

SECTION 20

LOADING AND SECURING OF LOADS

CONTENTS

Section	Description	Page
20.1	Scope	20-1
20.2	General Principles	20-2
20.2.1	Vehicle Construction	20-2
20.2.2	Design Forces	20-2
20.2.3	Loading	20-2
20.2.4	Protection	20-3
20.2.5	Installation and use	20-3
20.3	Structural Supports	20-4
20.4	Securing Devices	20-5
20.4.1	General Requirements	20-5
20.4.2	Chains and Fittings	20-5
20.4.3	Webbing Straps with Tensioning Devices	20-5
20.4.4	Synthetic and Natural Fibre Ropes	20-5
20.5	Dunnage and Packing	20-7

20.1 SCOPE

- 20.1.1 This Section specifies the basic principles and minimum requirements for the design and construction of equipment for the loading and securing of freight on or in general purpose vehicles of all types not specially equipped for the carriage of specific types of loading.
- 20.1.2 It includes the general conditions relating to dunnage and other systems used to locate, support and protect loading. It also specifies minimum requirements for the strength and attachment of securing devices, systems and components.
- 20.1.3 Requirements for vehicles in intermodal service (containers and TOFC traffic) are specified in Section 11, and for vehicles specially equipped for specific commodities in Section 21.
- 20.1.4 In addition to the requirements of the Section, vehicles shall also comply with all other relevant and applicable Sections.

20.2 GENERAL PRINCIPLES

20.2.1 Vehicle Construction

- 20.2.1.1 Vehicles shall be designed and constructed to incorporate adequate support, protection and restraint for the anticipated variety of loading. These aspects shall apply to bulkheads (fixed or removable), stanchions, attachment points for securing equipment, internal lining where fitted, floors, walls, doors, tarpaulins and their supports, dunnage and separation components, etc.
- 20.2.1.2 Vehicles shall also accommodate where practicable any loading which complies with the maximum loading outline(s) applicable to the routes over which they are likely to operate.
- 20.2.1.3 Support, restraint, and securing systems and components shall be designed to withstand the forces specified in Section 20.2.2.
- 20.2.1.4 Vehicle doors, doorways and other openings used for the loading and unloading of goods shall be so designed and constructed as to prevent any lateral movement of the loading during transit obstructing or impairing the opening of the doors.
- 20.2.1.5 Copings, rails, pillars, lashing points and other structural components shall be designed with smooth and radiused corners and edges to minimise the risk of wear and other damage to tarpaulins, ropes, chains, and other equipment.
- 20.2.1.6 Provision shall be made for the safe storage of unused load securing and restraint equipment (lashing assemblies, stanchions, dunnage, packing, etc.) on the vehicle.
- 20.2.1.7 Open cars shall be provided with external fittings for the securing of tarpaulins when used. These fittings shall be capable of accommodating the ropes used with standard railway tarpaulins, and shall be recessed wherever possible.
- 20.2.1.8 Flat cars shall be fitted with either recessed or retractable anchor points for the attachment of lashing assemblies of various types. They may also be fitted with rope rails for securing tarpaulins or for the fastening of fibre ropes where permitted.

20.2.2 Design Forces

- 20.2.2.1 Loading and securement systems and their attachment to the vehicle shall be capable of withstanding the forces normally experienced in rail transit and shunt movements without exceeding the yield stress of the material in any component, in order to prevent damage to the vehicle, equipment, loading, track and structures, and to ensure the safety of railway personnel and members of the public.
- 20.2.2.2 The minimum accelerations for which such equipment shall be designed shall be:

Longitudinal: 4g

Vertical: 2g

Lateral: 1g

where g = acceleration due to gravity (9.8 m/sec^2)

The design forces shall be calculated using the above accelerations applied to the mass of the anticipated loading or, where applicable for attachments, to the minimum safe working load of each component of the securement systems.

20.2.3 Loading

- 20.2.3.1 Vehicles shall be so loaded as to maximise load-space utilisation and carrying capacity without infringing loading outlines, axle load limits or weight distribution restrictions.
- 20.2.3.2 The vehicle design shall permit loads to be placed and positioned on the vehicle using existing terminal loading equipment and facilities.

20.2.4 Protection

- 20.2.4.1 Vehicle structures, attachments and equipment with which loading is liable to come into contact shall be so designed as to minimise damage or obstruction to loading caused by such contact.
- 20.2.4.2 The contact surfaces shall be smooth, flush and of a material which under normal operating conditions does not inflict unnecessary wear or other damage to either itself or the loading.
- 20.2.4.3 In addition to fixed securing and lashing systems, provision shall also be made when required for movable components to be used to locate and restrain loading.
- 20.2.4.4 Permanent internal fittings intended for the attachment of lashing equipment, restraining devices and similar components shall not protrude beyond the inner face of the body wall lining. Lining panels which incorporate recesses for strength or other purposes shall be so designed that the recesses do not provide the opportunity for loading to become damaged or fouled.
- 20.2.4.5 Where lashing or other securing equipment passes over or around sharp or abrupt corners or edges, suitable protective material shall be placed between the loading and the securing equipment to prevent undue damage.
- 20.2.4.6 Frames for supporting and securing tarpaulins shall be constructed with smooth and well rounded bends and edges to minimise damage to tarpaulins and ropes.

20.2.5 Installation and Use

All lashing equipment and securing systems shall be installed and used in accordance with the manufacturer's recommendations, Statutory regulations and Standards.

20.3 STRUCTURAL SUPPORTS

- 20.3.1 All structural support systems and components shall be designed and constructed to withstand the forces specified in Section 20.2.2.
- 20.3.2 Vehicle floors shall be designed and constructed to comply with the requirements of Section 8.4.2. as a minimum. Allowance shall be made where it is anticipated that known loading conditions arising from the operation of fork lift trucks or specific types of loading will exceed the requirements specified therein.
- 20.3.3 Bulkheads, whether fixed or removable, shall be designed to withstand the longitudinal forces specified in Section 20.2.2. The design longitudinal force shall be equivalent to four (4) times the maximum carrying capacity of the vehicle and shall be applied, as a distributed load, uniformly over the width of the bulkhead from floor (deck) level to a point 1500 mm above deck level.
The inner face of the bulkhead and longitudinal braces where fitted shall be fitted with a resilient material to minimise end and side damage to loading.
- 20.3.4 Stanchions used for lateral restraint of loading shall be designed to withstand lateral forces equivalent to the carrying capacity of the vehicle, applied to no more than two (2) stanchions per side as a distributed load extending from deck level to 1500 mm above deck level.
- 20.3.5 End walls of open and box cars shall be designed and constructed to comply with the requirements of 20.3.3 except that the resilient lining is not required.
- 20.3.6 Other structural assemblies or components used to support, locate or restrain loading shall be designed and constructed to withstand the specified forces and to minimise damage to the loading.

20.4 SECURING DEVICES

20.4.1 General Requirements

- 20.4.1.1 Securing devices, components and assemblies shall have a minimum safe working load of 20 kN.
- 20.4.1.2 All components of an assembly or device shall have a similar safe working load.
- 20.4.1.3 The type of securing equipment used shall be appropriate to and suitable for the loading.
- 20.4.1.4 The securing equipment shall be so designed and installed that it is positively held in the secured position and cannot be accidentally or unintentionally released or released due to the vibration or load movement experienced in transit. Provision shall be made for the securing of loose ends and excess equipment in transit to prevent loss or damage to vehicles, track or other equipment.
- 20.4.1.5 Attachment points for lashing equipment shall be located so that lashings providing longitudinal restraint can be installed with an angle to the horizontal of not more than 60°.
- 20.4.1.6 All securing devices shall be attached to specially designed anchor points. Tie-rails, bollards and similar components provided for the securing of tarpaulin ropes and other protective devices shall not be used for the attachment of load securing equipment.

20.4.2 Chains and Fittings

- 20.4.2.1 Chain used as part of load securing assemblies shall comply with the minimum requirements of Australian Standard AS-2321, Short Link Chain for Lifting Purposes (Non-Calibrated) and may be of Grades L, P or T. Higher tensile steel chain, with properties superior to those of Grade P and specially developed for lashing purposes, may be used. The link material diameter shall not be less than 8 mm, and the safe working load not less than 20 kN.
- 20.4.2.2 Chain lashing assemblies shall incorporate either load binders or turn-buckles for tightening and securing. These components shall have a safe working load equivalent to that of the chain with which they are used. Previously used components shall not be incorporated into lashing assemblies if there is any indication that they have been over-stressed or so worn in service that the safe working load is reduced.
- 20.4.2.3 Chain assemblies shall be attached to specially designed anchor points using shackles or equivalent components (Hammerlocks, etc.) having a safe working load equivalent to the chain in use.

20.4.3 Webbing Straps with Tensioning Devices

- 20.4.3.1 Synthetic, reinforced webbing strap assemblies shall incorporate hand operated ratchet tensioning devices or winches. The synthetic webbing material shall be light resistant (UV stabilised), see 20.4.4.2.
- 20.4.3.2 These assemblies shall be readily adjustable in length, easily tensioned after application to the load, and provided with adequate end fittings for attachment to the vehicle structure. The strap assemblies shall be permanently attached to specially designed anchor points.
- 20.4.3.3 Where there is the possibility of wear or chafing occurring because of contact within the assembly, suitable rubbing plates or similar shall be provided.

20.4.4 Synthetic and Natural Fibre Ropes

- 20.4.4.1 Ropes used for lashing and other securing purposes shall be of a quality complying with the minimum requirements of AS-1504, Fibre rope, Three Strand, Hawser Laid.
- 20.4.4.2 Ropes shall be manufactured from a light resistant (UV Stabilised) 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

20.4.4.3 Ropes shall be of not less than 12 mm nominal diameter and shall 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 shall not be used as original equipment.

20.5 DUNNAGE AND PACKING

- 20.5.1 Timber and other material used for dunnage and packing shall be in good condition and capable of withstanding the intended journey without loss or failure. Where such dunnage is used between the loading and the vehicle floor it shall be positively located and retained in position.
- 20.5.2 Dunnage shall not have sharp edges, projections or contain fasteners or other items which may damage the loading or the vehicle.
- 20.5.3 Where used to separate layers or blocks of loading, dunnage shall be of adequate strength to support the anticipated loads, and the required thickness shall be provided by one piece.