Figure A-1.

Container ID: _____

<u>Frame Rails</u>	Top	Bottom	Sides	Ends
<input type="checkbox"/> Cracked or broken welds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Bent or distorted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Fractured	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Severe corrosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<u>Body Panels (including roof)</u>	Top	Bottom	Sides	Ends
<input type="checkbox"/> Loose or missing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Punctured or torn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Severe corrosion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Fork and Grappler Pockets

Badly corroded

Cracked or broken welds

Severe distortion

Punctured or torn

Dangerous Goods

Leaking product

Missing labels

Incorrect labels

Incorrect loading

Faulty valves / pipes

Doors

Not secured

Inoperable mechanism

Faulty seals / fittings

Refrigerated Units

Fuel leaks

Faulty operation

Missing / damaged fittings

General

Misalignment of fittings / frame

Load adjustment required

Inadequate load securement

Other (give details)

CONTAINER FAULT ADVICE

Date: _____ Time: _____ Terminal: _____

Container No: _____ Consignor: _____ Consignee: _____

Contents: _____

Faults recorded as above by: _____

Consignor advised at: _____ on: _____ by: _____

Consignor contact: _____

Appendix Figure A-1 Sample fault form

A.5.3 Doors and latching mechanisms

For side doors with one locking mechanism per door:

- (a) the locking cams should be engaged top and bottom;
- (b) the locking handle should be secured by a safety latch in the fully closed position; and
- (c) all safety latches should be secured using high security seals in accordance with ISO 17712:2013.

For side doors with two locking mechanisms per door:

- (d) the locking bar closest to the opening edge of the end door should have both the top and bottom cams engaged, for each end-door panel;
- (e) the locking handle should be secured by a safety latch in the fully closed position; and
- (f) at least one safety latch per door, nearest the edge that opens, should be secured in the fully closed position with high security seals in accordance with ISO 17712:2013, any defective mechanisms should be wired in the closed position.

For end doors, with one or two mechanisms per door:

- (g) at least one mechanism per door should have the locking cams engaged top and bottom;
- (h) the locking handle should be secured by a safety latch in the fully closed position;
- (i) at least one safety latch of the locking bar with cams, which are engaged at the top and bottom, per door should be secured with a wire seal, soft wire or cable tie, container seals, padlocks, etc. to maintain its position in transit;
- (j) the seal shall be placed on the locking mechanism that is nearest the edge that opens;
- (k) where doors overlap, the overlapping door should have at least one safety latch secured using either a wire seal, soft wire or a cable tie;
- (l) where end doors do not overlap, each door should have at least one safety latch secured using either a wire seal, soft wire or a cable tie;
- (m) any defective mechanisms should be wired in the closed position; and
- (n) if the standard end door cannot be secured by at least one fully operational end door locking mechanism, the door should be secured by other means against opening during transit that is approved by the RSO.

Container side-doors should have all hinges operational and non-defective.

Defective door hinges on container end doors are permitted to travel subject to the following limitations and conditions:

- (o) For empty containers, not more than two defective hinges per door on doors with four or more hinges or not more than one defective hinge per door if there are three or fewer hinges per door.
- (p) For loaded containers, not more than one defective hinge per door on doors with four or more hinges or no defective hinges if there are three or fewer hinges per door.

- (q) All containers with defective hinges should be marked or labelled for repair.

Wherever possible, containers with defective end doors, hinges or locking mechanisms should be placed on the rail vehicle with the doors immediately adjacent to another container to limit the risk of doors opening in transit.

Containers with defective end-doors and side doors should be loaded in well or open wagons if these are available.

A.6 Loading in or on Containers

A.6.1 Responsibility

The correct securing and distribution of loading inside a container is the responsibility of the person loading the container.

Dangerous goods shall be carried only in ISO or Australian standard containers. They should not be loaded into domestic special containers.

A.6.2 Load distribution and positioning

Loading should be positioned so that as far as is possible the load mass is evenly distributed transversely (from side to side) and longitudinally (from end to end). Where a load does not occupy the whole floor area of the container, it should be positioned centrally.

Tank containers, refrigerated containers and containers carrying dangerous goods require access in the event of faults occurring in transit. Accordingly, they shall not be loaded as the bottom tier in well wagons or loaded into open wagons.

Loading refrigerated containers into well wagons is only permitted with authorisation by the RSO. Further guidance can be found in CTU Code (2014).

A.6.3 Load securement

All freight in containers shall be secured against movement during transit.

Where the loading does not occupy the whole floor area of the container, the loading should be restrained by suitable devices. All load restraint devices should be attached to anchor points of a suitable size and type.

All restraint devices should be attached to securing points with adequate strength and in good condition. Where applicable, loading should also be chocked to prevent movement.

A.7 Securing containers to rail vehicles

A.7.1 General requirements

Every container carrying dangerous goods and loaded on a flat vehicle shall have all four securing devices fully engaged and secured before departure from the originating terminal. Other containers carrying general (non-dangerous) goods and loaded on a flat vehicle shall have at least three securing devices fully engaged and secured before departure.

In double stack loading, the top containers shall be secured by using approved devices.

Where a securing device is found to be defective or missing prior to departure or in transit, the loaded vehicle shall be permitted to continue to its destination provided that:

- (a) a steel chain (minimum link diameter 8 mm) is used in lieu of the defective fitting to provide vertical and horizontal restraint;

- (b) the chain is fitted through the bottom container corner fitting and firmly secured to the vehicle structure; and
- (c) the chain and fittings comply with the requirements of Clause 4.8.1.

Only one defective device is permitted per container, and the rail vehicle is to be marked to be repaired.

Double stacked containers shall have all securing devices without any defect when securing top and bottom containers.

Containers in well wagons should be correctly seated on the retaining pins or spigots.

A combination of manual securing devices and automatic / semi-automatic securing devices should not be used to secure a single container to the vehicle. When loading or unloading containers with automatic twistlocks, the vehicle shall be checked after loading/unloading to ensure that it has not derailed or that the centre plate has been displaced or disengaged.

A.7.2 Removable corner brackets

Removable corner brackets should be securely positioned on the vehicle structure in the correct location before loading containers onto the vehicle.

Where applicable, the locking pins should be fully engaged and secured. Brackets should not be removed from the vehicle.

A.7.3 Retractable twistlocks – pivoted type

Pivoted type retractable twistlocks rotate about a fixed horizontal pin.

The twistlocks shall be raised above the deck in the required locations with the support pins fully engaged and locked in position.

Unused twistlocks shall remain retracted below deck level.

Rotating spigots shall be in the unlocked position before loading containers.

After loading, the spigots shall be moved to the locked position and secured in place.

A.7.4 Retractable twistlocks – vertical type

Vertical type retractable twistlocks slide vertically in a support for application and retraction. The support is permanently fixed to the vehicle structure in the appropriate locations.

Unused twistlocks shall remain retracted below deck level.

Spigots shall be raised before loading containers. It is important to ensure that the locking mechanisms are engaged.

Rotating spigots shall be in the unlocked position before loading containers.

After loading, the spigots are to be moved to the locked position and secured in place.

A.7.5 Removable twistlocks – manually operated

These removable or portable twistlocks fit into cut-outs in the vehicle deck or supports. They are also used to connect the upper and lower containers in double stack configuration; in this application they are generally known as IBCs (inter box connectors).

They should be placed in the required positions for the size of container to be loaded and locked in position by rotating the body.

Rotating spigots shall be in the unlocked position before loading containers.

After loading, the spigots shall be moved to the locked position by turning the handle. The spigot shall be checked to ensure that it is firmly locked.

A.7.6 Removable twistlocks – automatic

Automatic removable twistlocks are similar in application and use to the manually operated type. Their design allows the rotating spigots to be operated by the forces applied by the container corner casting during loading and unloading operations.

During loading the mass of the container rotates the spigot that allows the container to be seated on the support surface. The spigot returns automatically to the locked position when the container is correctly seated.

During unloading the force exerted by the lifting equipment rotates the spigot to release the container. The spigot returns automatically to the locked position when the container is removed.

Care shall be taken to lift or lower the container vertically (square with the vehicle deck) for correct operation of the twistlocks.

A.8 Double stacking of containers

A.8.1 General requirements

Unless authorized otherwise by the RSO, only ISO1496 / AS 3711 and R series compliant containers should be loaded as the top unit in double stack configuration.

The base of containers that are not self-supporting will deflect below the support faces and make contact with the bottom container, imposing unacceptable forces on the bottom container. Containers that require support in addition to the four corner points shall not be loaded on top.

Containers used as the bottom unit in double stack configuration shall be approved for use in that position. ISO and R series containers are suitable for that purpose.

Double stacked containers shall not exceed the permissible loading outline for the route(s) to be traversed unless where permitted by the RIM.

Containers shall be in good condition, with no indication of product leakage.

For stability, the loading inside the container should be distributed evenly across the width such that the difference in container mass from side to side does not exceed 0.5 t.

The heaviest of the container(s) should be loaded as the bottom unit.

Stacking of containers carrying dangerous goods shall comply with the requirements of the ADG.

Tank containers and containers carrying dangerous goods should not be loaded:

- (a) as the bottom unit in well wagons;
- (b) into open wagons of any type; or
- (c) as the top unit in double stack configuration on flat wagons.

See Appendix Clause A.10 for more detailed requirements for containers carrying dangerous goods.

Where practical and convenient, containers with dangerous goods should be loaded so that the doors are easily accessible if entry is required during transit.

A.8.2 Standard ISO and R series containers

Containers built to ISO 1496 standards, AS 3711 and AS 4615 with valid data plates are suitable for transport as either the top or bottom unit in double stack configuration.

As top units the above containers can be loaded across all configurations of approved bottom units (see Appendix Clause A.8.1 (c)).

A.8.3 Domestic specials or non-standard containers

Containers not constructed to ISO or Australian standards should not be used as bottom units in double stack configuration. They are typically not self-supporting, and the majority are therefore also not suitable as top units in double stack configuration except under the following conditions:

- (a) 12.2 m containers that are not self-supporting shall only be loaded on top of other 12.2 m containers that are fitted with substantial vertical posts at the 6.1 m positions, and that are capable of supporting the top unit when it deflects.
- (b) 12.2 m containers may also be loaded on top of two 6.1 m containers that are approved as bottom units for double stacking.
- (c) 6.1 m containers may be loaded on top of any container that is approved as a bottom unit for double stacking.
- (d) Platform type containers commonly referred to as Transiflats, Railtainers and Tautliners are not self-supporting and should only be loaded directly onto a flat wagon deck. Vehicles used to carry these types of containers shall have adequate underframe capacity to accommodate that type of loading. Some skeletal type vehicles are designed to suit point loads only and might not be suitable for these container types.

A.8.4 Securing of the bottom container

Bottom containers on flat wagons shall have all four twistlocks correctly engaged and locked.

Bottom containers in well wagons shall be correctly located on all four fixed spigots or in the corner brackets, as applicable.

A.8.5 Securing of the top container

Portable (removable) type twistlocks shall be used as inter box connectors (IBCs) to secure the top container to the bottom unit.

The twistlocks shall be the manually operated type. Automatic twistlocks shall not be used as IBCs.

All four twistlocks shall be locked into the bottom container before loading the top unit.

A.9 Loading containers in open and well wagons

A.9.1 General

Only containers that are suitable for top lifting shall be loaded in open or well wagons.

Tank containers and those carrying dangerous goods should not be loaded into open wagons or well wagons.

A.9.2 Open wagons

Containers loaded in open wagons can move in transit: lateral movement can allow the container to infringe the loading outline or mass distribution limits. Accordingly physical restraints should be placed between the container and the vehicle side walls to restrict lateral displacement to acceptable levels. Open wagons that are used principally or regularly for the transport of containers should be equipped with permanent guides or locating devices.

Containers may be placed on tyres or similar packing to increase the frictional resistance. Note that this increases the overall height of the loaded vehicle and can infringe the permissible loading outline.

Open wagons that have openings in the side walls or have had the doors removed should be loaded so that all container positions are occupied.

A.10 Containers with dangerous goods

Containers that are carrying dangerous goods in quantities that are placardable (i.e. they require marking in accordance with the ADG) shall be stacked and marshalled in accordance with the ADG and the following requirements.

A.10.1 Open wagons and well wagons

To allow for ready access if needed in transit, dangerous goods should not be loaded in open wagons or as the bottom unit in well wagons.

If dangerous goods containers are loaded in open or well wagons, then the dangerous goods placard and emergency information panels shall be visible from both sides of the vehicle as required by the ADG. This can require additional labelling on the containers and/or rail vehicle.

A.10.2 Dangerous goods not to be double stacked

Containers carrying any of the goods listed below shall not be double stacked:

- (a) Liquid or gaseous dangerous goods in portable tanks or multiple element gas containers.
- (b) Explosives and dangerous goods of class 1.
- (c) Freight containers known to contain food or food packaging with freight or bulk containers or portable tanks placarded with label model Nos. 2.3, 6.1, 6.2, 7 (A–E), 8 or 10 (mixed class).
- (d) Dangerous goods in open or curtain-sided containers.

A.10.3 Permissible double stack containers

Other than the products and container prohibited above, the following containers may be double stacked:

- (a) Products with a dangerous goods Class of 3, 6 and 9 (see ADG), either mixed or in separate containers.
- (b) Freight containers loaded with the dangerous product or substance of the same United Nations number.
- (c) Freight containers carrying dangerous goods and freight containers carrying non-dangerous goods.
- (d) Freight containers that contain less than a placard load of dangerous goods.

A.10.4 Separation

Freight and tank containers carrying dangerous goods shall be separated and marshalled into the train consist in accordance with the requirements of the ADG.

Appendix B Steel (Normative)

B.1 General requirements

Loading and securement of all types of steel products should comply with Section 1, Section 3, Section 4 and Section 8 of this document.

Unless where otherwise prescribed, Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

Attention should be given to the condition of securement equipment, load distribution and position on the carrying vehicle.

Operators should select the rail vehicles that are most suitable to the type of consignment and the dimensions of the loading. Short plates should be transported in open wagons.

Loading and supports should be positioned so that the risk of the load moving and falling off the support is minimized. Generally, the load should overhang the supports by not less than 200 mm.

B.2 Structural sections

B.2.1 Unitizing

Loads should be unitized into bundles weighing no more than the maximum capacity of loading/unloading equipment. One bundle weight which has been used on the Australian rail network is 5 t, though other bundle weights may be used. Bundles should be secured with the appropriate number of steel (or equivalent) straps (e.g., in the case of 5 tonne bundles, not less than three) at each end of the bundle so that all items in the bundle are effectively secured.

Any strapping that is found to be broken or loose should be removed and replaced before the load is permitted to continue in transit.

B.2.2 Transport vehicles

Vehicles should be selected to suit the type, width and the length of the sections to be transported.

Vehicles with end bulkheads and partial sides or fixed stanchions are preferred to avoid the requirement for other restraint devices such as straps or chains.

B.2.3 Loading

If loads are more than one tier high, the longest loads should be placed on the bottom to provide optimum weight distribution over the length of the vehicle. See Appendix Figure B-1.

Wherever possible short lengths should be loaded over the bogies at each end of the vehicle, distributing the loads as equally as possible. See Appendix Figure B-2.

Short loads less than 6 m in length should be loaded between longer lengths to prevent the short lengths from rotating during transit and protruding over the edge of the vehicle or through the openings in the sides.

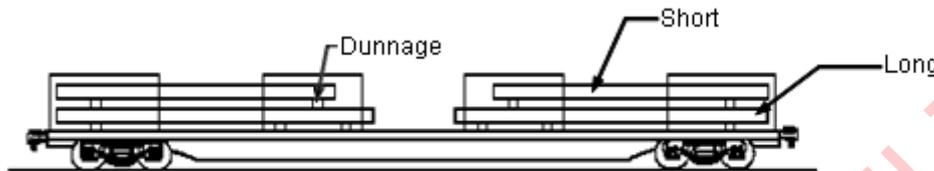
Loads should be positioned across the vehicle and evenly distributed about the longitudinal centre line so that at least 75% (3/4) of the vehicle width is covered by the load. See Appendix Figure B-3.

Unitized bundles with section heights less than 150 mm as loaded should not protrude above the top of the vehicle sides or ends.

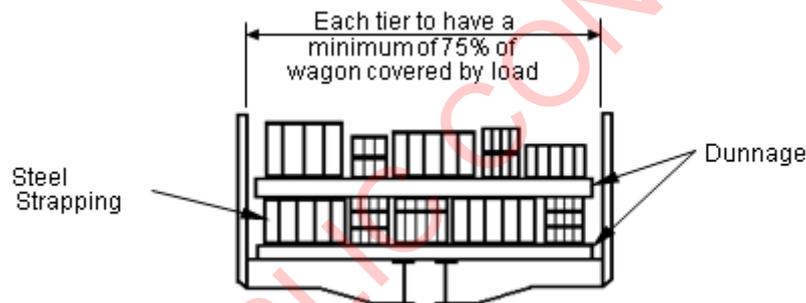
Unitized bundles with section heights greater than 150 mm as loaded may protrude above the top of the vehicle sides and ends by not more than 1/3 of the total section depth.



Appendix Figure B-1 Long and short loads



Appendix Figure B-2 Positioning short loads



Appendix Figure B-3 Width coverage

B.2.4 Dunnage

Dunnage should be of hardwood timber, at least 100 mm square in cross-section.

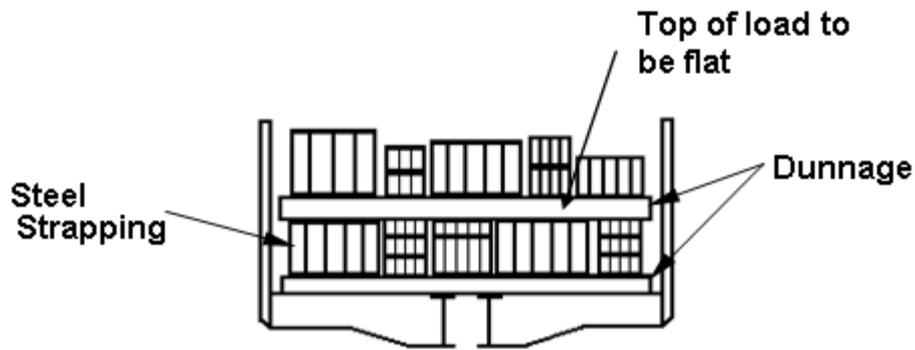
For ease of loading and unloading, dunnage should be placed between the vehicle floor and the load, and between each tier of loading. Dunnage should not be double-stacked i.e. the required thickness should be provided by a single piece of dunnage.

Underlying tiers of the load should have a level top surface to provide a firm, even base for supporting the dunnage and to provide load stability. See Appendix Figure B-4.

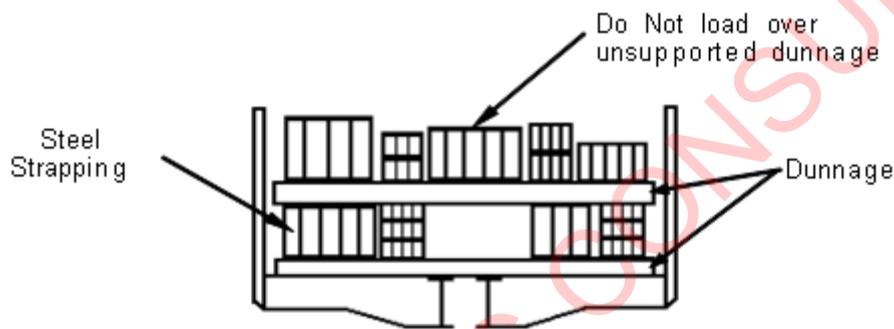
Dunnage should be placed to prevent excessive deflection (sagging) of the load between supports. It should have sufficient area in contact with the load above it that will prevent it from moving in transit.

At least 75% of any bundle should be resting on dunnage that is fully supported from below. See Appendix Figure B-5. Where there is more than one tier, dunnage in upper tiers should be in line with the dunnage below.

When used in vehicles that have non-continuous sides, such as open wagons with the doors or parts of the walls removed, dunnage should not be positioned at door openings or where there are no side panels.



Appendix Figure B-4 Level base for dunnage



Appendix Figure B-5 Incorrect dunnage support

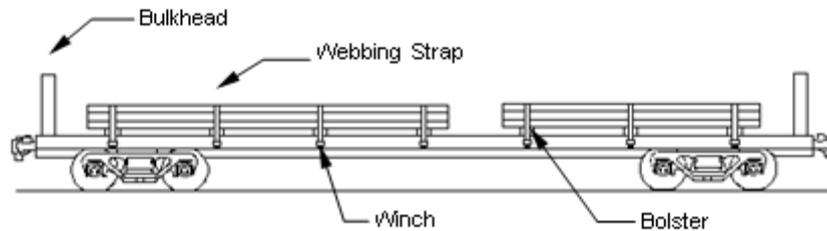
B.3 Steel plate – In gauge

B.3.1 In gauge plate

Plate up to 2,800 mm wide is classified as in gauge plate. Plate exceeding 2,800 mm in width is classified as out of gauge and is conveyed under special conditions.

Plate should be transported on flat cars fitted with end bulkheads, fixed bolsters (load supports) and adequate securement devices. Securement devices should be located within 200 mm of the support bolsters, see Appendix Figure B-6.

Where end bulkheads are not fitted, the ends of the plates should be cross-chained to prevent longitudinal movement.



Appendix Figure B-6 Typical vehicle for steel plate

B.3.2 Vehicle preparation

Before loading, vehicles should be checked to ensure all necessary equipment is present and in good order. This can include:

- (a) Webbing straps should be free from the tensioners before loading.
- (b) Chains, if fitted, should be unfastened before loading.
- (c) Webbing, ratchets, winches, chains and all other fittings should be removed clear of the deck before loading so that they are not trapped by, or do not obstruct, the load and are readily accessible to loading staff.
- (d) Fixed bolsters should be in good condition and securely fastened.
- (e) The vehicle deck should be clear of all debris and loose dunnage.

B.3.3 Dunnage and bolsters

Loose dunnage may be placed between layers to facilitate the loading and unloading of plate by forklift or slings with approval by the RIM.

Dunnage, if not of square section, should be placed with the shortest side vertical for stability, and to prevent the restraint devices from becoming loose.

Dunnage placed between plates should only be positioned directly above the bolsters.

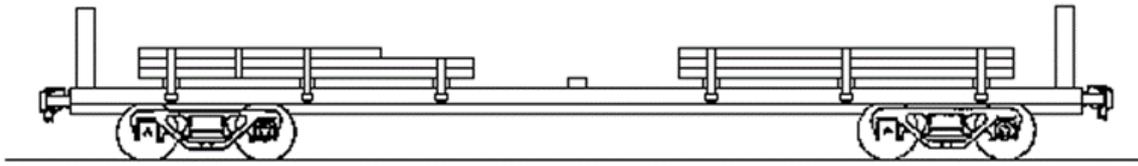
Dunnage should be fitted as a single thickness. Where two thicknesses are required (double stacked) all pieces should be securely fastened together.

Loose dunnage placed directly on top of the bolsters should be secured to the bolsters to prevent movement and/or dislodgment during transit.

Bolsters used to support loading should incorporate a single thickness of timber packing, with a minimum height of 200 mm above the vehicle deck to provide clearance for restraint and tensioning devices.

Where multiple thicknesses of timber are used to provide the required height, they should be securely fastened together and to the bolster structure.

Bolsters should be positioned over or close to the bogies, and at other locations so as not to produce excessive stress in the vehicle structure, see Appendix Figure B-7.



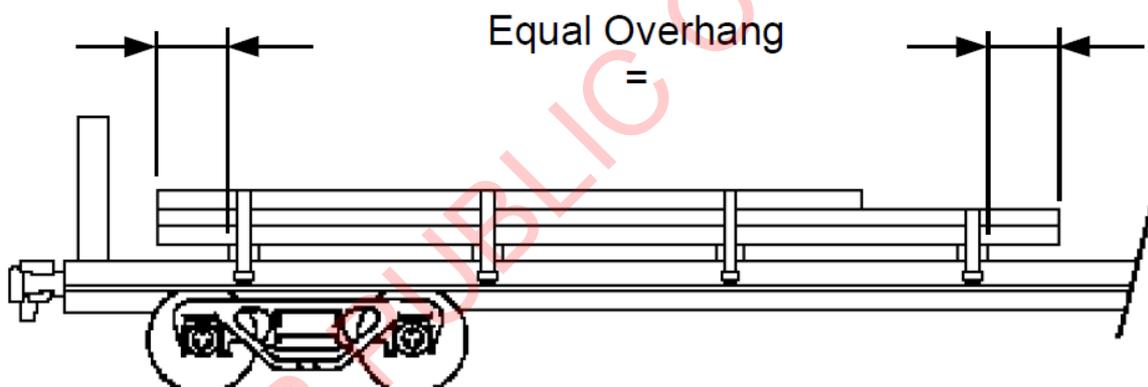
Appendix Figure B-7 Typical plate location

B.3.4 Loading of plates

Steel plate should be loaded on timber bolsters, well supported to reduce deflection, and as far as is practicable with an equal amount overhanging the bolsters at each end, see Appendix Figure B-8. Steel plates should not overhang the ends of the vehicle.

Webbing straps with tensioning devices are the preferred method of securing steel plate. Chains should only be used where webbing straps are not available, or for emergency replacements en route.

Plates should be loaded so that they are parallel to the deck. Where interleaving is unavoidable, top plates that are not parallel to the deck should be secured with not more than 1 m of plate extending beyond the outermost restraints. This can require the use of intermediate straps (known as belly straps) to protect the plate ends from flutter in transit.



Appendix Figure B-8 Typical plate loading

Plates of different widths if loaded in one stack should be loaded with a wide plate on top so that the restraints can apply the maximum securement force. The width of narrow plates in the lower tiers should be at least half that of the top plate(s). See Appendix Figure B-9. Thin plate that can bend when the restraints are tensioned correctly should not be used in this loading pattern. See Appendix Figure B-10.

Where it is not possible to avoid having a narrow plate on top, the angle between the restraints and the horizontal plane should not be less than 60°.

All plates should be secured by not less than three restraint units, with no more than 1.5 m of plate left free.

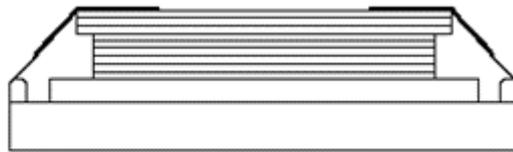
Short plates that, because of their length, cannot be easily secured by three restraints should be loaded on top of longer plates and a belly strap used to secure the short plates to the longer plates. See Appendix Figure B-11

If there is more than 1.5 m, at the centre of any vehicle, between the ends of two stacks of plate, those ends should be cross-chained to prevent longitudinal movement in transit.

All securing units should be fitted with synthetic sleeves specially manufactured for protection of the restraints and the load. The sleeves should cover all sharp corners and edges of the plates and protect the webbing or other restraints from abrasion, cuts and other damage.

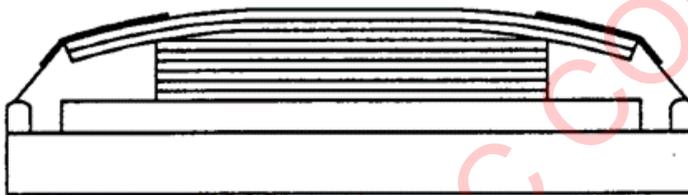
The use of other soft or flexible materials (such as hessian, canvas, carpet) for protection is unacceptable.

All plates should be correctly located and secured, and all securement devices should be correctly tensioned before transit commences.

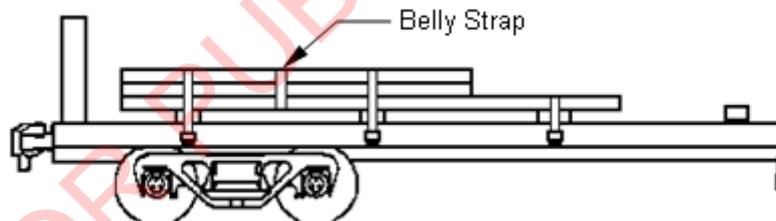


Narrow plate to be clamped under wider plate

Appendix Figure B-9 Plate of different width



Appendix Figure B-10 Thin top plate



Appendix Figure B-11 Short plates

B.3.5 Securing equipment

Webbing straps, used in conjunction with ratchet tensioners or winches, are the preferred system for the securement of steel plates on flat cars. They are usually fitted to all vehicles dedicated to the transport of steel plate.

Straps should be fitted with at least two protective sleeves to protect the webbing when passing over sharp edges or corners. Additional sleeves should be added whenever necessary to provide adequate protection.

Chains with load binders or turnbuckles and appropriate end attachments are also used to secure plates.

Section 5 specifies requirements for securement devices.

B.3.6 Use and care of equipment

Clause 4.8 specifies general requirements for the use and care of securing devices and equipment.

Webbing straps:

- (a) should be attached to the vehicle so that they are square across the vehicle, i.e. the end fittings are directly opposite each other;
- (b) should be positioned so that they and their attachments are not twisted, are aligned straight and have an unobstructed line of pull when tensioned; and
- (c) should be visually inspected before loading for cuts and abrasions. If damage extends across more than 10% of the strap width (i.e., 7.5 mm for a 75 mm strap) the strap should be condemned and replaced.

Sleeves should also be inspected for deep cuts or side splits. If one side of the sleeve is damaged it should be turned over so that the other side can be placed against the load to protect the strap.

Protective sleeves should be positioned so that they cover all edges and sharp corners;

Chains should be:

- (d) attached securely to the vehicle using shackles, hooks or equivalent fittings (hammerlocks, etc.). Attachment points should be directly opposite each other, except for those chains used for longitudinal restraint;
- (e) in good condition and applied so that they are not twisted. Loading staff should take particular care that chains are correctly tensioned, and that links are not caught on the loading, leading to loss of tension in transit; and

Securement equipment not in use should be stored in recesses on the vehicle where such facilities are provided, or else adequately secured against becoming loose, detached, dragging or falling off the vehicle.

B.4 Steel plate –wide, out of gauge

B.4.1 Wide out of gauge plate

Any plate with a width greater than 2,800 mm but not exceeding 3,400 mm is classified as an out of gauge load and is subject to special transport conditions. Plates with a width within that range are separated into Category A and Category B according to their width:

- (a) Category A plate has a width greater than 2,800 mm but not more than 3,200 mm. This plate should be loaded so that the underside of the lowest plate is not less than 1,370 mm above rail level.
- (b) Category B plate has a width greater than 3,200 mm but not more than the maximum permissible width of 3,400 mm. This plate should be loaded so that the underside of the lowest plate is not less than 1,450 mm above rail level.

B.4.2 Transport vehicles

Wide steel plate can be carried:

- (a) in the horizontal position on flat cars without side stanchions and equipped with appropriate restraint devices,
- (b) in an inclined position on vehicles fitted with an inclined framework (slope-deck vehicle) and appropriate restraint devices,

- (c) in an inclined position on vehicles with a pivoted framework (tilt-bed vehicle) that permits plate to be loaded in the horizontal position and rotated to reduce the effective width.

Bolsters used on flat cars for wide plate should be permanently fixed to the vehicle floor. The top of the bolster should be not less than 1,370 mm above rail level, with the vehicle fully loaded and with wheels worn to the condemning limit of rim thickness. It can be necessary to fit additional packing or fixed dunnage to compensate for wheel and component wear in service.

The length of bolsters across the vehicle should be not less than 80% of the vehicle's deck width.

End bolsters should be located not more than 600 mm from the end-sill of the vehicle. Longitudinal spacing between adjacent bolsters should not exceed 2,000 mm.

B.4.3 Loading of wide plates

The loading of wide plate on flat cars should follow the same procedures and requirements prescribed for in gauge plate in Appendix Clause B.3.

When loading plate on flat cars without end bulkheads, the ends of the plates should be cross- chained to provide the required longitudinal restraint.

Wide plate loaded on flat cars should be positioned so that there is equal overhang on each side of the vehicle.

Wide plate loaded on slope-deck or tilt-bed vehicles should be positioned to provide the most evenly distributed loading on the vehicle and secured with the restraining equipment provided.

B.5 Billets, ingots & slabs

B.5.1 Loading of billets

Billets should be loaded onto vehicles that have been specially modified or constructed for that purpose. They should be loaded in layers up to the maximum allowable carrying capacity of the vehicle.

Loading should not exceed the maximum mass permitted for the carrying vehicle for the particular corridor over which the vehicle will travel. Billets are solid material with the potential to roll. Where billets do not extend across the full width of the vehicle floor, they should be centrally located about the longitudinal centre line of the vehicle.

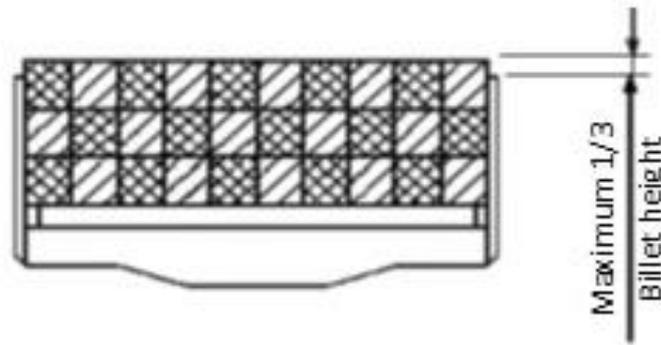
Billets should not protrude above the top of the side walls or stanchions by more than 1/3 of the height of the billet, Appendix Figure B-12 tolerances provide a real potential for overloading.

Billets should be distributed over the length of the vehicle so that the bogies are evenly loaded. Load concentrations in the centre of the vehicle should be avoided.

Each layer should occupy at least 75% of the width of the vehicle floor to reduce the potential for the billets to rotate in transit.

Where billets do not extend across the full width of the vehicle floor, they should be centrally located about the longitudinal centre line of the vehicle.

Billets should not protrude above the top of the side walls or stanchions by more than 1/3 of the height of the billet, Appendix Figure B-12.



Appendix Figure B-12 Loading of billets

B.5.2 Loading of ingots and slabs

Ingots and slabs may be carried on any of the following:

- (a) Flat cars fitted with side stanchions and end stanchions or bulkheads.
- (b) Open wagons.
- (c) Modified open wagons with the doors removed and, in some cases, some side panels removed.
- (d) Special purpose vehicles designed specifically for the transport of ingots and slabs.
- (e) Any other vehicle that provides effective restraint for the loading and easy access for loading and unloading.

The longest slabs or ingots should be placed on the bottom to assist with even load distribution on the bogies.

Loading should be placed centrally about the longitudinal centre line of the vehicle.

Bolsters may be fitted under the load to assist with load distribution but are not required on those vehicles designed and built specifically for slab transport. Where fitted they should be in good condition providing a firm level support for the loading.

Dunnage should not be used between layers of slabs or ingots.

Vehicles with timber floors should be fitted with bolsters or dunnage to distribute the load evenly across the timber floor.

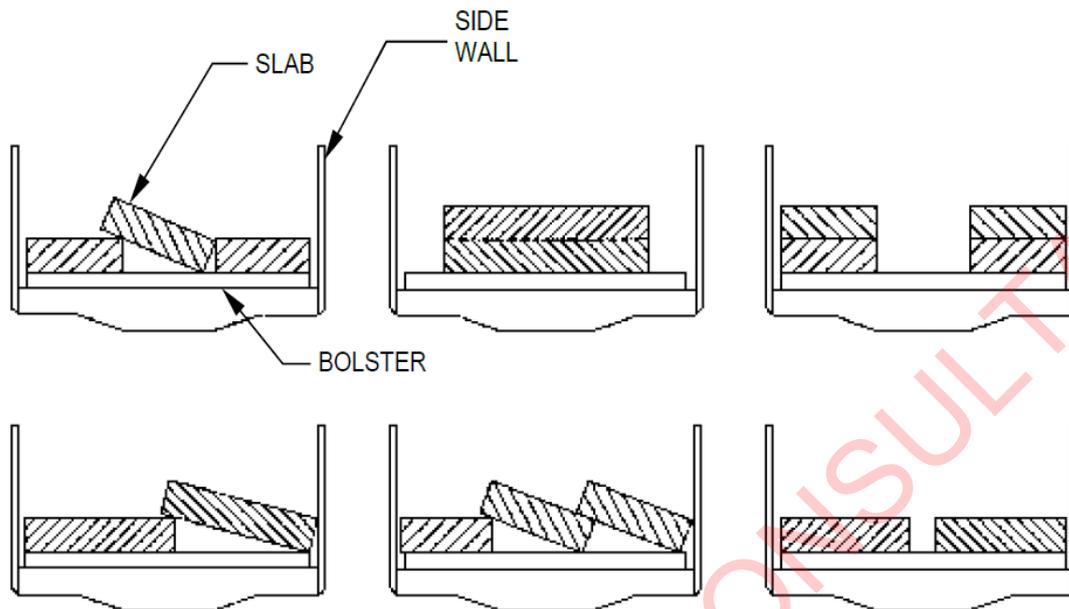
Where adequate side and end structures are not provided, additional restraint in the form of straps or chains will be required. Where such structures are provided, additional restraint should not be necessary.

Particular attention should be given to the stacking and position of narrow or short slabs. These have the potential to rotate in transit and possibly protrude through the openings in the vehicle sides or between the stanchions.

Stanchion spacing, where used, shall be set to retain the slabs within the boundaries of the vehicle.

Slabs that are curved longitudinally shall not be loaded with the curve concave, i.e. with the ends higher than the centre. When loaded in that manner they are supported in the centre, causing load concentrations and possible damage to the vehicle structure, and can rotate in transit resulting in a potentially hazardous out of gauge situation.

Slabs and ingots should be loaded alongside each other where their width permits. If not, they should be loaded in one of the configurations shown in Appendix Figure B-13.



Appendix Figure B-13 Typical loading of slab

B.6 Merchant bar

Merchant bar should only be loaded in open wagons with end walls, side walls and side doors that are in good condition and fully operational. These vehicles with full side and end walls provide adequate securement for the large range of bars without the need for additional load restraints.

Merchant bar should not be loaded on flat cars or in open wagons with walls or ends in poor condition (particularly corrosion damage) or without doors.

Bars should be unitized into easily handled bundles. The load should be distributed as evenly as is possible over the length of the vehicle so that each bogie is equally loaded. The load should also be distributed centrally about the longitudinal centre line of the vehicle.

The longest bundles should be placed on the bottom of the load.

Short bundles should be loaded at the ends and distributed so that the total load is distributed as evenly as is possible to each bogie.

No portion of the load is to extend beyond the top of the side or end walls.

Total loading should not exceed the maximum permitted carrying capacity of the vehicle.

B.7 Coiled sheet and plate

B.7.1 Coiled plate

Coiled plate is steel sheet or plate that is rolled into cylindrical coils for transport. The centre of the coil (the eye) is hollow.

Coils are generally described as small coils, mass less than 16.5 t, or large (jumbo) coils, mass exceeding 16 t. Coils whose mass lies between these limits may be treated in either category.

Coils may be transported on special purpose vehicles:

- (a) with the eye horizontal and its axis laterally across the vehicle (transverse loading);
- (b) with the eye horizontal and its axis longitudinally along the vehicle (fore and aft loading), and
- (c) with the eye vertical (top-hat).

Coils may also be transported in containers designed specifically for transport of coils on pallets.

All coils should be loaded and transported strictly in accordance with the procedures prescribed by the operator and those in this Manual for each type of cradle and vehicle.

B.7.2 Transverse loading of coils (eye horizontal) on coil wagons

Coils are large, heavy objects that have the potential to create a severe hazard during transit if they should unravel and extend beyond the vehicle outline and being circular they could roll and thus travel long distances if they should become separated from the carrying vehicle.

Coil steel should be carried, wherever possible, on specially equipped vehicles fitted with cradles designed to accommodate coils of various widths and diameters. Cradles are lined with rubber or timber to minimize the risk of coil movement during transit.

All coils should have a minimum of two unitizing straps fitted circumferentially.

In addition, large (jumbo) coils should have not less than 2 radial (transverse or across the width) straps to unitize coils with a material thickness less than 2 mm. Radial straps shall be positioned near the tail (end) of the coil.

Unitizing straps should be equivalent or superior to 31 mm black steel straps (see Clause 4.8.4).

Coils should not be loaded in more than one layer or tier. Coil diameter should be 1,400 mm max. for small coils and 2,100 mm max. for large coils.

A core or eye strap that passes through the core should be fitted to coils with a material thickness less than 2.6 mm or those in which the eye appears to be loose.

Telescoping of coils (the lateral movement of the inner portions of the coil) should not exceed the maximum permissible amount of 150 mm. For large (jumbo) coils, this limit may be increased to 250 mm if at least three radial straps are fitted.

All coil cradles should be fitted with lateral restraints that restrict telescoping and prevent the coils from moving laterally and falling off the vehicles in transit. Lateral restraints should not obstruct access to the eye of the coil for loading and unloading purposes. This restraint could be provided by using webbing straps or chains passing through the eye of the coil and fastened to each side of the vehicle.

Coil protectors such as rubber or synthetic strips or mats should be fitted between the coil and the securing devices to prevent damage to the coil.

Coils should be positioned on the vehicle so that:

- (a) the tail (outer end) of the coil is at the bottom of the cradle to restrict the movement if the unitizing straps fail in transit;
- (b) the centre of mass of the load is on the longitudinal centre line of the vehicle; and
- (c) the load is distributed evenly along the length of the vehicle so that the bogies are evenly loaded.

When protection from the weather is required, coils should be covered by tarpaulins. Tarpaulins shall be tightly and adequately secured to prevent them becoming loose in transit.

B.7.3 Transverse loading of coils on flat wagons

When coils are loaded onto flat cars that are not fitted with special coil cradles, they should be secured in the longitudinal (fore and aft) direction, using webbing straps and tensioners, or chains with turn-buckles.

Coils on flat cars should be chocked on either side to prevent lateral movement, using timber chocks fixed securely to the vehicle floor.

All other requirements of Appendix Clause B.7.2 (coil wagons) should be applied to loading on flat wagons.

B.7.4 Slitted jumbo coils

Slitted jumbo coils (narrow coils or multiple units) should only be transported on vehicles fitted with cradles and restraining bars that limit lateral movement of the coils in transit. The restraining bars should be positioned as close to the coil as is possible.

Coils should be unitized using not less than eight (8) radial or transverse straps equally spaced around the coil. Each multiple unit should be bound with at least one circumferential strap.

Where more than eight multiple units are unitized as a single coil, additional securement should be provided by two webbing straps passing through the eye of the coil and fastened to the support cradle.

Unitizing straps should have properties equivalent to or superior to 31 mm black steel straps (see Clause 4.8.4).

Clamping brackets should be fitted to the coil, horizontally opposite between the 9 and 10 o'clock positions on one side, and between 2 and 3 o'clock on the other.

Telescoping allowance on these coils is zero so that the clamps will remain tight in transit.

Nuts on the clamping brackets should be sufficiently tightened so that the unitized coils will not move during transit.

After tightening, clamping brackets should be marked with chalk to visually indicate during inspection that they have been tightened.

B.7.5 Longitudinal loading of coils with eye horizontal on coil wagons

Coils loaded lengthwise are usually finished product, wrapped in a protective cover with multiple straps around the circumference and through the eye.

Coils should be secured in the cradle by webbing straps and covered by tarpaulin for weather protection.

B.7.6 Loading of coils with eye vertical

Coils transported with the eye vertical are generally finished product with an outer covering and numerous unitizing straps. They are strapped to pallets with at least two black steel straps or their equivalent.

Coils should be loaded in one tier or layer only.

Coils loaded directly onto a rail vehicle should be positioned so that the loading is evenly distributed along and across the vehicle.

Coils should be secured to the anchor points on the vehicle by webbing straps.

B.7.7 Palletized vertical coils in containers

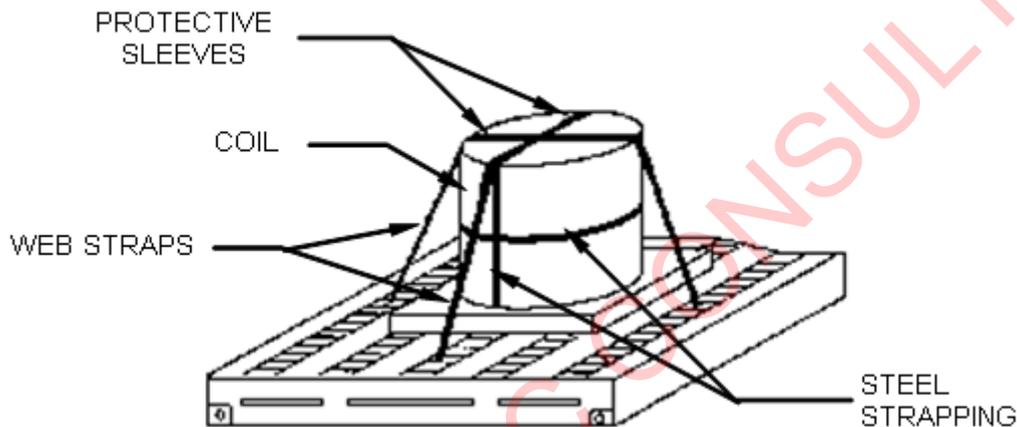
Before loading coils, the container lid should be removed and the container floor checked to be free of debris and other foreign material.

Loaded coils should be positioned to distribute the loading evenly along and across the container base.

Coils should be loaded in one tier or layer only.

The total mass of coils loaded onto any one container should not exceed 26.5 t.

Webbing straps should be used to secure each coil to the container. Not less than two straps should be used; one placed transversely and one longitudinally. Straps should be positioned so that they pass over the centre of each coil, see Appendix Figure B-14.



Appendix Figure B-14 securing palletized vertical coils to container

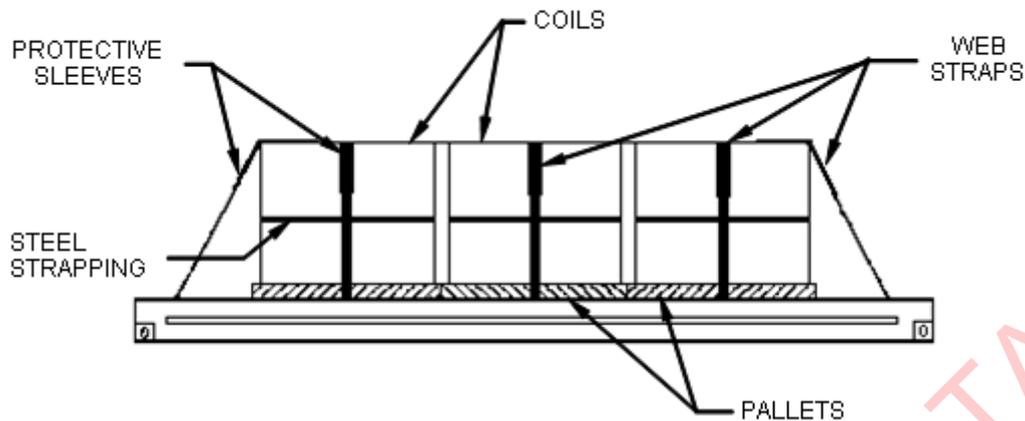
Where there is insufficient longitudinal clearance for individual longitudinal straps to be fitted to each coil, one longitudinal strap should be placed over all coils. In this configuration, all coils shall be of the same height, see Appendix Figure B-15.

Protective sleeves shall be placed over all sharp edges of the loads to protect the webbing straps.

Webbing straps should not be attached to damaged anchor points.

Straps should be sufficiently tensioned to prevent coils from moving in transit. Loose strap ends should be secured to prevent them from being damaged.

After loading, the container lid should be placed in position over the loading and all twistlocks closed and locked.



Appendix Figure B-15 Slitted vertical coils in containers

Before loading, the container lid should be removed (unlock all twistlocks) and the container floor checked to be free of debris, obstructions and other foreign material.

Dunnage should be square hardwood, positioned to provide a stable base for the coils, across the width of the container.

Each coil should be seated on two pieces of dunnage. Coils may be stacked vertically; stacks should not exceed three coils in height.

Coils should be loaded centrally so that the centre of gravity is located on the longitudinal centre line of the container, see Appendix Figure B-16. Coils and dunnage of each tier should be positioned directly above those below.

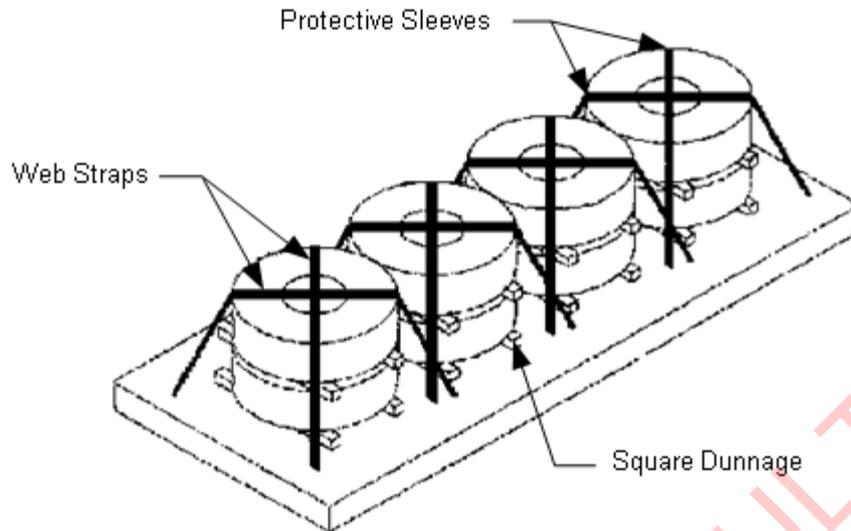
Each coil should be placed firmly against the adjacent coil.

The total mass of coils in any container should not exceed 26.5 t.

At least two webbing straps should be placed over each stack, placed at 90° to each other and 45° to the container centre line. Straps should be positioned so that they pass over the centre of the top coil, see Appendix Figure B-16.

Protective sleeves should be placed over all sharp edges of the load. Straps should not be attached to damaged anchor points and should be tensioned so that the coils will not move in transit. Safety loops should be correctly fitted to the hooks before tensioning the straps. Loose ends of straps should be secured to prevent them from being damaged.

After loading, the container lid should be placed in position over the loading and all twistlocks closed and locked.

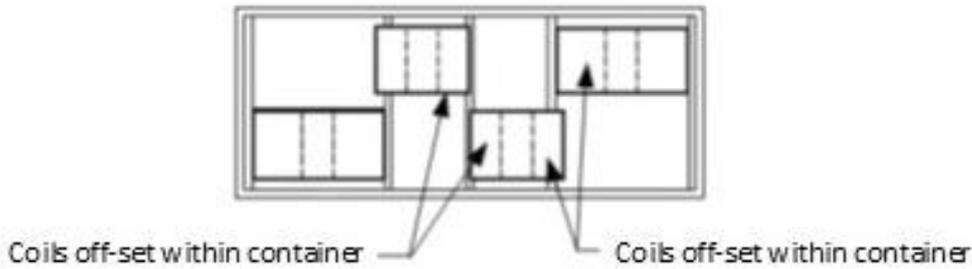


Appendix Figure B-16 Securing stacks

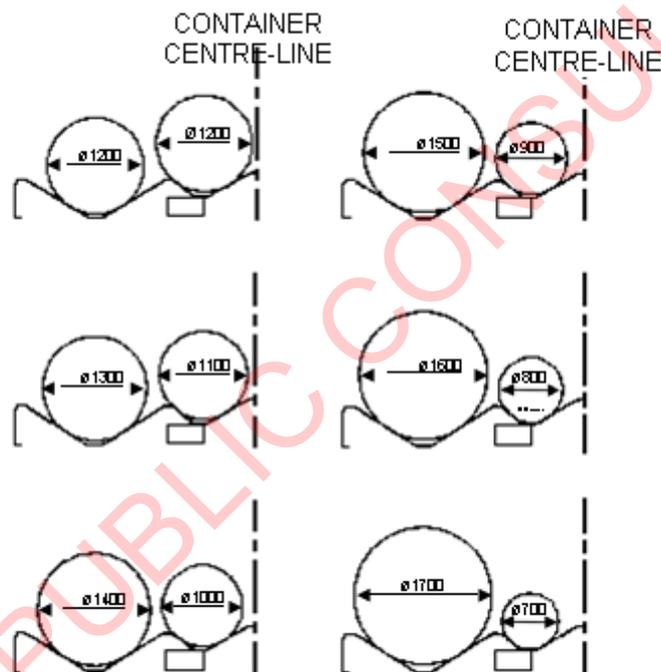
B.7.8 Coils in containers – eye horizontal

Coils may be loaded in special purpose containers designed to transport coil with the eye transverse and horizontal. These containers are fitted with removable lids or covers and with cradles to support the coils. The following applies to the use of containers for coils:

- (a) Before loading, the container lid should be removed and the coil cradles checked. They should be in good condition, free of defects, debris and other foreign material.
- (b) Coils are loaded with the eye horizontal and positioned transversely, across the container to facilitate access by forklift truck as required.
- (c) Coils should be centrally loaded so that the containers are evenly balanced.
- (d) Where coils cannot be placed centrally because of their diameters, they may be placed off-set in the cradles if their width is suitable for this configuration and the loading can be evenly distributed, see Appendix Figure B-17. The minimum permissible coil diameter for loading on all cradles is 600 mm.
- (e) The maximum permissible diameter of coils that can be loaded in the outer cradles is 1,700 mm, see Appendix Figure B-18.
- (f) The maximum permissible diameter of coils that can be loaded centrally in the inner cradles is 1,200 mm, see Appendix Figure B-18.
- (g) The maximum permissible diameter of coils that can be loaded in an off-set configuration in the inner cradles is 1,400 mm.
- (h) The maximum permissible width of any load, including provision for product packaging and the removal of lifting equipment or slings (when used) is 2,620 mm.
- (i) The maximum total mass permitted on the outer cradles is 20 t.
- (j) The maximum total mass of the loading in each container is 26.5 t.
- (k) After loading, the container lid is to be fitted over the loading and all twistlocks closed and locked.



Appendix Figure B-17 Off-set loading of coils in containers



Maximum diameters for **centrally placed coils**

Appendix Figure B-18 Maximum diameters of coil loaded centrally in containers

B.8 Coiled wire and rod

B.8.1 General

Coiled wire and rod may be transported in open wagons (general or special purpose), on container bases (railleurs and transflats) or in half-height containers.

All coils shall be firmly packed and held together with four (4) steel straps or wires positioned equally around the circumference.

B.8.2 Open Wagons

The diameter of the coils should be between 1,100 mm and 1,250 mm. Coils may be stacked but shall not exceed two layers.

Coil bundles should be placed to distribute the load as evenly as possible over the length and width of the vehicle.

Wherever possible, each layer of coils should cover the full width of the vehicle to prevent collapse of the load in transit.

No rod in any bundle should protrude beyond the boundaries of the vehicle.

B.8.3 Raitainers and transiflats

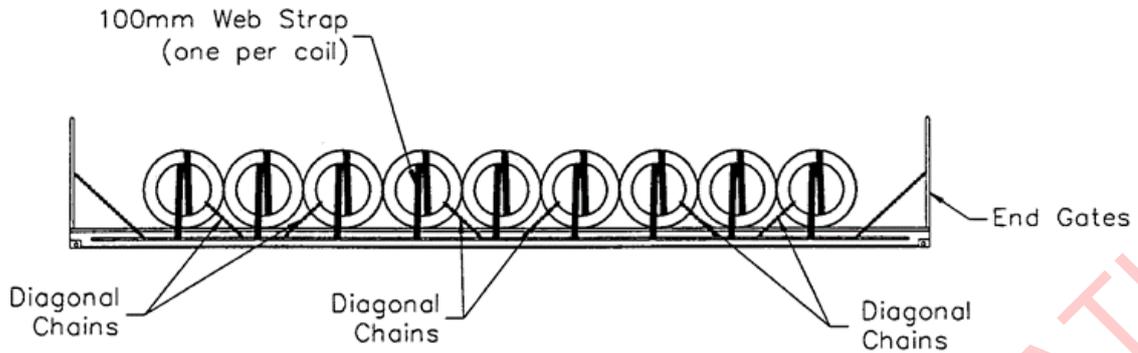
Specially designed end stops, bulkheads or end frames are required for transport of coiled rod. If they are not a permanent fixed part of the structure, they should be secured in the longitudinal direction by chains and load binders or webbing straps with ratchets.

On 6.1 m bases:

- (a) side restraints shall be used to prevent lateral movement;
- (b) coils shall be unitized in rows by passing a webbing strap through the eye of each coil and securing it at each side;
- (c) no rod in any bundle should protrude beyond the boundaries of the container;
- (d) each top row in double stack configuration should be placed between two bottom rows; and
- (e) not less than two 100 mm webbing straps should be used longitudinally to secure the coils in the fore and aft direction.

On 12.2 m bases:

- (f) coils should be loaded transversely in an upright position, placed centrally on the container base, with the eye horizontal;
- (g) coils shall not protrude outside the boundaries of the container;
- (h) each coil should be secured with at least one 100 mm webbing strap that is attached to one side of the container and looped around the top of the coil. The strap should pass through the eye of the coil, over the top, back through the eye and then be secured and tensioned on the opposite side;
- (i) straps should be protected against damage from sharp edges and securely tightened;
- (j) end coils and every second coil should be secured with a diagonal chain and load binder positioned to pull the coils towards each other so that the intermediate coils are held, Appendix Figure B-9, and
- (k) all load binders should be wired in the closed position.



Appendix Figure B-19 Coiled rod on 12.2 m transflats

B.8.4 Coiled rod in half height containers

Coils should be loaded in the upright position and evenly distributed over the container base. Coils shall not protrude outside the boundaries of the container.

Each row of coils should be secured by webbing and winches. The webbing should pass through the centre of the coil, loop over the top, back through the centre and then secured and tensioned on the opposite side.

End coils should be secured to the end bulkheads and secured with a webbing strap through the centre of the coil.

B.9 Tin plate stillages

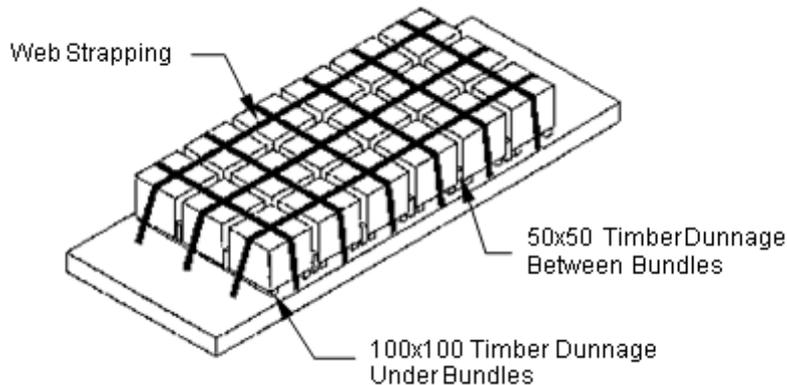
Tin plate stillages are usually loaded in special purpose containers:

- (a) before loading, the container lid should be removed and the floor checked to be free of debris and other foreign material;
- (b) when loading, packs or bundles should be positioned to evenly distribute the load over the container base;

each bundle should be placed on two pieces of square dunnage space to provide stability. Where square dunnage is not available, the dunnage should be placed with the largest cross-sectional face horizontal. Dunnage should also be placed between adjacent bundles for protection from damage caused by contact, Appendix Figure B-20 each bundle should be loaded tightly against the adjacent bundle and:

- (c) the total mass of all bundles loaded onto any one container should not exceed 26.5 t;
- (d) securing of bundles should be by webbing straps;
- (e) protective sleeves shall be placed over all sharp edges and corners to protect the webbing straps from damage;
- (f) at least one webbing strap should be fitted longitudinally over each bundle or longitudinal row, and at least one webbing strap fitted transversely over each bundle or transverse row;
- (g) webbing straps should not be attached to any damaged anchor points. Straps should be sufficiently tensioned to prevent movement in transit;
- (h) loose strap ends should be secured to prevent them from being damaged or from dragging from the container in transit; and

- (i) after loading, the container lid should be replaced and all twistlocks closed and locked.

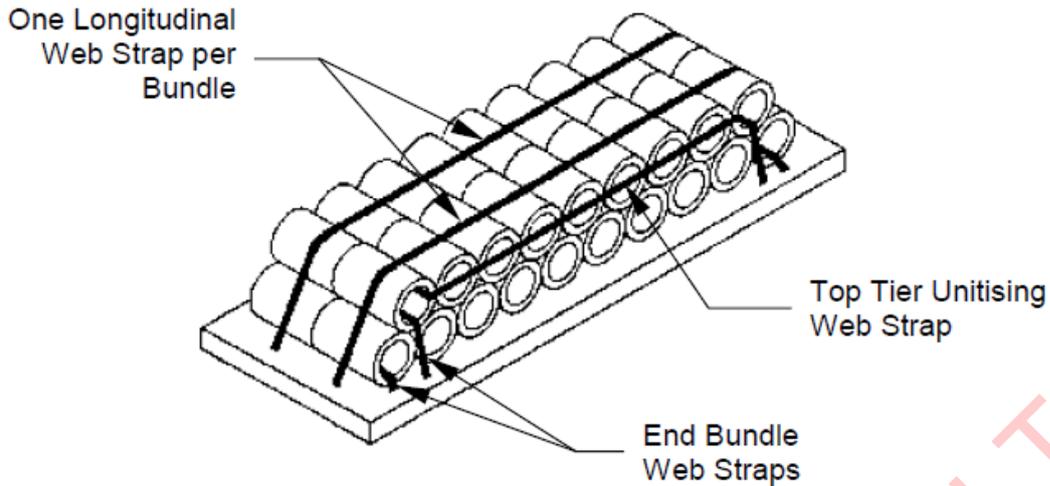


Appendix Figure B-20 Tin plate on containers

B.10 Bundled steel strapping

The following procedures apply to loading in special purpose containers:

- (a) Before loading, the container lid should be removed and the floor checked to be free of debris and other foreign material.
- (b) When loading, bundles should be placed with the eye horizontal and across the container. Bundles should be positioned to evenly distribute the load over the container base.
- (c) Each bundle should be loaded tightly against the adjacent bundle.
- (d) Bundles should not be loaded more than two tiers high.
- (e) The total mass of all bundles loaded onto any one container should not exceed 26.5 t.
- (f) Securing of bundles should be by webbing straps.
- (g) Protective sleeves shall be placed over all sharp edges and corners to protect the webbing straps from damage.
- (h) At least one webbing strap should be fitted longitudinally over each bundle or longitudinal row and fastened to the container base, see Appendix Figure B-21.
- (i) The end bundles of each tier should be secured to the container base with at least one webbing strap placed through the eye, see Appendix Figure B-21.
- (j) Webbing straps should not be attached to any damaged anchor points.
- (k) Straps should be sufficiently tensioned, equally at both ends of the load, to prevent movement in transit.
- (l) Loose strap ends should be secured to prevent them from being damaged or from dragging from the container in transit.
- (m) After loading, the container lid should be replaced and all twistlocks closed and locked.



Appendix Figure B-21 Bundled steel strapping

B.11 Steel pipes

B.11.1 General

Pipes, other than those fitted into special recessed cradles, should be transported in packs or bundles unitized with webbing or steel straps and containing pipes of approximately equal lengths.

Small diameter pipes may be loaded in rows with timber spacers between each layer of pipes and unitized with webbing or steel straps. Chocks against the outside pipes and secured to the timber spacers should be used to provide lateral restraint.

Large diameter and coated pipes should be transported in distinct tiers, placed in specially made cradles that suit the pipe diameter and the nature of the coating, if any. Soft packings are recommended for coated pipe. Spacing dunnage between the tiers should be profiled to suit the upper and lower pipes. Protection should be provided against damage to the pipes or the coating due to securing equipment.

Pipes may be carried on any suitably equipped vehicle. Open wagons generally provide the optimum security for the load, but flat cars and platform based containers may also be used provided that adequate restraint and support is provided (stanchions and end frames or bulkheads are required, see Appendix Clause B.11.3(a)).

If pipes, or pipe bundles, are not of equal length the shorter units should be placed on top of the load.

Pipes may be loaded in symmetrical layout (parallel vertical sides and level top) or pyramid style (the stack becoming narrower as the height increase). Loading shall always be within the loose loading outline.

Pipes loaded in layers or tiers should be placed on purpose-built cradles and/or separation dunnage.

Not more than 1/3 of any pipe may protrude above the top of any side wall, end wall, bulkhead, side frame or stanchion.

All supports, dunnage and securement equipment should be suitable for the type of pipe, its diameter and length, and for the protection of the coating, if any.

B.11.2 Open wagons

Pipes may be loaded in open wagons in symmetrical layout up to the top of the side wall coping and in pyramid style above that level, provided that the total load is within the applicable loose load outline. Side stanchions should be fitted above the coping wherever possible.

Loading above the coping shall be unitized with webbing or steel straps. To secure the load, webbing straps or chains should be passed over the top of the load and securely fastened to the vehicle structure.

Vehicles with pipes loaded in pyramid fashion above the coping and without end bulkheads for the full height of the load shall not be marshalled next to locomotives, passenger vehicles, tank wagons or any vehicle carrying dangerous goods.

Pipes should be loaded so that the load is distributed as evenly as possible over each of the bogies.

B.11.3 Flat wagons

Flat cars used to transport pipes should be fitted with side stanchions and end bulkheads, either fixed or removable.

Pipes loaded on flat cars shall be unitized with webbing or steel straps, or placed in purpose-built cradles with adequate side restraint.

Unitized bundles of pipe should be stacked evenly across the floor of the flat car between the stanchions and secured over the top with webbing straps or chains, sufficiently tensioned to prevent movement in transit.

Flat cars with pipes loaded without end bulkheads for the full height of the load shall not be marshalled next to locomotives, passenger vehicles, tank wagons or any vehicle carrying dangerous goods.

B.11.4 Transiflats

The loading of steel pipes on transiflats and similar containers should follow the general principles and requirements outlined in Appendix Clause B.11.1.

Each consignment should be evaluated with respect to the length, diameter and type of pipe to be carried.

Pipes should only be carried on transiflats with end gates or bulkheads.

Side gates or stanchions should also be fitted and secured laterally with ridge bows or webbing straps.

B.12 Rails less than 14 m

B.12.1 Loading

Rails should be loaded in open wagons, or on vehicles specially intended for the transport of rails. Rails should be positioned so that the load is distributed as evenly as possible over the bogies, and from side to side.

Each tier of rails should extend the full width of the vehicle floor, within one rail width so that the risk of rotation (skewing) is minimized. Where this is not possible, RSOs can load greater than one rail width so long as necessary calculations have been conducted to prove the risk of rotating is controlled.

Protective packing such as conveyor belting, soft plywood and similar products should be used to protect the rail from damage due to contact with the vehicle structure.

B.12.2 Dunnage

Where fixed bolsters are not provided on the vehicle floor, hardwood dunnage should be placed between the floor and the first tier of rails. Supports should be located near the ends of the vehicle as close as possible to the bogie centres to minimize the loading on the centre of the vehicle. Avoid positioning dunnage in the middle third of the vehicle floor between bogie centres.

Dunnage should not be placed in the door openings of open wagons.

Not less than two pieces of dunnage should be placed between each tier of rails. Dunnage should be the full width of the vehicle so that no part of the load is unsupported.

Where a tier of rails does not extend for the full width of the vehicle, dunnage shall be used between the outer rails and the vehicle sides to prevent lateral movement and rotation.

B.13 Continuous welded rails

Safe loading, securement and transportation of continuous welded rail is a specialist operation, and appropriate measures should be determined in accordance with the RIM.

Appendix C Timber Products (Normative)

C.1 General

Unless where otherwise prescribed, Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

C.2 Lengths

C.2.1 Unitizing

Timber sections in individual lengths (e.g., beams, billets, etc.) should be unitized into packs for ease of handling wherever practicable.

Each pack should be secured with two not less than three 19 mm black steel or equivalent straps. An additional strap should be used for each metre increase in length.

Wherever practicable, packs should also be unitized in groups of two or more in a similar manner.

C.3 Open wagons

C.3.1 General

Timber, loose or in packs, should be positioned in open wagons so that the loading is evenly distributed from end to end and side to side.

Loading should be so positioned so that it is effectively prevented from moving in transit, using chocks and bracing if necessary.

Where open wagons with doors are used, particular care should be taken with the positioning and bracing of the load to prevent it fouling the doors.

Where open wagons are used with doors removed, the load should be secured to prevent it from moving during transit and protruding through the openings.

C.3.2 Platform type containers

Platform type containers (e.g., transflats, flatracks, etc.) for transporting timber and timber products should be equipped with end bulkheads.

Timber bundles can extend beyond the base of the platform if suitably secured and complying with other requirements of this code.

For containers without bulkheads, the height of the loading should not be greater than the applicable loading outline. The securing method shall provide longitudinal restraint that is sufficient to prevent longitudinal movement of the load in transit.

For containers with bulkheads provided to limit longitudinal movement, the load should not extend beyond the height of the bulkhead unless additional longitudinal restraint is provided.

Where packs are loaded in tiers, each tier should be tied to the one below with belly straps to prevent sideways movement during transit.

The minimum number of belly straps that shall be used is:

- (a) two for packs up to 2.4 m long;
- (b) three for packs between 2.4 and 4.0 m long;
- (c) four for packs longer than 4.0 m, and

- (d) packs or tiers up to 2.4 m long should be secured to the container base using a minimum of three 75 mm webbing straps/ratchets or chains with load binders. An additional strap or chain shall be added for each additional metre of pack up to a maximum of six for a 6.1 m container base or ten for a 12.2 m base.

C.4 Poles

C.4.1 General

Poles should be stacked in pyramid configuration or in tiers, supported on solid, one-piece dunnage or packing contoured to suit the pole profile, or on straight dunnage with chocks. Each tier of poles should also be separated by similarly shaped dunnage.

Tapered poles require special attention to ensure all poles are adequately restrained to prevent longitudinal movement.

Stanchions should be fitted to the sides of flat wagons or additional securing provided (e.g., extra chains or straps, etc.).

Dunnage between each tier should be placed immediately above the dunnage in the tier below. Each tier of poles should be belly strapped to the tier below.

Poles should be restrained vertically by 75 mm webbing straps passed over the top tier and secured to the base. The straps should be directly above the dunnage.

Loading should not protrude above the top of the sides or ends of the container or vehicle.

C.4.2 Platform based containers

Flatracks and similar container bases used to transport poles should be fitted with end gates or bulkheads.

Side gates should be fitted and secured laterally using ridge bows, webbing straps or chains.

If the load is longer than the container, at least one end should be fitted with an end gate or bulkhead. The open or ungated end should face away from the direction of travel.

C.5 Assembled components

Timber assembled components or fabrications such as frames, beams and trusses should be loaded so that no part of the load extends beyond the permissible loading outline. If loaded onto platform-based containers they should not protrude beyond the outline of the base. Assembled components should be strapped together to prevent movement during transit.

Appendix D Miscellaneous Loose Loading (Normative)

D.1 General

Unless where otherwise prescribed, Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

Loose loading should be adequately secured and positioned on the carrying vehicle to prevent it from rotating, skewing or moving in the longitudinal or lateral directions during transit to infringe the loose loading outline or produce an unacceptable change in mass distribution.

Loading should not exceed the loose loading outline applicable to the routes to be traversed as specified in Clause 3.3.

D.2 Pipes – Other than steel or concrete

Note

Steel pipes are covered in Appendix Clause B.11, and concrete pipes in Appendix Clause D.12.

Pipes of large diameter (greater than 150 mm diameter) should be transported individually using dunnage and/or support frames specially shaped to suit the pipe profile.

Small diameter pipes should be bundled and unitized using metal straps or equivalent components and supported on dunnage for the easy access of forklift tines or slings.

Pipes should be carried in open wagons wherever possible, otherwise flat cars with suitable stanchions, end bulkheads, etc. are acceptable.

Container bases used to transport pipes should be fitted with end gates or bulkheads in conjunction with side gates or stanchions. The side gates should be restrained laterally by ridge bows, chains or webbing straps.

D.3 Aluminium ingots

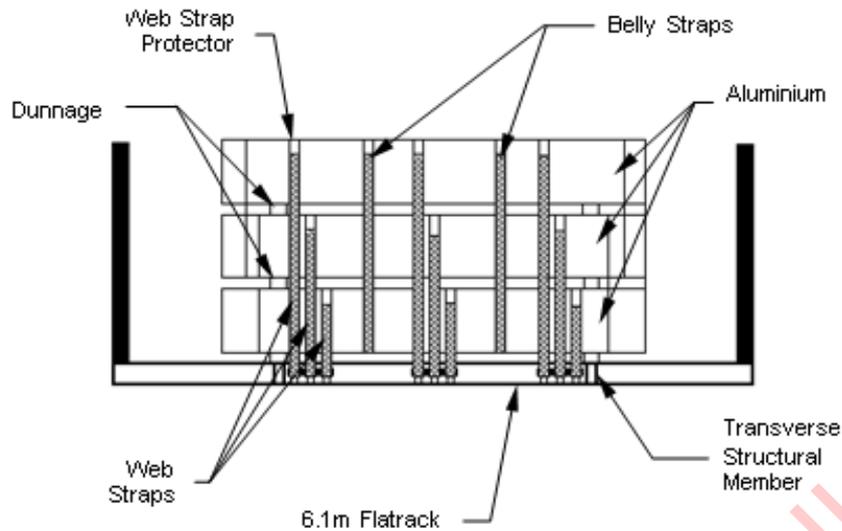
D.3.1 Large aluminium ingots

Large aluminium ingots are typically 4.0 m x 1.75 m x 0.6 m and weigh approximately 8 t. These should only be loaded on 6.1 m container bases that have been specially configured to accommodate removable bulkheads.

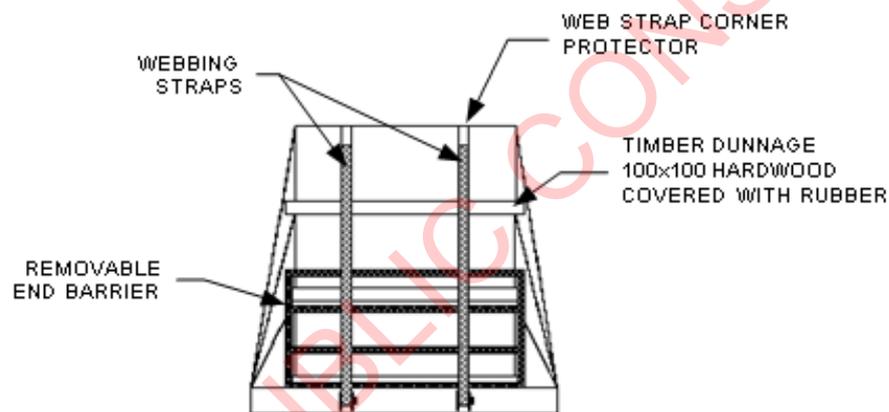
They may also be carried on other platform bases with end gates subject to the conditions prescribed below:

- (a) Not more than three ingots should be loaded on any container base. Ingots should be loaded in tiers.
- (b) Each tier should be supported on two pieces of 100 mm x 100 mm dunnage whose length is not less than the width of the ingot. Frictional resistance should be increased by covering the dunnage with a high friction material such as rubber sheeting or similar. See Appendix Figure D-1 and Appendix Figure D-2.
- (c) The lower dunnage and that between each tier should be placed immediately above a transverse structural member of the container base.
- (d) Each tier should be secured to the container base by not less than three webbing straps equally spaced along the base and securely tightened, see Appendix Figure D-1.

- (e) The top tier should be secured to the bottom tier by two belly straps, see Appendix Figure D-1.
- (f) The whole load should be additionally secured to the base by two longitudinal straps over the top of the load secured to the base and tightened, see Appendix Figure D-2.
- (g) Webbing straps should have a breaking strain of not less than 12 t and should be in good condition. Straps should not be used if more than 10% of the strap is frayed or damaged.
- (h) Where the straps pass over the edges of the ingots, protective sleeves should be fitted to the straps, or the edges should be covered to prevent damage to the straps in transit.
- (i) On containers with end bulkheads specially made for these ingots, the bulkheads should be fitted into the pockets and secured using two webbing straps per bulkhead.
- (j) Side gates are preferred as a secondary means of restraint to maintain the load within the loading gauge. Gates for this purpose shall be designed to adequately contain the load and withstand an impact of 1g without failure.



Appendix Figure D-1 Securing large ingots to container base – side view



Appendix Figure D-2 Securing large ingots to container base – end view

D.3.2 Small aluminium ingots

Small aluminium ingots typically weigh less than 1 tonne.

They should be loaded on container bases fitted with end bulkheads, with or without side gates.

Side gates if used shall be in good condition and firmly secured so that the load will be retained if the primary strapping fails.

Ingots should be placed symmetrically about the container longitudinal centre line and should not protrude above the top of the gates or bulkheads. They should be loaded in not more than three tiers, in the following configuration:

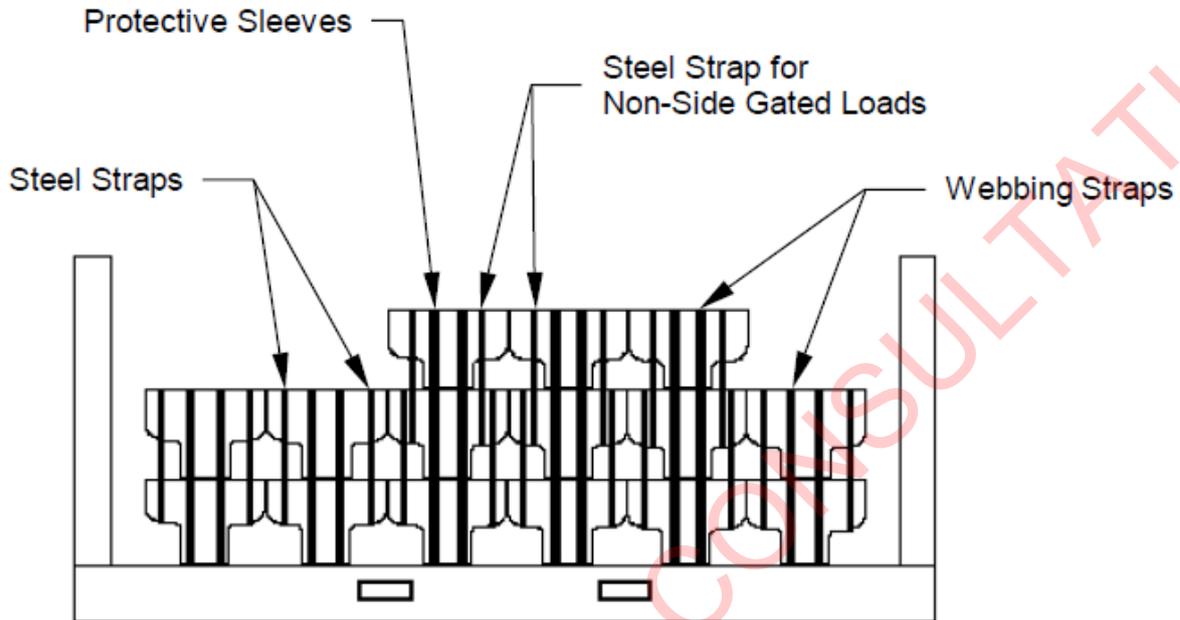
- (a) Bottom tier: 2 rows of 6.
- (b) Middle tier: 2 rows of 6.
- (c) Top tier: 2 rows of 3.

The loading configuration and securing requirements are shown in Appendix Figure D-3.

Each stack of ingots should be secured by not less than two transverse webbing straps passing over the top and securely tightened. The webbing straps should have a minimum breaking strain of 5 t.

Webbing straps should be fitted with protective sleeves where they pass over sharp edges and corners. Straps should not be used if more than 10% of the strap is worn, frayed or damaged.

Where adequate side gates are not used, the load should be unitized by securing ingots in adjacent tiers with two black steel or equivalent straps 31.0 mm x 0.8 mm.



Appendix Figure D-3 Securing small ingots to container bases – side view

D.4 Copper sheets - bundled

Copper sheets bundled and unitized using metal strapping should be supported on dunnage not less than 70 mm in height to provide ready access for forklift tines.

Each bundle or pack should be supported on two pieces of timber dunnage. For transport on container bases, each piece should have a recess or rebate on the bottom to allow for black steel or equivalent straps used to secure the dunnage to the bundle.

Copper sheets loaded into open wagons should be loaded along the longitudinal centre line of the vehicle to ensure even load distribution. No additional securement is necessary.

Copper sheets loaded onto container bases should be loaded in one tier, as close as possible to each other to minimize movement during transit. Each bundle should be secured by at least one transverse chain and at least one longitudinal chain, each passing over the centre of the bundle. Chains should be tightened and secured by load binders; load binder handles should be wired in the closed position. Each chain should be secured to a rigid lashing point that is adequate to withstand the forces experienced in service. Side bars normally used for tying down tarpaulins are not adequate securing points.

D.5 Pavers, bricks and roof tiles

D.5.1 General

Pallets used for these products should be of hardwood and in good condition. Pallets may be double stacked; the bottom pallets should be able to adequately support the top layers. Each pallet should be placed hard up against the adjacent pallet to minimize the risk of separation or movement of the load.

D.5.2 Loading on container bases

Loading should be positioned centrally along the container base.

End gates shall be fitted and secured with diagonal chains and load binders. The load binders shall be wired closed.

The outer faces of each pallet load should be covered to resist bricks, pavers, etc. dislodging from the stack. The covering should be pressed hardboard (e.g., masonite, etc.) or steel mesh and secured with two black steel or equivalent straps. The openings in the mesh should be smaller than the product.

Loading should not protrude above the top of the end or side gates.

At least two webbing straps should be placed over each row of pallets. Webbing protectors should be used on all corners.

Side gates should be fitted and secured laterally with ridge bows, ropes or webbing straps.

D.6 Empty pallets

Pallets should be transported on container bases fitted with side and end gates.

Adjoining side gates shall be secured to each other with catches or steel strapping. At least one rope or ridge bow should be used to secure side gates laterally.

Each stack of pallets should be secured to the container with at least one rope in good condition.

The whole load should be covered with a tarpaulin for additional security against movement.

D.7 Nested container bases

D.7.1 General

These include transflats, flatracks, railtainers, etc., stacked one above the other for transport.

D.7.2 Positive location

Container bases stacked for transport shall be positively located and secured to prevent movement during transit.

There are several acceptable methods of locating and unitising stacked containers. Welding, steel straps or chains alone shall not be used for securing one tier to the next.

Portable twistlocks or inter-box connectors (IBCs), can be used provided:

- (a) One is fitted and locked in position at each corner between each tier.
- (b) Each twistlock shall be undamaged and fully operational.
- (c) With this configuration, nested containers can be lifted from the top or bottom.
- (d) All twistlocks shall be in the fully locked position before lifting so that the load does not separate.

Integrated twistlocks (the permanent type that are retractable) can be used where fitted:

- (e) if all four are undamaged, fully operational and are locked in position between each tier;
- (f) with this configuration, nested containers can be lifted from the top or bottom; and
- (g) all twistlocks shall be in the fully locked position before lifting so that the load does not separate.

Steel rods may be used to nest up to six containers in a unit as follows:

- (h) Four steel rods 24 mm diameter or more should be used.
- (i) Each rod is fitted with a retention chain which shall be secured to the bottom container.
- (j) With this method, the containers can only be lifted from the bottom.

Corner location brackets placed into the container corner fittings, may also be used as follows:

- (k) The containers shall be placed so that the tabs prevent lateral and longitudinal movement.
- (l) Containers can only be lifted from the bottom. Containers are also nested using corner rings and bolts:
- (m) All four corner rings shall be positioned and locked to the container above using the locking bolt.
- (n) The bolts shall be securely locked in all four positions on each tier.
- (o) Lifting is possible only from the bottom.

D.7.3 Securing of nested container bases

Container bases that are not connected by twistlocks between each tier shall have additional securement. Nested containers without twistlock connections should only be lifted from the bottom.

The nested containers shall be secured as a unit by the application of:

- (a) not less than four steel straps passing over, or attached to, the top container and tightly secured to the bottom container;
- (b) straps should conform to requirements of Clause 4.8.4;
- (c) sharp or abrupt edges and corners should be fitted with rounded protective pieces or strips where the straps pass over them;
- (d) Straps should be secured to round horizontal fixing bars in good condition. Attaching straps to links, or bent, damaged or inadequate securing points is unacceptable;
- (e) chains with load binders, or web straps with winches, may be substituted for steel strapping, see -Clause 4.8.1, and
- (f) containers with collapsible bulkheads should have the end bulkheads on the top container folded down and with lock-down equipment engaged. The bulkheads should be secured by not less than two 32 mm black steel or equivalent straps passed over each bulkhead.

D.7.4 Loading of nested containers

All returning side gates and end gates (i.e. with empty container bases), loaded on the top container shall be unitized with steel straps.

Tarpaulins if carried should be rolled up tightly and placed on top of the unitized gates.

Gates and tarpaulins should be adequately secured to the bottom container using not less than two steel chains and load binders or webbing straps and winches.

The total height of a unit of nested containers should not exceed 2.6 m on the interstate network or as per RIM requirements for other networks.

The loading (including gates, tarpaulins, etc. loaded on top) shall not exceed the applicable loose loading outline.

D.8 Bogie components

D.8.1 Wheels

New railway wheels are typically consigned by the supplier in packs of four, contained within a timber frame:

- (a) The timber frame should be in good condition, with the wheels firmly held by tension on the corner bolts.
- (b) Wheel packs should be placed centrally about the longitudinal centre line, in two rows where the wheel diameter allows. They should be stacked firmly against each other to prevent movement in transit. Suitable packing should be placed between the packs where necessary to prevent adjacent wheels from touching.
- (c) Wheel packs carried in open wagons should require no additional securement if the above procedures are followed.
- (d) Wheel packs loaded on flat cars or container bases should be secured with not less than two 10 mm chains or 100 mm webbing straps placed laterally over each pack and securely tightened, see Clause 4.8.1.
- (e) Webbing straps shall be protected by sleeves or similar devices where they pass over corners and edges.

D.8.2 Wheelsets

Assembled wheelsets, whether new, reconditioned or re-turned should be transported on purpose built flat cars, or in open wagons:

Wheelsets consigned without bearings or axle boxes fitted shall have the axle journal effectively protected against damage during loading, unloading and transit.

When loaded in open wagons, wheelsets should be positioned and nested (adjacent wheelsets offset to each other) to maximize the loading capacity.

Flat cars specially designed for the transport of wheelsets should also have the wheelset positions offset. Wheelsets should be located in recesses in the vehicle floor, on rails or in suitable brackets. The support structure should restrict lateral and longitudinal movement of the wheelsets and prevent contact in transit.

D.8.3 Bogie bolsters

Bogie bolsters loaded in open wagons should be positioned to achieve even load distribution.

Bolsters loaded onto container bases should be double stacked in pairs with the top (centre bowl) surfaces mating, see Figure D 4.

Hardwood dunnage at least 100 mm thick should be positioned on the side bearer faces and the bolsters unitized with not less than two green steel straps near the bolster centre. A black steel or equivalent strap around each end of each bolster at the spring seat should also be used to secure the bolsters together.

Bolsters should be aligned longitudinally and loaded four wide across the container base, placed centrally about the longitudinal centre line ensuring that the load is evenly distributed along the length of the container.

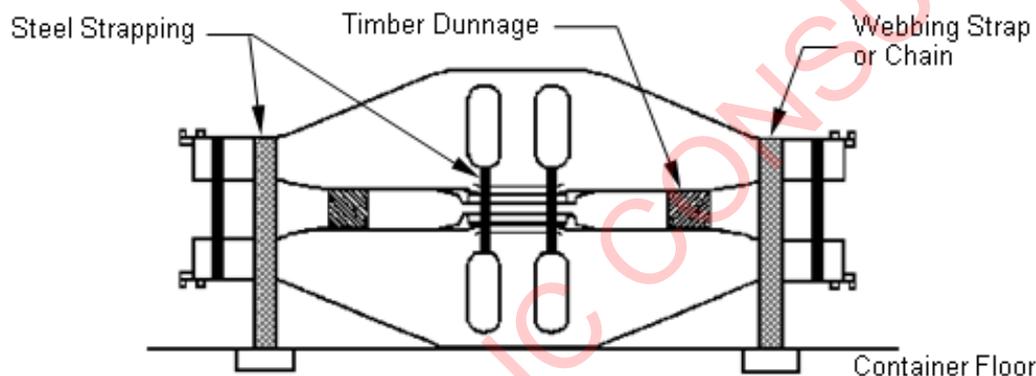
Bolsters should be secured to the tie down fittings on the container base by chains and load binders or webbing straps with winches, as shown in Appendix Figure D-4 and as specified in Clause 4.8.1. Two chains or straps should be placed over each row of bolsters and securely tightened to prevent movement during transit.

Chains should be not less than 13 mm diameter; load binder handles should be wired in the closed position.

Webbing straps should not be less than 75 mm in width and fitted with protective sleeves over all sharp edges and corners. Straps should not be used if more than 10% of the surface is frayed or damaged.

Container bases should be fitted with side and end gates to completely contain the load. Gates should be in good condition. Adjacent gates should be attached to each other at the top by interconnecting catches. Gates on opposite sides should be restrained from outward movement by a ridge bow, chain, rope or webbing strap.

End gates should be secured by diagonal chains each side, tightened by load-binders.



Appendix Figure D-4 Securing bogie bolsters to container bases

D.8.4 New axles

New axles are usually packed in wooden crates by the manufacturer or supplier:

When loaded on container bases, they should be aligned longitudinally.

Crates should be placed up against each other to minimize movement and positioned to achieve an even load distribution.

Each row of crates should be secured to the container base with not less than two 75 mm webbing straps and winches, evenly spaced along the crate and securely tightened. Straps shall be fitted with protective sleeves where they pass over sharp corners and edges.

Container bases should be fitted with side and end gates to completely contain the load. Gates should be in good condition. Adjacent gates should be attached to each other at the top by interconnecting catches. Gates on opposite sides should be restrained from outward movement by a ridge bow, chain, rope or webbing strap.

End gates should be braced against longitudinal movement by diagonal chains each side, tightened by load-binders.

D.9 Star pickets

Steel star pickets should be unitized in bundles using at least two black steel straps in accordance with Clause 4.8.4 or equivalent straps evenly spaced along the length. Additional security should also be provided by tying with wire passing through the holes or around the hooks.

D.10 Bagged products (non-bulk)

When transporting palletized bagged products such as cement, sand, flour, lime and similar bagged products on container bases, the following procedures should apply:

- (a) Pallets should be positioned evenly over the floor to achieve a balanced mass distribution. Pallet loads should be secured to the container base.
- (b) At least two webbing straps should pass laterally over each pallet load and be securely tightened. At least one webbing strap should pass longitudinally over each pallet load and be securely tightened.
- (c) Containers shall be fitted with side and end gates. End gates should be restrained against longitudinal movement by diagonal chains and load binders. Side gates should be restrained laterally by ridge bows or webbing straps.
- (d) Plywood, hardboard (e.g., Masonite) or similar shall be placed between the product and the gates to prevent damage to the product or packaging.

D.11 Bagged bulk products e.g.,

Bagged bulk products (e.g., 1 m³ bulk bags) on container bases should be positioned evenly over the floor to achieve a balanced mass distribution.

Bags should be placed as close as possible to each other and secured to the container base.

Bags should be secured by at least one webbing strap passing over each bag and securely tightened.

Containers shall be fitted with side and end gates.

End gates should be restrained by diagonal chains and load binders.

Side gates should be restrained laterally by ridge bows or webbing straps.

Plywood, hardboard (e.g., Masonite) or similar shall be placed between the product and the gates to prevent damage to the product or packaging.

D.12 Reinforced concrete pipes

Concrete pipes should be loaded longitudinally in tiers and:

- (a) each tier should be loaded on two pieces of timber dunnage.
- (b) the dunnage should not be less than 75 mm wide x 50 mm thick, with the shortest side vertical to prevent roll-over during transit.
- (c) where the pipes are not the same diameter for their full length, they should be loaded in alternate directions with the ends staggered so that the parallel portions are in contact.

When loaded on container bases, the pipes should be secured with at least three chains and load binders in accordance with Clause 4.8.1 and the following:

- (d) Load binders should be wired in the closed position.
- (e) Rubber or similar material should be placed between the pipes and chains for protection of the loading.

Containers shall be fitted with side and end gates.

End gates should be restrained by diagonal chains and load binders.

Side gates should be restrained laterally by ridge bows or webbing straps.

- (f) Pipes should not be loaded above the height of the side and end gates.

D.13 Broken glass in open top containers

Container doors shall be securely locked with all cams engaged at top and bottom, with the locking handles completely closed and secured by safety latches.

At least one safety latch on the overlapping door should be secured with a seal, wire or cable tie to prevent the door mechanism opening accidentally in transit. Where the end doors do not overlap, this requirement applies to both doors.

Glass should be spread evenly across the container floor for a balanced weight distribution.

The glass should not be loaded to a height that would result in contact with the tarpaulin used to protect the loading.

The tarpaulin should fully cover the load and should be securely fastened to the container with sufficient tension to prevent excess movement in transit.

D.14 Demountable huts on flat wagons

D.14.1 Loading

Flat cars used for demountable huts shall have substantially full floors. Skeletal vehicles shall not be used.

Vehicles should be fitted with substantial lashing points for adequate securement of the load.

Where huts extend beyond the side of the vehicle, or the height exceeds the loose loading outline, they shall be referred to the RIM. See Section 8.

Huts shall be placed on the vehicle so that the weight is distributed laterally and longitudinally as evenly as possible.

Huts should be placed on car tyres or similar to increase the frictional resistance between the huts and the deck of the flat car.

D.14.2 Securement on the flat wagon

All tie-downs shall be attached to structurally sound points on the hut and positioned in accordance with the hut manufacturer's instructions or recommendations.

Care shall be taken to ensure that the application of the tie-downs does not damage the hut.

The huts should be secured using not less than the minimum number of tie-downs given below in Appendix Clause D.14.3 for the size of hut.

Chains with load binders or webbing straps with winches shall be securely tightened in accordance with Clause 4.8.1.

Each end of every hut should be secured with two diagonal chains or straps to provide lateral and longitudinal restraint. These should be aligned as near as possible to 30° from the horizontal surface of the vehicle floor, and around 45° from the longitudinal centre line of the vehicle.

Additional tie-downs should be spaced equally along the sides of each hut to provide restraint in the longitudinal direction. The angle between the tie-downs and the deck should not be more than 30°.

D.14.3 Number of tie-downs required

The number of tie-downs required for each hut depends on the total mass of the hut. Tie-downs should comprise any one of the following options:

- (a) webbing straps rated at 2.5 t;
- (b) webbing straps rated at 5.0 t;
- (c) 8 mm diameter chains with minimum tensile strength 6 t; and
- (d) 10 mm diameter chains with minimum tensile strength 10 t.

Available options and the number of lashings required for each are given in Appendix Table D-1.

Appendix Table D-1 Tie-downs for huts

Mass of Hut (tonnes)		Webbing straps 2.5 t	Webbing straps 5.0 t	Chains No. x diameter
More than	Not more than			
0	2.5	6		4 x 8 mm
2.5	4.0	8	9	4 x 8 mm
4.0	7.5	12	8	6 x 8 mm
7.5	10.0		10	8 x 8 mm or 6 x 10 mm
10.0	16.0			6 x 10 mm

D.15 Long aluminium bar

The following procedures apply when loading long aluminium bar (up to 6.1 m) in tiers on flat containers without side or end gates, see Figure D 5.

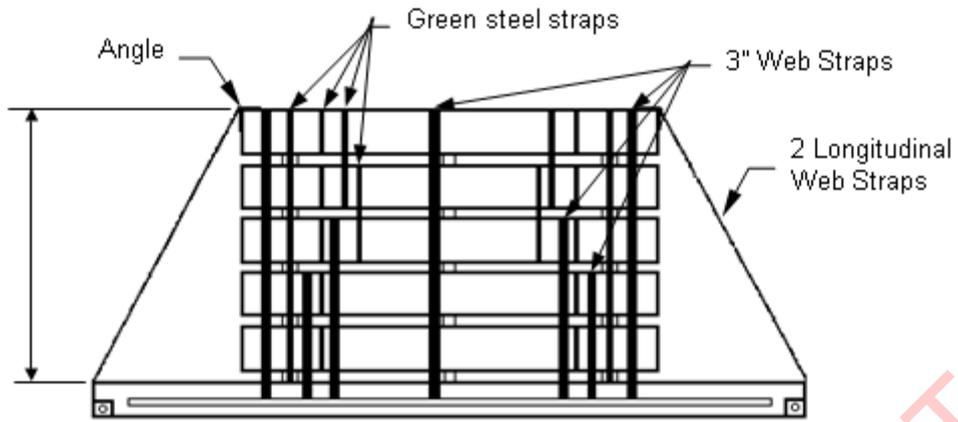
- (a) Total mass should not exceed 20 t.
- (b) Total height of the load should not exceed 2,330 mm.
- (c) Bars should be unitized into bundles using not less than five 32 mm Black steel or equivalent straps. Three of these should be used to secure three pieces of timber dunnage to each tier of loading.
- (d) The top three tiers should be unitized by strapping each to the adjacent tier using not less than three 19 mm black steel or equivalent straps or two 32 mm black steel or equivalent straps.

The full load should be secured using 75 mm webbing straps fastened to the container base. Straps should be applied as follows:

- (e) Two straps should pass over the second tier.
- (f) two over the third tier; and
- (g) three over the top tier (see Figure D 5).

Webbing straps should be well tightened, and the loose ends secured as follows:

- (h) two longitudinal webbing straps should be placed over the top of the load and securely tightened; and
- (i) angle brackets should be placed on the corners of the load under the straps to protect both the straps and the bars.



Appendix Figure D-5 Securing long aluminium bars to container bases – side view

Appendix E Newsprint (Informative)

E.1 Vehicle type and preparation

Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

Vehicles for transporting newsprint should be covered vehicles (box wagons) especially modified or constructed for the purpose. The following applies for transport of newsprint:

- (a) Vehicles should be fully enclosed and weatherproof. Interior wall lining should be flat and smooth with a flush surface. There should be no protrusions, projections or sharp edges and all fastenings should be recessed below the surface of the lining.
- (b) Vehicle floors should be of steel or aluminium and designed to accommodate the loading imposed by forklift trucks. Floors should be covered with a smooth resilient coating having an anti-slip high- friction surface to minimize load movement during transit and to provide traction for lift trucks during loading and unloading operations. The coating should possess high resistance to abrasion, impact and gouging.
- (c) Surface preparation and application of the coating should be in accordance with the manufacturer's instructions and recommendations.
- (d) The inner face of the access doors should be smooth, flat and free of protrusions, projections and sharp edges; all fastenings should be recessed below the surface of the lining.
- (e) Removable load restraints should be fitted across or adjacent to door openings to prevent rolls from moving in transit and contacting the loading doors.
- (f) Operation of the opening mechanism and door movement should be easily performed by one person from either ground level or a platform (loading dock).

E.2 Loading

Newsprint rolls should be carried in the vertical position and should be loaded in two tiers or layers depending on the roll size, weight, and the internal height of the vehicle.

Provision should be made for the protection of the ends and circumference of each roll.

Loading should commence at the ends of the vehicle and be distributed evenly from each end to prevent unacceptable differences in mass distribution.

Where the total mass of the load does not allow the full volume of the vehicle to be utilized, the vacant area should be opposite the doors.

Appendix F Road Vehicles (Normative)

F.1 Commercial road transport vehicles

F.1.1 General

Unless where otherwise prescribed, Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

F.1.2 General

Commercial road transport vehicles include rigid trucks, vans and open and enclosed semi-trailers.

The transport of these on rail vehicles is commonly referred to as piggy-back or trailer-on-flat-car (TOFC) and is only available over those routes for which the relevant RIM has given special approval.

Semi-trailers may be carried with or without prime movers.

F.1.3 Rail vehicles

Semi-trailers, with or without prime movers, should be carried wherever possible on special purpose piggy-back flat cars. These vehicles are provided with wheel guides and substantial collapsible hitches that engage the fifth wheel on the trailer. The longer vehicles are normally configured to accommodate two trailers without prime movers. On these vehicles, it is not usually necessary to provide any other form of restraint or securement.

Other road vehicles should be carried on flat cars. Flat cars used for carrying road transport should have complete floors or decks that are adequate to support the road vehicle during loading and transit. They should also be fitted with lashing securement points having sufficient strength to withstand the forces experienced in operation.

F.1.4 Loading on flat wagons

The road vehicle should be positioned centrally about the longitudinal centre line of the vehicle with the brakes applied. Any road vehicle or its load that extends beyond the boundaries of the flat car should be referred to the RIM for assessment.

Trailers should be supported at the fifth wheel position by a rigid stand that is secured to the flat car by four chains with a minimum load rating of 5 t. The chains should be located at each corner of the stand.

Trailer support stands shall be raised clear of the vehicle deck by at least 100 mm. Rear wheels should be restrained by fitting chocks or cradles.

F.1.5 Lashing and Securement

Trailers should be secured using transport chain fitted with load-binders or turnbuckles.

Trailers should be chained diagonally at the front and rear to provide lateral and longitudinal restraint, using two chains at each end. Each chain is fixed to the trailer and to the flat car at the opposite side.

See Figure G 1.

Additional chains should be used along the sides of the trailer for further longitudinal restraint. These chains should be fixed to the trailer and the flat car in opposing directions so that they provide restraint in both directions. See Figure G 1.

For trailers, up to 24 t gross mass, the lashings should be 10 mm chain with a minimum tensile strength of 10 t. They should be attached as follows:

- (a) Two (2) each end in diagonal configuration to provide lateral and longitudinal restraint.
- (b) Two (2) chains each side sloping away from each other to provide longitudinal restraint in both directions.

For trailers, up to 32 t gross mass the lashings should be 13 mm chain with a minimum tensile strength of 15 t. 13 mm chain should be attached as follows:

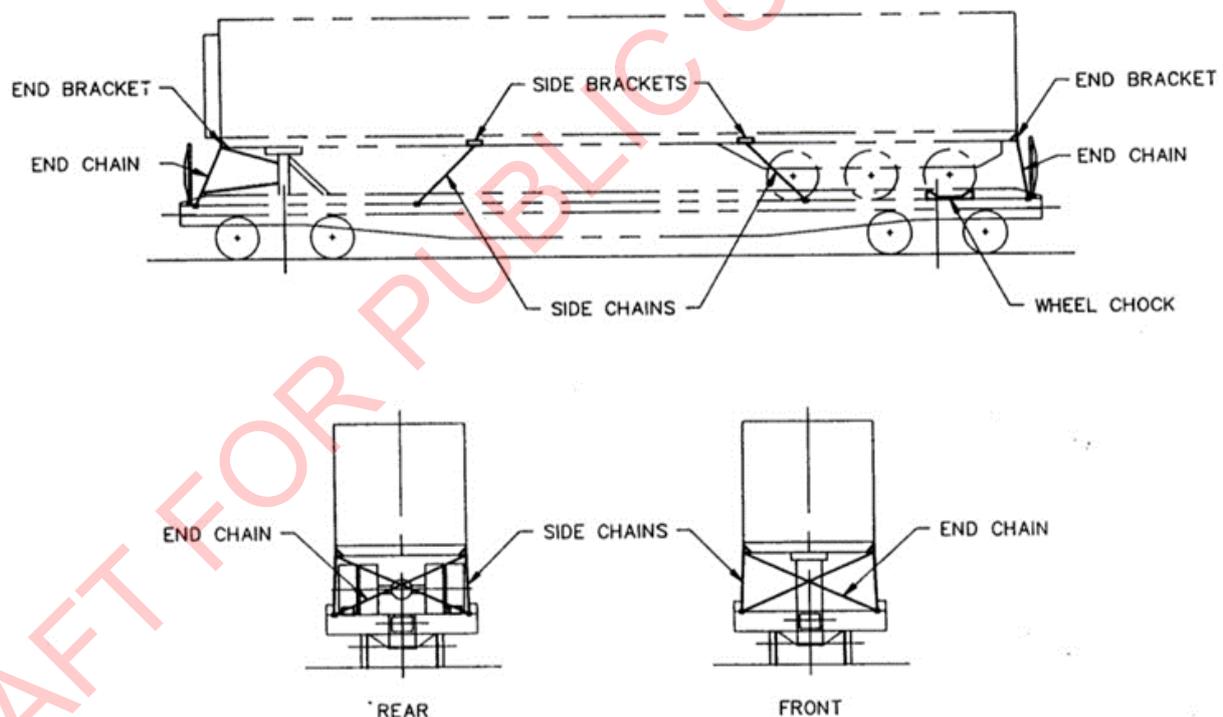
- (c) Two (2) each end in diagonal configuration to provide lateral and longitudinal restraint.
- (d) Two (2) chains each side sloping away from each other to provide longitudinal restraint in both directions.

If 10 mm chain is used, the requirements are as follows:

- (e) Four each end in diagonal configuration to provide lateral and longitudinal restraint.
- (f) Four chains each side sloping away from each other to provide longitudinal restraint in both directions.

Rigid trucks should be secured in the same manner as trailers.

All lashing chains should be applied as set out in Clause 4.8.1. A typical lashing arrangement is shown in Figure G 1.



Appendix Figure G-1 Typical arrangement for lashing a semi-trailer to a flat wagon

F.2 Light motor vehicles

F.2.1 Multi-level car carriers

Light motor vehicles, including cars, vans and light commercials are usually transported on specially constructed multi-level car carriers, whether the motor vehicles are new or carried on behalf of rail passengers. RSOs will have special instructions for loading on these types of vehicles.

These vehicles are equipped with wheel guides and adjustable wheel chocks to provide lateral and longitudinal restraint. Generally, no provision is made for vertical restraint.

The height of the motor vehicle must be checked before loading to ensure that fouling of the rail vehicle structure does not occur.

Care should be taken when loading motor vehicles on multi-level carriers that the upper deck loading does not exceed the permissible loading outline.

F.2.2 Flat wagons

Light motor vehicles are also transported on flat cars, particularly when included on passenger services.

When carried on flat cars:

- (a) the motor vehicles should be restrained in the vertical, lateral and longitudinal directions by the use of rope or webbing straps;
- (b) restraints should be attached to suitable elements of the vehicle structure, preferably above the road suspension to reduce the effects of spring movement during transit; and
- (c) care should be taken when securing motor vehicles not to damage the suspension or steering mechanism of the vehicle.

Appendix G Machinery – Agriculture and Plant (Normative)

G.1 Agriculture and plant

G.1.1 General

Unless where otherwise prescribed, Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

G.1.2 Transport

Agricultural and plant machinery such as earth moving equipment should be transported on flat cars. The type and class of vehicle should be selected to suit the type of machine, its mass and its dimensions so that the vehicle is not overloaded in transit.

Some light agricultural machinery may also be transported in open wagons. Machines should comply with:

- (a) the permissible loading outline applicable to the route(s) to be traversed;
- (b) the applicable height limits for centre of gravity.

Machines extending beyond the loading outline when loaded onto rail shall be referred to the RIM and handled as out of gauge loads. The removal or repositioning of infringing components should be performed where practicable to ensure that machines are not transported as out of gauge loads. This should be done in consultation with the manufacturer or consignor.

G.1.3 Mass distribution

Machines should be loaded so that the mass is distributed as evenly as possible in both the longitudinal (fore and aft) and lateral (side to side) directions.

The height of the combined centre of gravity of the rail vehicle and the load should not exceed the applicable limit. Vertical distribution of mass should be adjusted by the removal of as many components (e.g., cabs, canopies, buckets, counterweights, etc.) as is practical. See Clause 3.7.4 for limits.

Lateral distribution should also be adjusted when necessary, by a similar procedure. This is particularly important where machines have a significant variation in mass distribution from side to side, e.g., for example, some crane counterweights. Advice from the manufacturer or consignor will be of assistance in this matter.

G.2 Articulated machines

Articulated machines such as end loaders, scrapers, mobile cranes and graders shall be fixed in the straight-ahead direction by engaging the locking pin at the articulated joint where one is provided. If no locking pin is provided, the pivot point of the machine shall be secured longitudinally and laterally with additional lashings applied at the joint.

G.3 Loading

G.3.1 General requirements

A competent person with appropriate qualifications and experience should supervise the loading of heavy or cumbersome machinery, such as crawler type bulldozers and loaders, excavators, scrapers and dump trucks to reduce the risk of damage to the machine and the rail vehicle.

The machine should have its hand or park brakes applied and secured after being loaded and correctly positioned. Wheels and/or tracks should also be chocked where possible.

All loose or rotating equipment should be removed or securely fastened in accordance with the manufacturer's recommendations.

Mobile cranes should have the jib lowered to its lowest position for transport and securely fastened in position.

the recommendations of the machine manufacturer should be followed in relation to the setting of the gearbox or transmission, and the location of the securing points.

Care should be taken in positioning heavy machines on the rail vehicle, particularly those with wheels, so that the allowable point loads on the rail vehicle deck and structure are not exceeded.

Where possible, suitable packing such as timber or rubber matting should be placed between the tracks of tracked machines and the deck of the rail vehicle to improve frictional resistance.

G.3.2 Wide machines

Machines that are wider than the rail vehicle deck should be checked for out of gauge conditions in accordance with Section 3 for permissible outlines.

Wheels or tracks that extend beyond the edge of the vehicle deck by more than one third of their contact width should be supported by an extension added to the deck for that purpose.

G.3.3 Hydraulic cranes, etc.

Cranes and other machines or vehicles with hydraulic lifting jibs should have the hydraulic system disconnected or isolated before loading.

Cranes should be loaded with the free end of the jib trailing or facing away from the direction of travel to minimize the risk of damage if it moves in transit.

G.4 Securement

G.4.1 General

Machines should be secured with not less than the minimum number of tie-downs prescribed in Appendix Table G-1.

All tie-downs should be attached to structurally sound points on the machine and positioned in accordance with the manufacturer's instructions or recommendations. They should be attached to unsprung sections of the machine such as axles.

Care should be taken to ensure that the application of the tie-downs does not damage the machine.

Lashing chains with load binders or webbing straps with winches shall be securely tightened in accordance with Clause 4.8.1. Load binder handles should be wired to the chain in the closed position.

Loose ends shall be secured.

Each end of the machine should be secured with two diagonal chains or straps to provide lateral and longitudinal restraint. These should be aligned as near as possible to 30° from the horizontal surface of the vehicle floor, and around 45° from the longitudinal centre line of the vehicle.

Additional tie-downs should be spaced as equally as possible along the sides of the machine to provide restraint in the longitudinal direction. The angle between the tie-downs and the deck should not be more than 30°.

G.4.2 Minimum tie-down requirements

The number of tie-downs required depends on the total mass of the machine. Tie-downs should comprise any one of the following options:

- (a) Webbing straps rated at 2.5 t.
- (b) Webbing straps rated at 5.0 t.
- (c) 8 mm diameter chains with minimum tensile strength 6 t.
- (d) 10 mm diameter chains with minimum tensile strength 10 t.
- (e) 13 mm diameter chains with minimum tensile strength 13 t.

Available options and the number of tie-downs required for each are given in Appendix Table G-1.

Appendix Table G-1 Tie-downs for machinery

More than (t)	Not more than (t)	Webbing straps 2.5 t	Webbing straps 5.0 t	Chains No. x link dia.
0	2.5	6		4 x 8 mm
2.5	4.0	8	6	4 x 8 mm
4.0	7.5	12	8	6 x 8 mm
7.5	10.0		10	8 x 8 mm or 6 x 10 mm
10.0	16.0			6 x 10 mm
16.0	24.0			8 x 10 mm or 6 x 13 mm
24.0	32.0			8 x 13 mm or 12 x 10 mm
32.0	40.0			10 x 13 mm
40.0				10 x 13 mm, plus two chains for each extra 10 t

Appendix H Bulk Products (Informative)

H.1 General

Generally, bulk product vehicles are purpose-designed wagons for the bulk product to be carried.

Appendix examples are provided as a guide. RSOs should conduct their own calculations based on specific freight and ensure it meets the requirements of Clause 4.6.2.

H.2 Powder, granulated and coarse products

H.2.1 General

This includes products such as seeds, cereals, pelletized minerals, flour, cement, fly-ash, lime, coal, minerals, rock, stone and ballast.

H.2.2 Loading process

The loading process should prevent the flow of product into unwanted areas. For example:

- (a) Between wagons.
- (b) On to the edges and ends of wagons.
- (c) To the top of open wagons – Sufficient freeboard is to be provided to prevent spillage due to movement of the product in transit.
- (d) Above the allowable rolling stock outline.
- (e) On to rolling stock not to be loaded (e.g., locomotives).

Also, the loading process should prevent:

- (f) uneven loading of the wagon,
- (g) load profiles greater than the natural angle of repose of the product.

H.2.3 Unloading process

The unloading process should prevent:

- (a) the build-up of product under the wagons; and
- (b) the product being left in the wagons.

H.2.4 Loading and unloading equipment

Loading and unloading equipment and mechanisms that intrude into the rolling stock outline are to be controlled such that contact with the rolling stock is avoided except at designed or designated interface points on the wagons.

Loading and unloading facilities should have means to:

- (a) detect excessive product spillage;
- (b) detect derailed rolling stock;
- (c) indicate to trains when it is safe to enter the facility;
- (d) stop the process and train immediately if there is an incident or emergency;
- (e) minimize dust during loading and transit and unloading; and

- (f) detect non-retracted pantographs (where electric locomotives are required to drop their pantographs through the facilities) and alert the train crew.

Loading facilities should have means to:

- (g) detect open doors (where fitted on wagons) and close them prior to loading,
- (h) detect overloading, excessively uneven loading or over-height loading of wagons,
- (i) unload or adjust overloaded, excessively uneven or over-height product,
- (j) remove product spilled on to the sides of wagons.

Appendix I Hazard Register (Informative)

Hazard number	Hazard
5.1.1.3	Excessive axle loads causing excessive track-borne vibration
5.1.1.4	Excessive unsprung mass causing excessive track-borne vibration
5.4.1.11	Overloading causing excessive draft gear and coupler wear
5.4.1.12	Overloading causing excessive structural fatigue
5.4.1.13	Overloading causing excessive suspension wear
5.4.1.56	Inadequate packing and restraint of loads causing excessive damage to loads
5.4.1.63	Unbalanced loads resulting in inability to jack or lift rolling stock without damage
5.5.1.23	Non-compliance with Dangerous Goods legislation
5.5.1.61	Inadequate container restraints causing extended loading/unloading times leading to timetable impacts
5.7.1.13	Objects from passing trains colliding with the sides of trains
5.7.1.14	Objects from passing trains colliding with the fronts of trains
5.19.1.39	Trains or carriages loaded to one end resulting in vehicle unbalance causing wheel unloading or overturning
5.19.1.40	Bound spigots / twistlocks when removing containers (during loading or unloading)
5.19.1.41	Vehicles being insufficiently restrained in tipler devices (during loading or unloading)
5.19.1.42	Containers on one end of multi-slot wagons being loaded to one end resulting in vehicle unbalance causing wheel unloading or overturning
5.19.1.45	Vehicles overturning due to being loaded to one side resulting in vehicle unbalance
5.26.1.17	Overloaded rolling stock causing a cracked axle (axle failure)
5.26.1.18	Overloaded rolling stock causing a failed bearing (axlebox failure)
5.28.1.2	High centres of gravity
5.28.1.3	Narrow gauges
5.28.1.8	Loads being inadequately restrained (load offset laterally)
5.28.1.9	Poor loading resulting in load offset to one side
5.29.1.15	Loads not being properly restrained resulting in objects falling from trains
6.6.1.15	Out-of-gauge trains
6.6.1.17	Objects falling from trains
6.9.1.16	Overloading heavy rolling stock

Hazard number	Hazard
6.14.1.46	Trains being loaded to one side
6.14.1.47	Trains being loaded to one end
6.14.1.49	Poor loading or unloading practices
6.14.1.52	Containers loaded on only one end of multi-slot wagons
6.14.1.53	Bound spigots or twistlocks when removing containers

Bibliography

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- AS 1353.1, *Flat synthetic webbing slings. Part 1: product specification*
- AS 2321, *Short-link chain for lifting purposes*
- AS 2741, *Shackles*
- AS 2759, *Steel wire rope – Use operation and maintenance*
- AS 3569, *Steel wire ropes – Product specification*
- AS 3711, *Freight containers*
- AS 3777, *Shank hooks and large eye hooks – maximum 50 tonne*
- AS 7507, *Railway Rolling Stock Outlines*
- ISO 1496, *Series 1 Freight Containers*
- ISO 17712:2013, *Freight containers — Mechanical seals*
- National Heavy Vehicle Regulator (NHVR), *Load Restraint Guide:2025*
- *IMO/ILO/UNECE Code of Practice for Packing of Cargo Transport Units (CTU Code) (2014)*