

SECTION 21

SPECIALLY EQUIPPED FREIGHT VEHICLES

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21.1 SCOPE

- 21.1.1 This Section applies to rail vehicles for regular intersystem use, equipped with special features required for the transport, loading and unloading of specific commodities.
- 21.1.2 It specifies general requirements and minimum standards for equipment to ensure safe transport and compatibility with terminal facilities at origin and destination.
- 21.1.3 In addition to the requirements of this section, vehicle designers and manufacturers shall consult with clients and terminal operators for any additional features required.
- 21.1.4 Special features are described in sub sections designated by the product or commodity transported. The stipulated requirements are considered to be the minimum necessary to ensure compatibility and satisfactory operational performance without inhibiting innovative design or vehicle development.
- 21.1.5 For the conveyance of commodities on other than specially equipped vehicles, refer to Section 20. The requirements for tank cars are given in Section 15, and for container and TOFC cars in Section 11.

21.2 GENERAL REQUIREMENTS

- 21.2.1 In addition to the specific features required by this Section, vehicles shall comply with all relevant and appropriate sections of this Manual.
- 21.2.2 Vehicles, attachments and fittings shall conform to the rolling stock outline applicable to the routes over which they are intended to operate. Details of these outlines are given in Section 18.
- 21.2.3 Special equipment, fittings and associated attachments shall not obstruct, hinder or inconvenience the operation, adjustment, maintenance or repair of any other equipment fitted to the vehicle.
- 21.2.4 Except where otherwise stipulated in this Section, vehicle and load restraint structures (bulkheads, stanchions, attachments etc) shall be designed to accommodate the forces arising from accelerations of the following magnitude without exceeding the safe working stresses applicable to the material:
- (a) 4 g longitudinal
 - (b) 1 g lateral
 - (c) 1 g vertically up
 - (d) 2 g vertically down

21.3 MOTOR VEHICLE TRANSPORT

- 21.3.1 Rail vehicles for the transport of motor vehicles may have two or three decks according to the maximum vehicle outline applicable to the intended routes. Vehicles with two decks shall conform when loaded to the Principal Maximum Rolling Stock Outlines, Diagrams 18-3 and 18-4.
- 21.3.2 The height from rail to each deck, at tare in new condition, shall be:
- (a) Lower deck 1020 mm min, 1060 mm max
 - (b) Second deck 2670 mm min, 2710 mm max
 - (c) Third deck 4320 mm min, 4360 mm max
- as shown on Diagram 21-1.
- 21.3.3 The upper deck of both two and three deck vehicles shall be fitted with guard rails complying with AS 1657, except for those vehicles which are equipped with enclosed sides or are fully enclosed. The base of the handrails shall be preferably bolted to the deck structure, but if welded, the design shall minimise the risk of vibration-induced fracture.
- 21.3.4 The sides of vehicles may be enclosed with solid panels fitted to the outside of the supporting framework and extending above the upper deck to the minimum height required for the handrails specified in Section 21.3.3. The support framework for the panels above the upper deck shall be at least equivalent in strength to the required handrails.
- Vehicles may also be fully enclosed.
- 21.3.5 The ends of each deck shall be fitted with a hinged track connector and extension plate in accordance with Diagrams 21-2, 21-3 and 21-4. These items shall be manufactured in accordance with the tolerances indicated to ensure interchangeability, free operation and automatic engagement of the locking pin when the plate is raised to the upright position.
- 21.3.6 Each deck shall be fitted with wheel guides as shown on Diagram 21-5. Inner and outer guides shall have $\varnothing 22$ holes at 90 mm centres, 18 mm from the top edge of the guide for location of wheel chocks.
- 21.3.7 Each vehicle shall be equipped with 20 wheel chocks per deck in accordance with Diagram 21-6. Suitable brackets shall be provided for wheel chock storage on each deck.
- 21.3.8 A lockable key box shall be fitted to each vehicle as shown on Diagram 21-7 for the storage of motor vehicle keys.
- 21.3.9 The inner face of all deck support structural members including braces shall be covered with a resilient material between the heights of 320 mm and 950 mm above the deck to reduce damage to motor vehicle doors.
- 21.3.10 Vehicles shall be sealed between decks and fully painted to prevent the marking of motor vehicles by rust, rain, condensation and other contaminants.

21.4 BULK POWDER AND GRANULAR PRODUCTS

21.4.1 GENERAL REQUIREMENTS

- 21.4.1.1 This Section applies to fully enclosed vehicles. Open top vehicles for the carriage of stone, ballast etc are not included. The product storage compartments and special equipment shall be designed and constructed according to the method of discharge to be used.
- 21.4.1.2 The interior of the storage compartments of all vehicles intended to transport cement, flyash, flour and other products with similar adhesive-cohesive properties may be coated with an abrasion-resistant low-friction material which shall be compatible with the products to be carried. Surface preparation and application shall be in accordance with the coating manufacturers instructions.
- 21.4.1.3 Ladders conforming to AS 1657 shall be fitted to each end of the vehicle at diagonally opposite corners. Full length walkways shall be provided on the top of the vehicle. The walkways shall be of antislip, open mesh construction, not less than 600 mm wide, and may be of steel or aluminium construction. They shall be continuous along one side of the vehicle and across the ends as required to provide easy access from the ladders. Handrails shall be fitted adjacent to the ladders and walkway to facilitate access.
- 21.4.1.4 For vehicles other than those for grain transport each compartment shall be fitted with a filling hatch of 400 mm minimum opening diameter. The hatch cover shall be hinged to the hatch frame and shall have multiple securing points with a single, central securing mechanism. The upper surface of the cover shall be convex to reduce accumulation of product and water. Mating surfaces of the cover and frame shall be machined, sealing shall be provided by an O-ring or flat resilient seal attached to the cover. The hatch assembly shall withstand without leaking a pressure of 210 kPa applied to the underside of the cover.
- Hatches shall be installed to open longitudinally in order to avoid obstruction of the walkways.
- 21.4.1.5 Brake equipment located above the underframe shall be protected from contamination by spilled loading by the provision of a solid cover designed to deflect spillage over the sides or end of the vehicle.
- 21.4.1.6 Fill hatches and manholes shall be constructed and installed so as to prevent the ingress of water.
- 21.4.1.7 The top of product compartments shall be designed to minimise the accumulation of product spilt during loading operations and to prevent fouling of walkways and fittings.

21.4.2 PRESSURE DISCHARGE VEHICLES

- 21.4.2.1 The storage compartments of pneumatic pressure discharge vehicles shall be basically cylindrical in shape and may be vertical or horizontal. Horizontal containers, similar to a tank car, may be constructed to form part of the load carrying structure to which end draft frames are attached. Vertical containers may be permanently attached to the vehicle structure or built as removable units to facilitate repair or overhaul.
- 21.4.2.2 Product storage compartments shall be designed and tested in accordance with the requirements of AS 1210. The design pressure shall be 250 kPa. Compartments are under pressure only during unloading operations and shall be designed as static vessels, except that supports and attachments shall comply with the requirements for transportable vessels. The bottom section of vertical cylindrical compartments shall be conical; the slope angle shall be such that in conjunction with the surface finish and aeration system used it enables efficient discharge to be achieved. The bottom of horizontal compartments shall be designed to ensure efficient flow of the product to the discharge outlet point.
- 21.4.2.3 Each storage compartment shall be fitted with a bolted manhole cover to permit access by personnel for inspection, maintenance and repair work. The diameter of the manhole shall be sufficient to allow entry by staff wearing required safety and protective equipment.
- 21.4.2.4 The discharge fittings shall be easily accessible from both sides of the vehicle and preferably below the level of the underframe. The fittings may be duplicated on each side of the vehicle with a suitable diverter system provided, or mounted on the end of the vehicle. The connection for the air supply, used for product aeration, compartment pressurisation and discharge, shall similarly be accessible from both sides. Refer to Diagram 21-8.

- 21.4.2.5 All valves used for the control of aeration and discharge shall be operable from both sides of the vehicle and clearly labelled with their function and direction of operation.
- 21.4.2.6 All valves, fittings and pipework shall be easily accessible and dismantled for maintenance as required.
- 21.4.2.7 Air supply and product discharge fittings shall be single point connections. On vehicles with multiple compartments the air supply to each compartment shall be taken from a common manifold. Similarly the product discharge pipes shall converge into a single outlet connection terminating at the end of the vehicle or at each side facing laterally.
- 21.4.2.8 Terminal fittings shall be male cam-lock type to NATO Specification MIL-C-27487, with screwed or flanged pipe connections, and fitted with aluminium dust caps. Dust caps are to be secured to the vehicle with light steel chain. The product discharge connection shall be 100 mm (4") and the air connection 80 mm (3") nominal size.
- 21.4.2.9 A metal plate with instructions for operating the system cast or engraved thereon shall be fitted in a highly visible location on each side of the vehicle. Character size and colour shall be such as to ensure the instructions can be read by unloading staff under poor lighting conditions.
- 21.4.2.10 Each compartment shall be fitted with a gauge indicating the pressure within the compartment. Gauges shall have a metal casing, a minimum face diameter of 100 mm and be fitted with a metal surround protecting the body and face from accidental damage.
- 21.4.2.11 Each vehicle shall be fitted with a pressure relief valve in the air inlet system, set to discharge at 250 kPa. In addition, each compartment shall be fitted with a frangible (bursting) disc designed to rupture at a pressure of 250 kPa. A valve connected to the top of each compartment to enable manual venting of the compartment after discharge or in an emergency situation, shall be located on each side of the vehicle in a position easily accessible from ground level. The filling hatch shall also incorporate a feature which provides for venting of the compartment while still restraining the cover, ensuring the cover cannot be released while the compartment is under pressure.

21.4.3 VACUUM DISCHARGE VEHICLES

- 21.4.3.1 The storage compartments of vacuum discharge vehicles shall preferably be cylindrical in shape with vertical walls, although rectangular compartments may be used. Compartments may be permanently attached to the vehicle structure or built as removable units to facilitate repair or overhaul.
- 21.4.3.2 The bottom section of each compartment shall be conical with a slope angle which in conjunction with the surface finish and aeration systems enables efficient discharge to be achieved. The base of the compartment shall be provided with an aeration pad not less than 800 mm in diameter and a discharge valve of 200 mm nominal bore. The discharge valve shall be operated by a pneumatic actuator of adequate size and capacity.
- 21.4.3.3 Discharge pipes shall be horizontal, of 150 mm nominal bore, and extend laterally to each side of the vehicle. Each compartment shall have a separate discharge pipe, terminating in a male cam-lock connector 150 mm nominal size to NATO Specification MIL-C-27487 with screwed, welded or flanged connections and fitted with aluminium dustcaps. Dustcaps are to be secured to the vehicle with light chains. The horizontal centre line of the discharge pipes shall be 250 to 750 mm above rail level in tare condition with new wheels, as shown on Diagram 21-9.
- 21.4.3.4 The air connection to the discharge aeration pad shall be of 40 mm nominal bore pipe extending to both sides of the vehicle and terminating in a male cam-lock connector of 40 mm nominal size to Specification MIL-C-27487 with screwed or flanged connections and fitted with aluminium dustcaps. Dustcaps are to be secured to the vehicle with light steel chain. Connections shall be provided at each side of the vehicle.
- 21.4.3.5 The top of each compartment shall be fitted with a hinged manhole to provide access for personnel while wearing required safety and protective equipment. The filling hatch may be incorporated into the manhole cover.
- 21.4.3.6 Aeration equipment may be fitted to the walls of the compartment to assist in maintaining continuous product flow. The air supply and controls for this equipment shall be separate from that used for the bottom aeration pad, and each compartment shall be individually controlled.

21.4.4 GRAVITY DISCHARGE VEHICLES (BOTTOM DUMP)

- 21.4.4.1 The walls of the storage compartments shall have a slope angle, which in conjunction with the surface finish and aeration equipment (if fitted), enables adequate product movement to be achieved.
- 21.4.4.2 Aeration panels or other aeration devices may be fitted to the internal walls to provide continuous flow of product to the discharge point and to minimise adhesion of the product to the compartment walls. The air supply connection and controls for the aeration system shall be provided on both sides of the vehicle; each compartment shall be individually controlled.
- 21.4.4.3 The discharge opening shall incorporate a sealing system to prevent product loss during transit. Door operation shall be performed by a pneumatic system with provision for manual operation when required. The door operating mechanism shall incorporate a self locking system to prevent accidental unauthorised or unintentional opening.
- 21.4.4.4 The lower face of the discharge opening shall be below the door, and shall provide a flat level surface to match the sealing face of the product receiving structure at unloading terminals. The lower face shall be not less than 200 mm nor more than 320 mm above rail level at tare with new wheels.
- 21.4.4.5 There shall be a single connection point on each side of the vehicle for the air supply to the door operating mechanism. Each door shall be individually controlled and the control valves shall be operable from both sides of the vehicle.

21.4.5 GRAVITY DISCHARGE VEHICLES (BOTTOM DUMP) FOR GRAIN

- 21.4.5.1 The interior of vehicles used for the transport of cereal grains and similar commodities shall be smooth, free of protrusions and obstructions and virtually self-cleaning.
- 21.4.5.2 The minimum valley angle of the walls and discharge chutes shall be 30° from the horizontal.
- 21.4.5.3 Discharge chutes shall be designed to discharge between the rails. They shall be fitted with doors which prevent the leakage of product and the ingress of water. Doors shall be operated by a pneumatic system with provision for manual operation when required, and shall incorporate a self-locking system to prevent accidental, unauthorised or unintentional operation. The bottom face of the chutes shall be as low as practicable to reduce dust emission during discharge.
- Doors may be operated individually or in unison. Details of door opening systems and methods shall be determined in conjunction with the relevant handling and unloading authorities.
- 21.4.5.4 An opening shall be provided in the top or roof of the vehicle for loading. The opening shall be 610 mm wide and substantially continuous in the longitudinal direction; the length shall enable the vehicle to be readily loaded to its maximum capacity.
- A readily removable open mesh panel shall be fitted below the loading opening to prevent the accidental entry of staff and large foreign objects. The panel shall be of lightweight construction, may be installed in sections and shall have a maximum mesh opening of 150 mm x 150 mm.
- The frame surrounding the opening shall be designed to prevent rain or other moisture from entering the interior when the covers are closed.
- 21.4.5.5 Each opening shall be fitted with a weatherproof cover which can be easily opened and closed by one person. The covers may be continuous or openable in sections, and if hinged shall be designed to open through approximately 180° to enable outloader nozzles to be correctly positioned for loading.
- The covers shall preferably be opened and closed by a mechanical or pneumatic system which can be operated by loading staff at ground level.
- 21.4.5.6 Ladders and walkways shall be fitted in accordance with 21.4.1.3 except that the walkways shall be fitted on *both* sides of the vehicle and across both ends to provide clear access with the hatch covers open.

21.5 COILED STEEL STRIP (HORIZONTAL TRANSPORT)

21.5.1 Thin steel strip in coils is normally transported with the central eye or core horizontal, and loaded transversely. Coils with a width greater than can be accommodated using transverse loading may be positioned longitudinally on the carrying vehicle.

21.5.2 Coils vary in diameter between 750 mm and 2100 mm and the width may be between 600 mm and 1800 mm.

21.5.3 TRANSVERSE LOADING

21.5.3.1 Coils shall be loaded into cradles permanently attached to the vehicle structure. The cradles shall be designed to support the coils above the vehicle deck, and shall accommodate coil diameters between 750 mm and 2100 mm.

21.5.3.2 The support surfaces of the cradles shall be covered with a smooth resilient material (fabric reinforced rubber or similar) to minimise damage to the coil surface. The method of fastening the material to the cradle shall ensure that the coil is in contact only with the covering material.

21.5.3.3 Lateral restraint between coils and outboard of coils shall be provided by adjustable and removable dunnage beams, capable of accommodating the range of coil widths given in 21.5.2. Beam surfaces likely to contact the coils shall be covered with a resilient material to minimise damage during loading and transit. The system used to secure the beams in position shall be easily operated by loading/unloading staff. Beams shall be easily removable from the cradle when required to facilitate loading and unloading by overhead crane or forklift truck.

21.5.4 LONGITUDINAL LOADING

21.5.4.1 Coils shall be loaded into cradles permanently attached to the vehicle structure. The cradles shall comply with the requirements of 21.5.3.1 and 21.5.3.2.

21.5.4.2 Cradles shall be located so that the load is symmetrical about the longitudinal centre line of the vehicle. Coils may be loaded in one or two rows depending on the coil diameter.

21.5.4.3 Longitudinal restraint and separation of coils shall be provided by dunnage beams complying with the requirements of 21.5.3.3.

21.5.5 SECURING

21.5.5.1 Securing of coils to prevent vertical displacement may be used where considered necessary.

21.5.5.2 Where used the securing system shall comprise flat webbing straps and ratchet winches. Not less than two (2) straps shall be applied to each coil. Straps shall have a minimum safe working load of 1500 kg. Chains, wire rope or metal straps are *not* permitted.

21.5.6 COVERING

21.5.6.1 Vehicles transporting coiled strips shall be covered with tarpaulins. Tarpaulins shall extend to the underframe and enclose both ends.

21.5.6.2 Tarpaulins shall be supported by removable bow frames. The frames shall be constructed of circular or rectangular steel or aluminium tube, minimum radius of all bends shall be 600 mm. There shall be no welded joints more than 1000 mm above the top of the underframe. All sharp edges shall be ground smooth.

21.5.6.3 The tarpaulin support frames at each end of the vehicle shall be permanently attached to the underframe and be covered with a steel or aluminium sheet to provide a weatherproof bulkhead. The bulkhead face shall be not less than 450 mm from the vehicle endsill to provide a work platform for loading staff. Lashing points and rings shall be fitted to the outer bulkhead face for securing tarpaulins.

21.5.6.4 Other forms of weatherproof enclosure may be fitted provided they do not hinder or obstruct loading and unloading operations and are acceptable to terminal operators and customers.

21.5.7 WORK PLATFORMS

- 21.5.7.1 Work platforms shall be provided at both ends of the vehicle for use by loading staff as shown on Diagram 21-16. The platforms shall be located between the vehicle end sill and the end bulkhead.
- 21.5.7.2 The platform shall be made from, or be coated with, an antislip material and shall preferably be of open mesh construction.
- 21.5.7.3 Guardrails complying with AS 1657 shall be fitted across the end sill and on each side of the vehicle outboard of the bulkhead.
- 21.5.7.4 No part of the work platform or attachments shall interfere with the safe and effective operation of other equipment fitted to the vehicle, eg handbrakes, steps, handrails, uncoupling gear etc.

21.5.8 OTHER TRANSPORT METHODS

- 21.5.8.1 Coiled steel strip may be transported on other types of vehicles (flat and open cars etc) in either horizontal or vertical alignment.
- 21.5.8.2 Fixed or removable frames and cradles may be used and shall comply with the support, restraint and damage and weather protection requirements of 21.5.3.2, 21.5.3.3, 21.5.5 and 21.5.6.
- 21.5.8.3 Coiled strip may be transported with the core vertical if securely strapped onto pallets and a suitable frame provided to locate and restrain each coil.
- 21.5.8.4 Frames and cradles may be constructed as individual units or assembled in multiples on a common base. The base structure may be similar to a platform or box-type container. Adequate provision shall be provided for securing the support structure to the transporting vehicle.
- 21.5.8.5 All methods and equipment shall be approved by the rail System on which the loading originates and the customer.

21.6 WIDE PLATE

- 21.6.1 Plates with a width greater than the clear opening between stanchions may be transported on an inclined support structure so that the loading does not infringe the appropriate Rolling Stock Outline, as indicated on Diagram 21-10.
- 21.6.2 The inclined structure may be permanently attached to the vehicle or constructed as a removable unit using container corner fittings (or equivalent components) for securement to the vehicle. Location of the corner fittings shall comply with Section 14 of this Manual.
- 21.6.3 The support structure shall preferably be pivoted on the longitudinal vehicle centre line so that it can be rotated to the horizontal position for loading and unloading by magnetic crane or forklift truck. Rotation shall be performed by mechanical or hydraulic devices.
- 21.6.4 The base frame of removable structures shall incorporate provision for handling by forklift truck, in addition to lifting by slings.
- 21.6.5 Pivoted support structures shall incorporate provision for securing the moveable portion in both the inclined and horizontal positions.
- 21.6.6 The lower edge of the inclined structure shall incorporate fixed stanchions to support and restrain the loading.
- 21.6.7 Where the vehicle does not incorporate end bulkheads, the inclined structure shall be fitted with stanchions to provide end restraint of the loading.
- 21.6.8 Plates shall be secured to the support structure using chains with load binders or webbing straps with ratchet tensioning devices. Each structure shall be fitted with five (5) strap assemblies; the minimum width of each strap shall be 75 mm. Each strap assembly shall have a minimum working strength of 15 kN.

21.7 STEEL SLABS

- 21.7.1 Vehicles for the transport of steel slabs shall be fitted with end bulkheads or walls not less than 900 mm high, permanently fixed side stanchions and floor bearers to permit loading and unloading by forklift truck.
- 21.7.2 Side stanchions shall be located to provide for loading of slabs of varying lengths by forklift truck while providing side restraint, as shown on Diagram 21-11. Height of the stanchions shall be not less than 600 mm above the upper face of the transverse bearers.
- 21.7.3 Transverse bearers shall be fitted at each stanchion location to permit loading and unloading by forklift truck, and permanently fixed to the underframe structure. The support face of the bearers shall be not less than 150 mm above the vehicle deck.
- 21.7.4 Load restraint, if used, shall be provided by alloy steel chain, not less than 10 mm link diameter, fitted with load binders or equivalent tensioning devices.
- 21.7.5 Vehicles used for the transport of hot slabs shall be so identified by the words 'Caution - Hot Steel' applied to each side of the vehicle. This notice shall be in red letters on a white background; the letters shall be not less than 180 mm in height.

21.8 LONG PRODUCTS

- 21.8 Rolled steel sections, bars and billets shall be transported on vehicles equipped for the purpose and whose length is appropriate to the length of the transported product.
- 21.8.2 Vehicles shall be fitted with end bulkheads not less than 1200 mm high. The inner face of each bulkhead shall be covered with hardwood, plywood or a resilient material (fabric reinforced rubber, polyurethane, etc) to minimise damage to the ends of the loading during transit.
- 21.8.3 Side stanchions shall be permanently fixed to the vehicle and located to permit loading, by forklift truck, of various lengths of product. The inner face of each stanchion shall be covered with a similar material to that used on the bulkheads to prevent edge damage to the loading. The height of the stanchions shall be not less than 1200 mm nor more than 1800 mm above the vehicle deck. If preferred, the stanchions may be constructed as short wall sections provided the loading function is not impaired.
- 21.8.4 Transverse bearers, of steel or hardwood, shall be fitted at each stanchion location and fastened to the floor. The minimum height of the bearers closest to the bogie centres shall be 150 mm, and for all other bearers shall be 100 mm.

21.9 RAILS

- 21.9.1 Railway rails are produced in standard lengths of 13.7 m and 27.4 m and non standard lengths as ordered by the manufacturer's customers.
- 21.9.2 Rail lengths up to 13.7 m shall be transported in bulk on single rail vehicles, lengths over 13.7 m shall be transported on multiple rail vehicles permanently coupled together. Diagrams 21-12 and 21-13 illustrate typical vehicles.
- 21.9.3 End bulkheads shall be fitted to both ends of single vehicles and the outer ends of permanently coupled vehicles. Bulkheads shall be not less than 900 mm in height and the inner face shall be covered with hardwood to minimise damage to rail ends during transit.
- 21.9.4 Permanent side stanchions shall be located adjacent to the end bulkhead and not more than 1000 mm nor less than 600 mm from the inner face of the bulkhead. These stanchions shall be tied longitudinally to the bulkhead structure by one horizontal brace near the top of the stanchion and by one diagonal brace, to prevent lateral protrusion of the rails beyond the vehicle structure during curve negotiation.
- 21.9.5 On permanently coupled vehicles, used for long rails, removable side stanchions shall be fitted near the inner bogie centres to permit loading and unloading by magnetic cranes. These stanchions shall be fitted with a lifting lug, ring or similar device to allow removal by a sling hook.
- Similar, but permanently attached stanchions, shall be fitted near the outer bogie centres. On single vehicles stanchions shall not be removable, but fixed adjacent to the bogie centres. All these stanchions shall incorporate on the inner face, a recess 160 mm wide and 60 mm deep to retain the transverse bearers used to separate tiers of rails. A typical cross section of a stanchion is shown on Diagram 21-12.
- 21.9.6 All stanchions on double (permanently coupled) vehicles shall be designed to withstand the forces produced by the lateral rail deflection experienced while negotiating a curve of 100 m radius, with the vehicles loaded to their maximum capacity with 65 kg/m rails.
- 21.9.7 The inner face of all side stanchions shall be covered with a resilient, low friction material to prevent edge damage to rails during transit.
- 21.9.8 Rails shall be loaded in tiers. Hardwood transverse bearers shall be placed between the vehicle deck and the first tier and between subsequent tiers. Each tier shall contain sufficient rails of the same cross section to occupy the available space between the stanchions, partly loaded tiers are not permitted, except that the top tier may contain less than the others if spacers of adequate strength are provided between the rails and stanchions.
- The bearers shall be 150 mm wide and 110 mm high and the ends shall be located in the recess in the inner stanchion face. The length of the bearers shall be not less than 10 mm nor more than 20 mm less than the distance between the recesses.
- 21.9.9 Vertical restraint (tie down) is not required, but the tops of removable stanchions may be tied together laterally using chains and load-binders or equivalent devices.
- 21.9.10 Double vehicles used to transport rails longer than 13.7 m shall be permanently coupled together to prevent inadvertent uncoupling by operating staff, preferably by using a solid drawbar in lieu of standard couplers. If the latter are used the lock-lifters shall be fitted with a device to prevent their operation. This device shall not be able to be removed by other than workshop or maintenance personnel; rings, bars, spring pins etc are not permitted.

21.10 ELECTRICALLY POWERED REFRIGERATED CONTAINERS

21.10.1 Refrigerated containers equipped with electrically operated refrigeration units (built in or 'clip on') may be carried on specially equipped vehicles, fitted with through-wiring, end connections, switchboard and outlets for connection to the containers.

These vehicles in a dedicated consist will be provided with power from a rail vehicle equipped with diesel-driven alternator sets (power van) head end power equipped locomotives or from a removable self-contained unit comprising one or two alternator sets (power pack) mounted on one of the container transport vehicles.

21.10.2 The container transport vehicles shall preferably be designed to carry two (2) 6.1 m ISO containers and shall be fitted with all necessary electrical equipment in addition to the requirements of Section 11.

21.10.3 Each vehicle shall be fitted with two (2) through-wired circuits (A&B) one each side, comprising 3 phase, neutral and trip wires enclosed in 50 mm diameter galvanised steel conduit, terminating in ROA standard 4-pin receptacles mounted on each end sill.

21.10.4 A switchboard shall be fitted on the 'B' circuit side of the vehicle near the centre. It shall incorporate a 3 phase, 40 Amp change-over switch (A and B circuits) and two (2) weatherproof 3 phase, 4 pin, 32 Amp outlets, each protected by a 3 phase, 32 Amp circuit breaker fitted with an insulating cover.

21.10.5 A junction box of 300 mm x 400 mm x 170 mm nominal dimensions, shall be fitted in the 'A' circuit. Power (3 phase), neutral and trip cables between the junction box and the switchboard shall be enclosed in 50 mm flexible conduit.

21.10.6 A typical vehicle layout is shown on Diagram 21-14, together with minimum cable sizes. The schematic electrical diagram is shown on Diagram 21-15.

21.10.7 Power vans used with container consists shall be built as rail vehicles complying with all applicable sections of this Manual. In addition, they shall be fitted with through wiring and receptacles as described in 21.10.3. Two (2) alternator sets shall be installed, the capacity of which shall be adequate for the anticipated load, but not greater than the cable rating. Output shall be 3 phase, 415 V, 50 Hz. Each alternator set shall be capable of supplying either the 'A' or 'B' circuit via change-over switches, and synchronising facilities shall be provided to enable sets to be operated in parallel.

Instrumentation shall include, for each set, a kilowatt-hour meter, volts, ampere and frequency meters, and an hours-run meter, in addition to an engine tachometer. Engine shutdown shall be provided in the event of overspeed, low oil pressure and high oil and coolant temperature. Circuit-breakers shall be fitted with thermal overload protection.

21.10.8 Removable self-contained power units shall comply with the relevant requirements of 21.10.7 as applied to one or two alternator sets. Each unit shall be mounted on a base frame to which is also secured the fuel tank. Instruments and controls shall be located in weatherproof enclosures. Two (2) ROA standard 4-pin power receptacles shall be fitted to the same end of the unit to enable connection to both the 'A' and 'B' vehicle circuits.

Units shall be built on a base frame dimensionally compatible with 3.05 m or 6.1 m containers (refer to Section 14 of this Manual), and preferably incorporating container bottom corner fittings for securement to the vehicle. Provision shall be made for lifting at the bottom corners by slings and also by forklift truck. Where desired, the units may be fully enclosed provided adequate ventilation and cooling is available to ensure effective operation under climatic conditions where the maximum shade temperature may exceed 40°C for six to 10 consecutive days.

In operation the power unit will be located at the extreme end of the container vehicle consist and connected to the vehicle electrical system by jumper cables fitted with ROA standard 4-pin power plugs at each end.

21.10.9 For all power sources the fuel capacity shall be sufficient to provide a minimum of 50 hours of operation for all alternator sets when operating at full load on a 60% duty cycle. Where space permits, sufficient fuel for 100 hours continuous operation is desirable.

21.10.10 The refrigeration units of containers used in this service shall be provided with a three phase, 4-pin, 32 Amp weatherproof outlet and matching jumper cable, or a fixed connection cable fitted with a 4-pin, 32 Amp plug compatible with that used on the vehicles.

21.10.11 Electrical plugs, sockets and couplers, except those to the ROA standards, shall comply with all the requirements of AS 3123. Control devices shall conform, as appropriate, to Australian Standards AS 1029, AS 1431, AS 1930, AS 2184, AS 3133 and any other applicable standards. All wiring shall comply with the requirements of AS 3000.

21.11 NEWSPRINT

21.11.1 Newsprint rolls are normally carried in the vertical position, loaded in one or two layers depending on the roll width and vertical clearance. They shall be protected against damage or distortion on the ends and the circumference.

21.11.2 Vehicles for transporting newsprint shall be fully enclosed and weatherproof. Interior wall lining shall be flat and smooth with a flush surface. There shall be no protrusions, projections or sharp edges and all fastenings shall be recessed below the surface of the lining.

21.11.3 Vehicle floors shall be of steel or aluminium and designed to accommodate the loading imposed by forklift trucks (refer to Section 8.4.2 of this Manual). Floors shall be covered with a smooth resilient coating having an anti-slip high-friction surface to minimise load movement during transit and to provide traction for lift trucks during loading and unloading operations. The coating shall be entirely suitable for this service and possess high resistance to abrasion, impact and gouging.

Surface preparation and application of the coating shall be strictly in accordance with the manufacturer's instructions and recommendations.

21.11.4 Access doors shall be located at the centre of the vehicle, on each side, and shall have minimum clear openings of 4800 mm wide and 2350 mm high. The doors shall incorporate weatherproof seals at the trailing edges and at the mating faces. Sliding doors shall comprise two sections opening away from each other; a robust, easily operated latch shall be fitted at the junction to secure the doors in the closed position and shall incorporate provision for a padlock and a standard railway seal. The inner face of the doors shall be smooth, flat and free of protrusions, projections and sharp edges; all fastenings shall be recessed below the surface of the lining.

21.11.5 Sliding doors shall preferably be of the 'plug' type, moving out when first opened to minimise risk of damage to the newsprint rolls during the opening procedure. Doors shall be supported on rollers for opening and closing, but during transit the rollers shall be substantially free of vertical loads to reduce damage to bearings and the roller support track. The opening mechanism and door movement shall be easily performed by one person from either ground level or a platform (loading dock).

21.11.6 Linear sliding doors may be used. Such doors shall be supported on rollers at the bottom during opening and closing. For transit the rollers shall be retracted so that the mass of the door is supported by the roller track or similar structure.

The roller lift/retracting mechanism shall be easily operated by one person from either ground or platform level and shall incorporate a self-locking feature to maintain the door in the raised position, clear of the support track for movement. Roller design shall ensure that door movement can be performed by one person. Suitable hand grips shall be provided on each door to permit manual movement from ground or platform level; reinforced pockets shall be fitted to each door to provide for opening or closing by mechanical means in the event of roller failure.

Guides shall be fitted to the bottom of all doors, at both ends, to prevent lateral displacement. The guides shall provide positive engagement with the door tracks in both the raised and lowered positions. A safety bracket shall also be fitted to the bottom of the doors at both ends to prevent vertical displacement. The guides and safety brackets shall be secured to the doors by bolts or swaged-pin fasteners; welding is not permitted.

To prevent rolls from contacting the inner face of the doors due to movement in transit, removable load restraining bars shall be fitted across door openings at vertical intervals of 400 mm above floor level. Bars shall be lightweight, easily handled by one person and fitted with a resilient covering on the inner face; they shall not protrude inboard of the wall lining surface. Flexible webbing straps fitted with a hand-operated tensioning device may be used in lieu of restraining bars. Strap installation shall ensure that the tensioning device will not contact the loading under normal operating conditions. The support/locating structure for the bars and straps shall extend the full height of the door opening so as not to create local protrusions.

21.11.7 Folding, curtain type doors may be used in lieu of rigid sliding doors and shall comply with the requirements of Section 21.12.

Load restraining bars or straps shall be fitted as described in 21.11.6, or combined with load restraining nets in accordance with 21.12.

21.11.8 The minimum internal height at the side wall shall be 2500 mm to permit double-stacking of 1200 mm wide rolls. The roof contour and support structure depth shall be designed to maximise the internal height and load space for forklift truck operation and load capacity.

21.12 CURTAIN-SIDE VEHICLES: VARIOUS PRODUCTS

21.12.1 Curtain-side vehicles are suitable for transporting substantially unitised products (newsprint, strapped or shrink-wrapped pallets etc) or low-mass, high volume goods (breakfast cereals, toilet rolls, facial tissues, disposable napkins etc). The folding curtains permit rapid and selective loading and unloading.

21.12.2 The curtains shall be made from double weave fabric-reinforced PVC or equivalent material possessing the following minimum average properties:

- (a) Mass: 850 g/m²
- (b) High gloss finish both sides
- (c) Temperature range: -30°C to +70°C
- (d) Tensile Resistance according to BS 3424/6A of 4300 N warp, 4000 N weft
- (e) Tear Strength according to BS 3424/7B of 1000 N warp, 1200 N weft

The material shall incorporate flame retardant additives.

21.12.3 The curtains shall consist of overlapping panels of material welded to form vertical pockets at not more than 600 mm centres to accept tie-down straps. The top of each curtain pocket shall be attached to a roller running in a continuous one-piece guide/support track firmly attached to the roof structure.

The bottom of the curtain shall fold under the special coaming fitted to the wagon side, held in place by the side tie-down straps.

21.12.4 The side tie-down straps shall consist of flexible webbing, incorporating a corrosion proof, rapid action hand tensioning device. The straps shall not be attached to the curtain other than to the top support roller. The bottom of each strap shall be fitted with a hook or similar device to engage the inner edge of the coaming. Each strap assembly shall have a minimum safe working load in tension of 20 kN.

21.12.5 Curtains shall be fixed to the vehicle structure at one end and the other end shall incorporate a circular vertical member, which for closing engages in a hand-operated ratchet tensioning device. This device shall provide rapid full-length, full height tensioning of the curtain. The operating handle shall incorporate provision for a padlock and railway wire seal.

21.12.6 The upper guide track or the longitudinal roof member immediately above it shall be fitted with a continuous, flexible, pelmet type cover on the outer face, which effectively weatherproofs the top of the curtain while permitting easy longitudinal movement.

21.12.7 The vehicle corner pillars shall incorporate suitable recesses to accept the fixed end of the curtain and the tensioning mechanism, and to provide a weatherproof seal between the curtain and vehicle structure.

21.12.8 With the ends and side straps correctly installed and tensioned, the bottom of the curtain shall not be able to be lifted by hand more than 50 mm above the top of the coaming between any two adjacent side straps.

21.12.9 Lateral load restraint may be provided by removable bars or tensioned straps, as described in 21.11.6 above, or by coarse mesh nets fitted inside the side curtains. These load restraint nets shall be supported by rollers running in a track fitted inboard of, or incorporated in, the main curtain track. The bottom of the nets shall be fitted with tie-down straps incorporating tensioning devices and hooks for coaming attachments.

21.12.10 Curtain panels may be used in lieu of sliding doors or body panels, if desired, where the product and loading methods are suitable.

21.12.11 The vehicle body design shall provide for adequate side pillars to support the roof structure in the absence of rigid body panels. Pillar location, both longitudinally and laterally shall be suitable for operation of the side curtains and load nets.

DIAGRAM 21-1

DECK HEIGHT - CAR CARRIERS

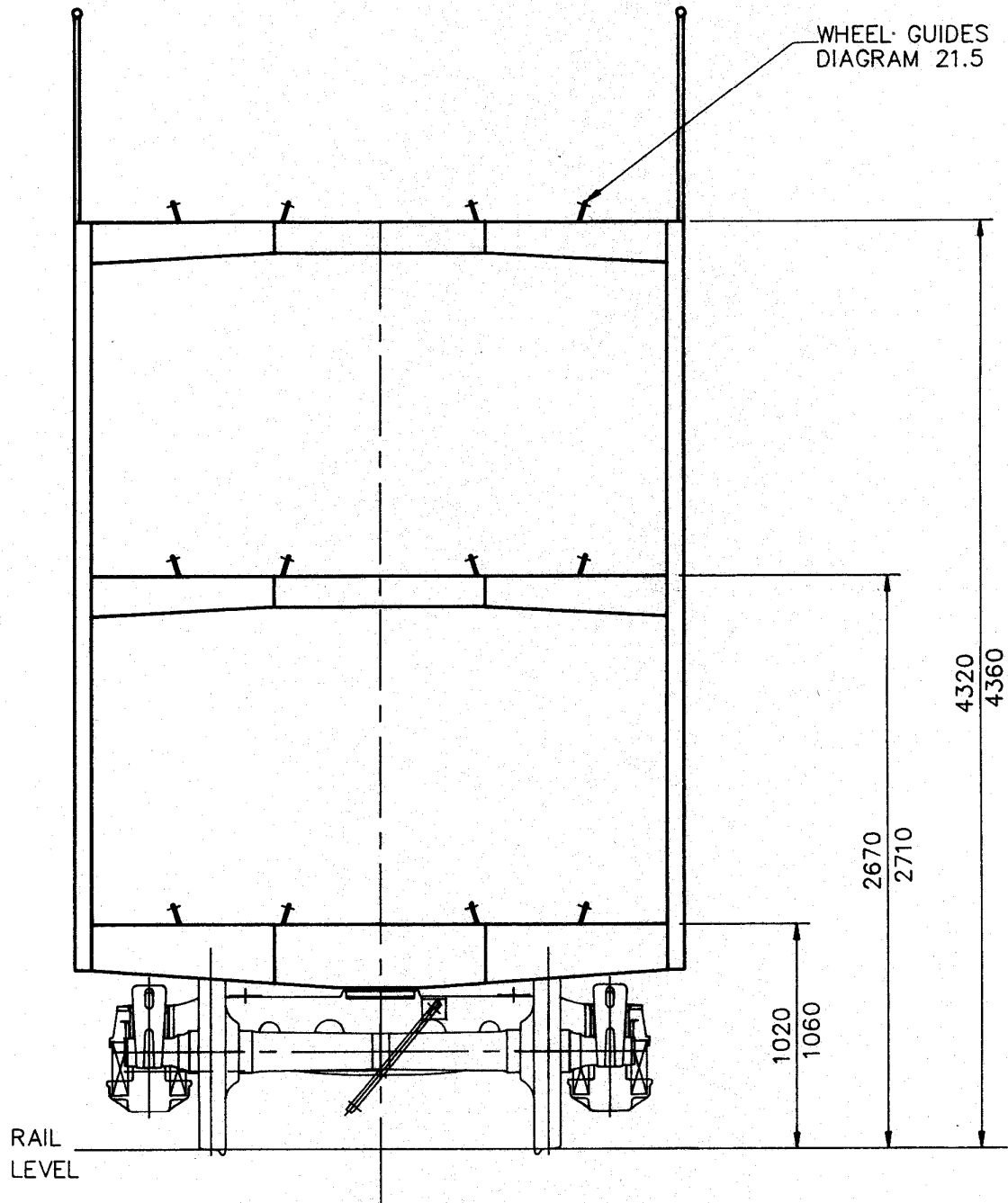


DIAGRAM 21-2

TRACK CONNECTOR ASSEMBLY

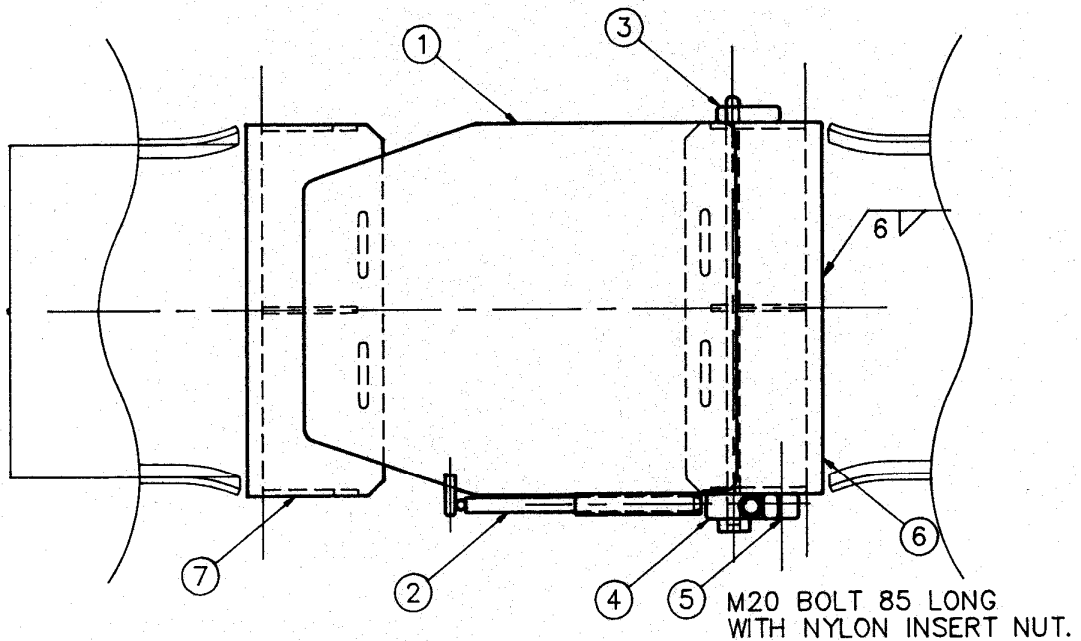
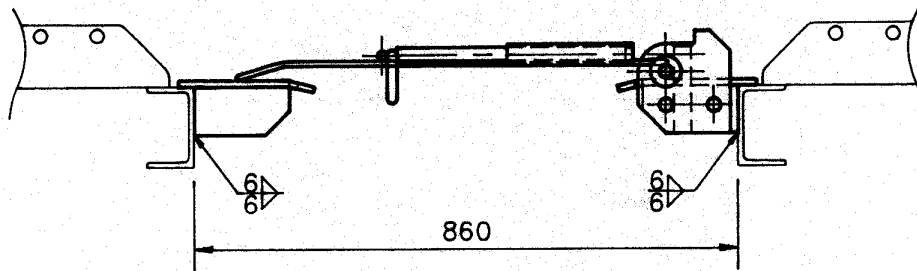
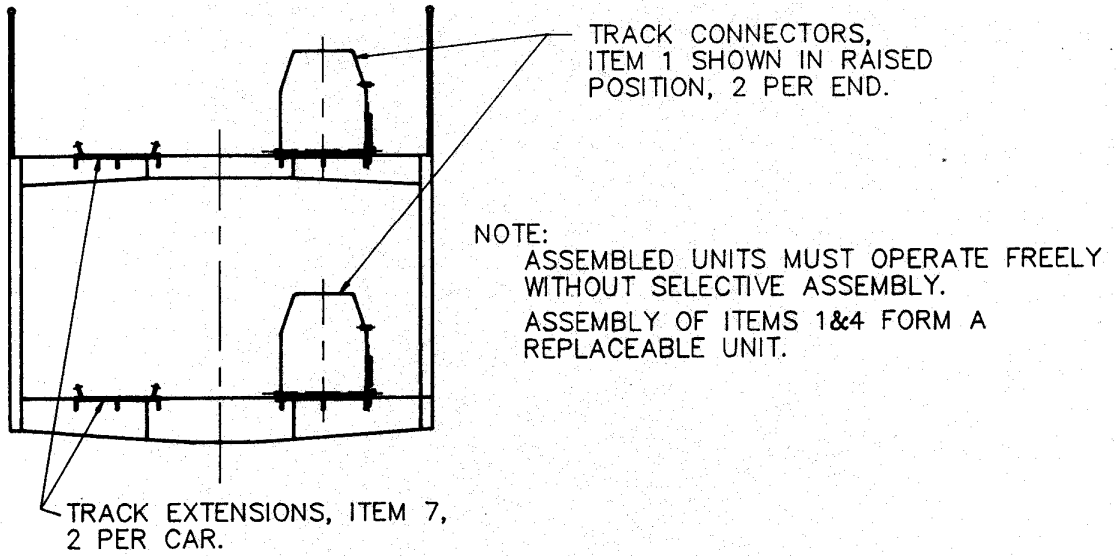


DIAGRAM 21-3

TRACK CONNECTOR DETAILS

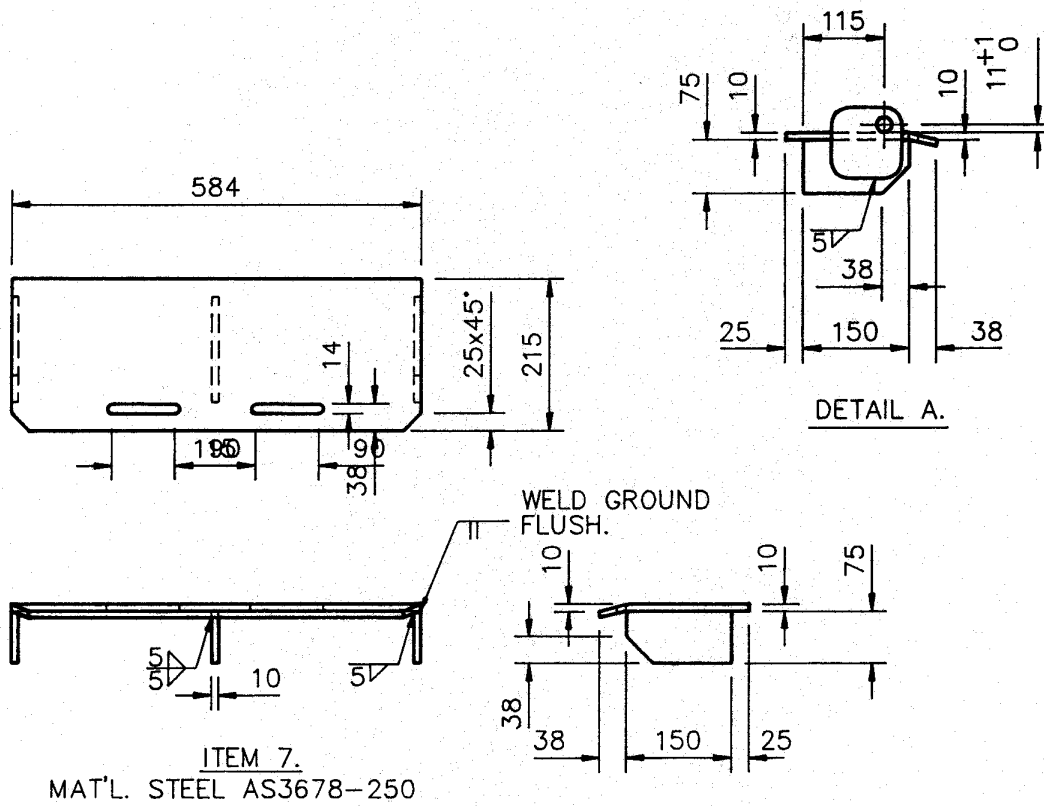
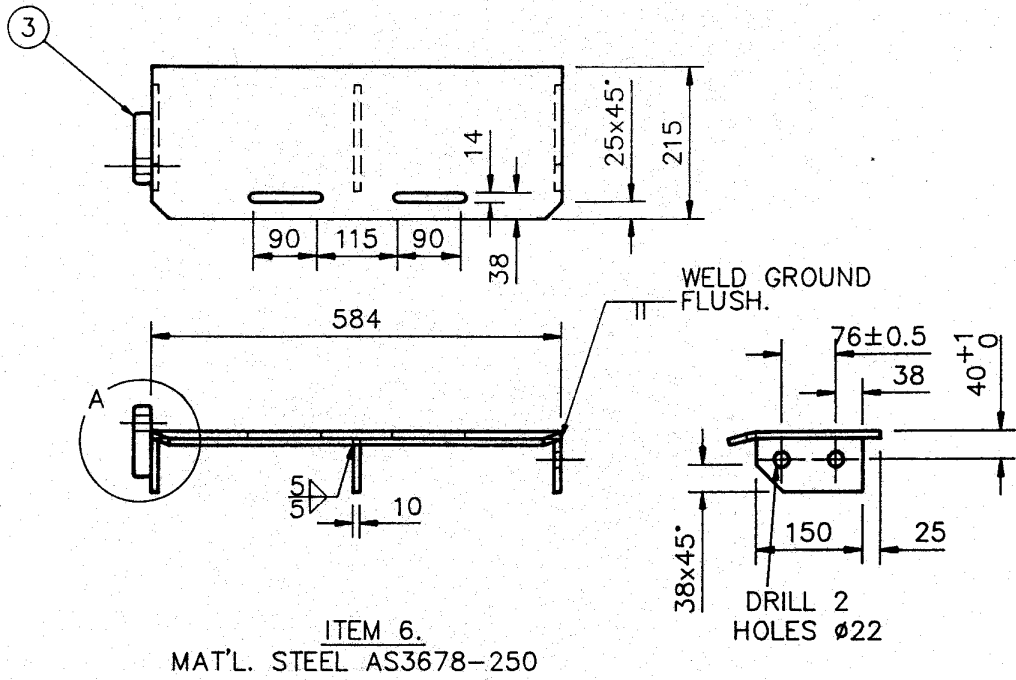


DIAGRAM 21-4

TRACK CONNECTOR DETAILS

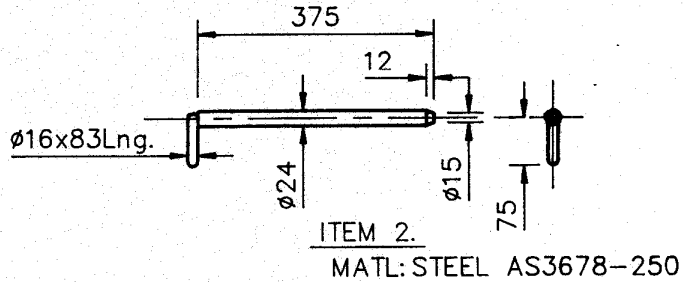
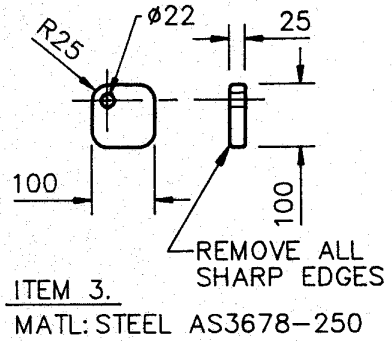
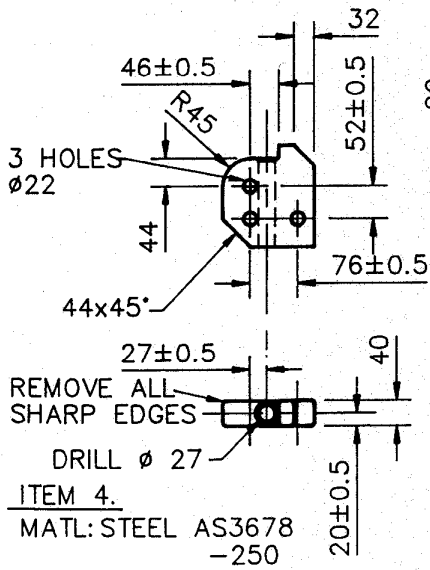
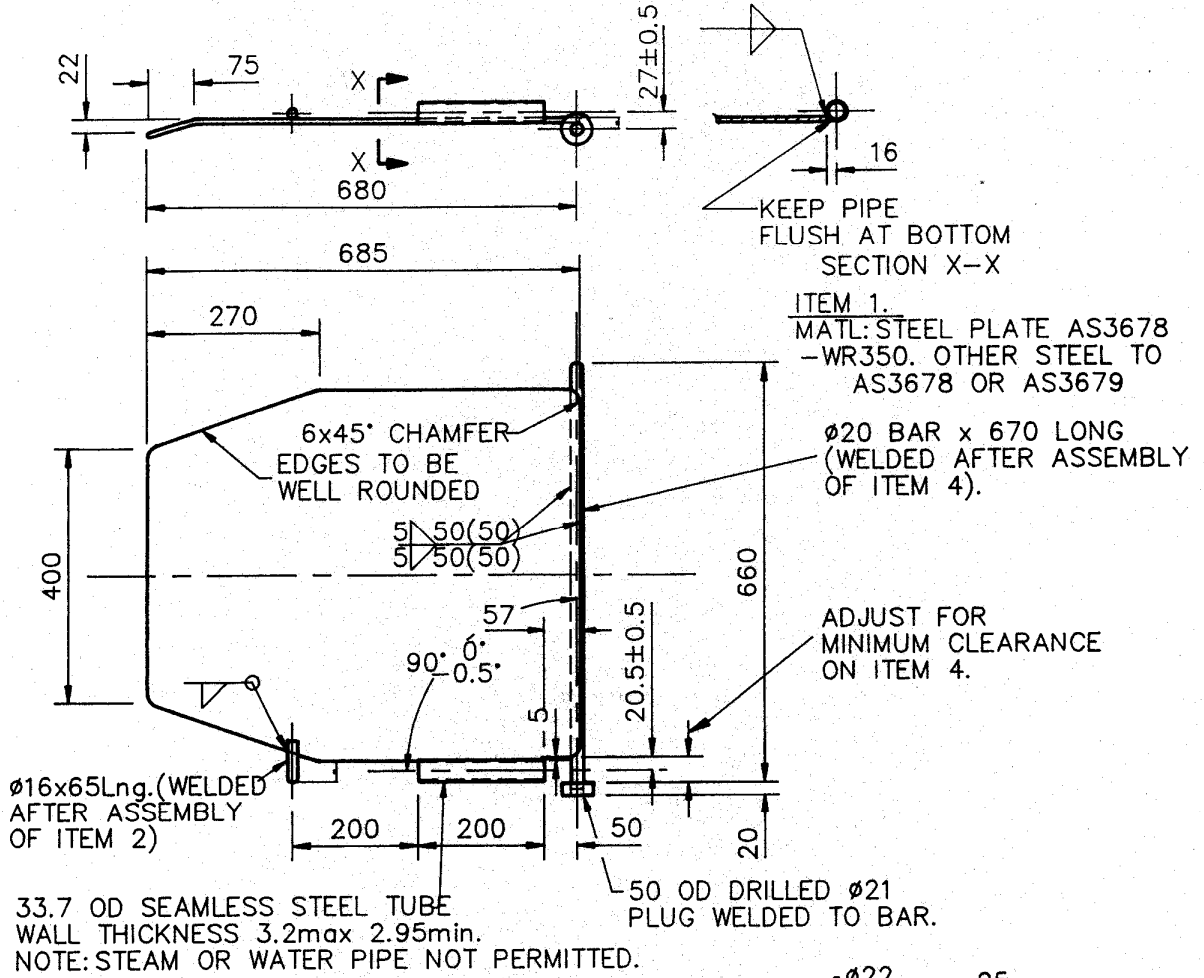
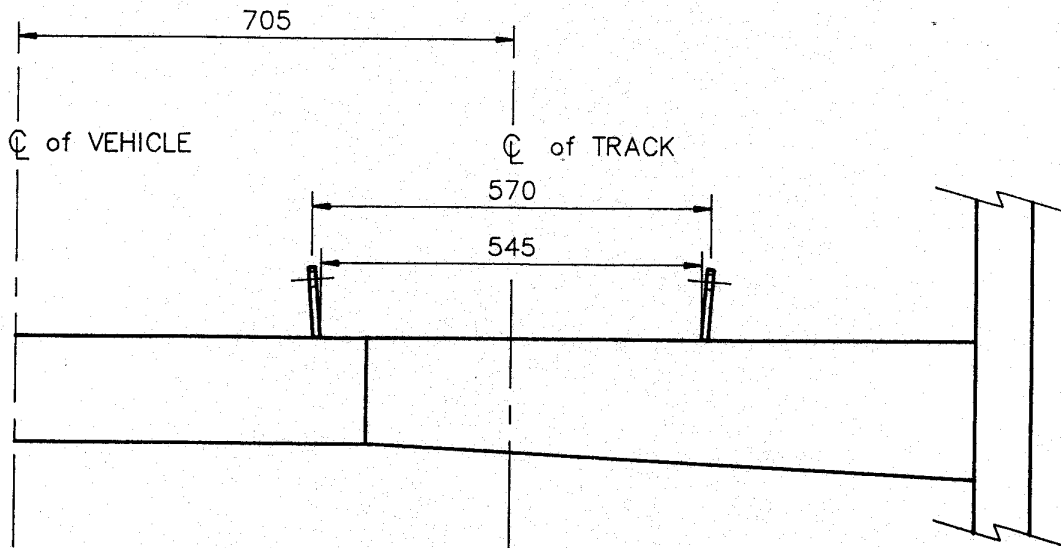
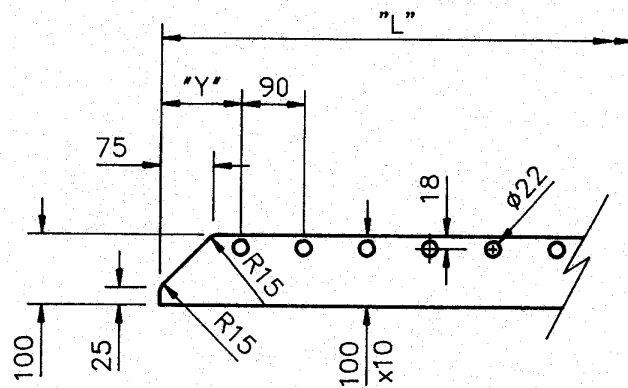


DIAGRAM 21-5

WHEEL GUIDES



WHEEL GUIDES



WHEEL GUIDE DETAIL

"L" & "Y" TO SUIT VEHICLE LENGTH.

DIAGRAM 21-6A
WHEEL CHOCK ASSEMBLY

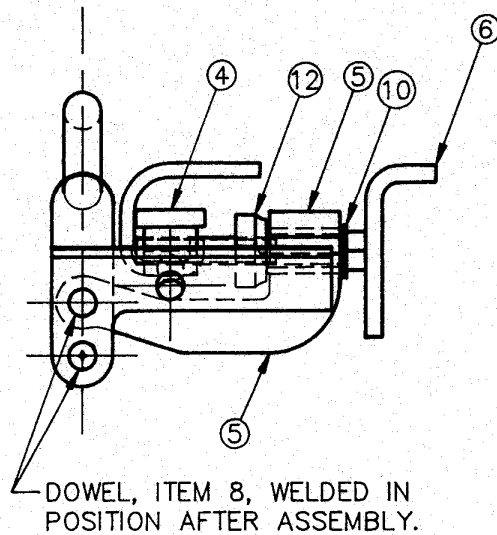
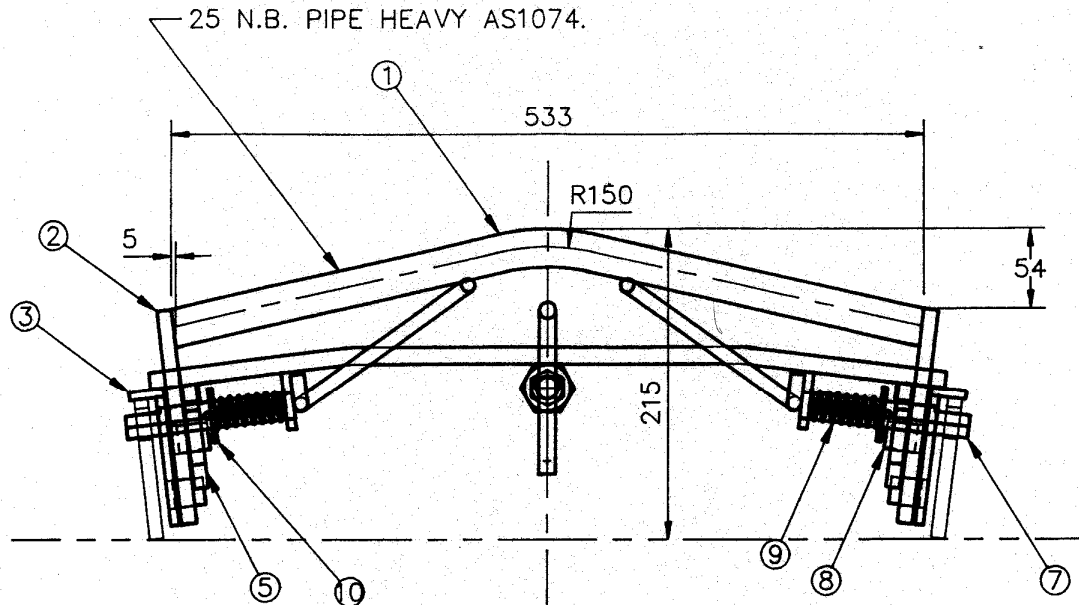
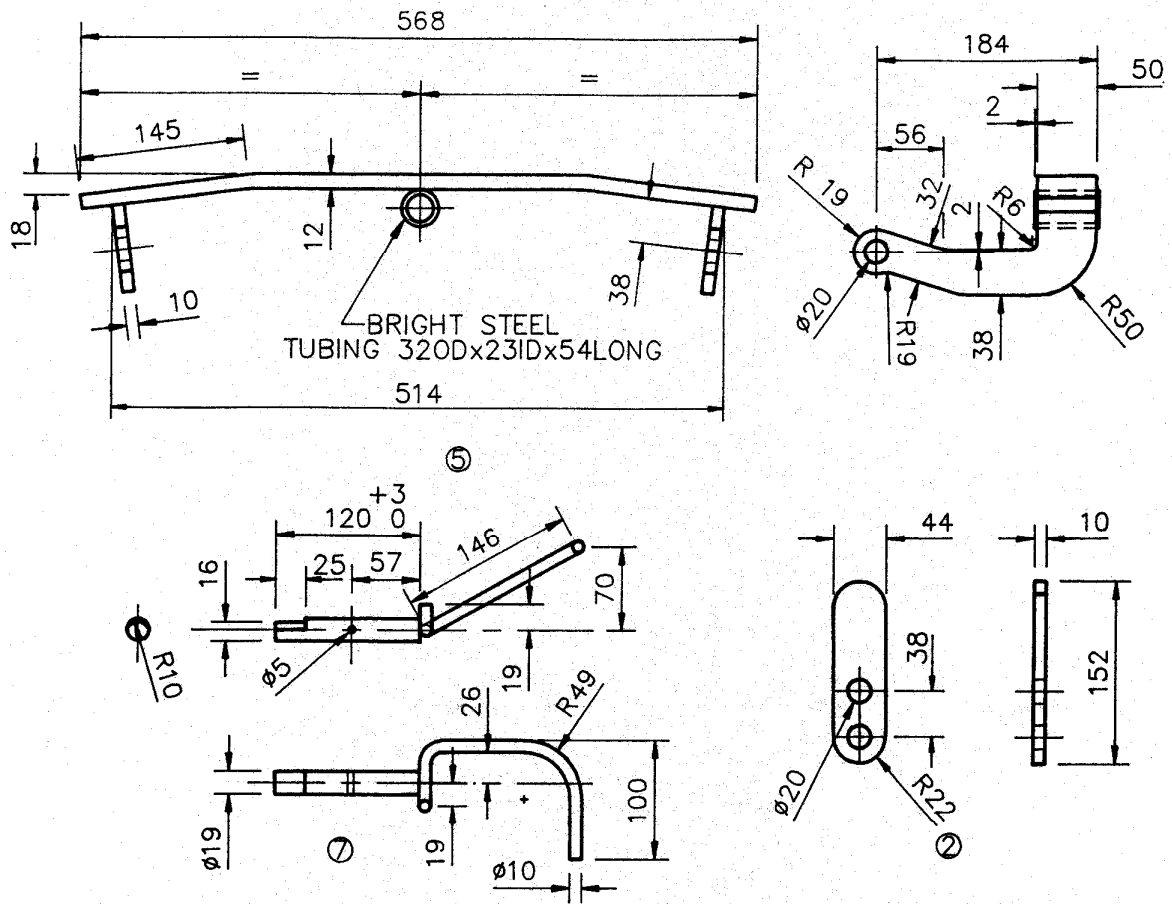


DIAGRAM 21-6B

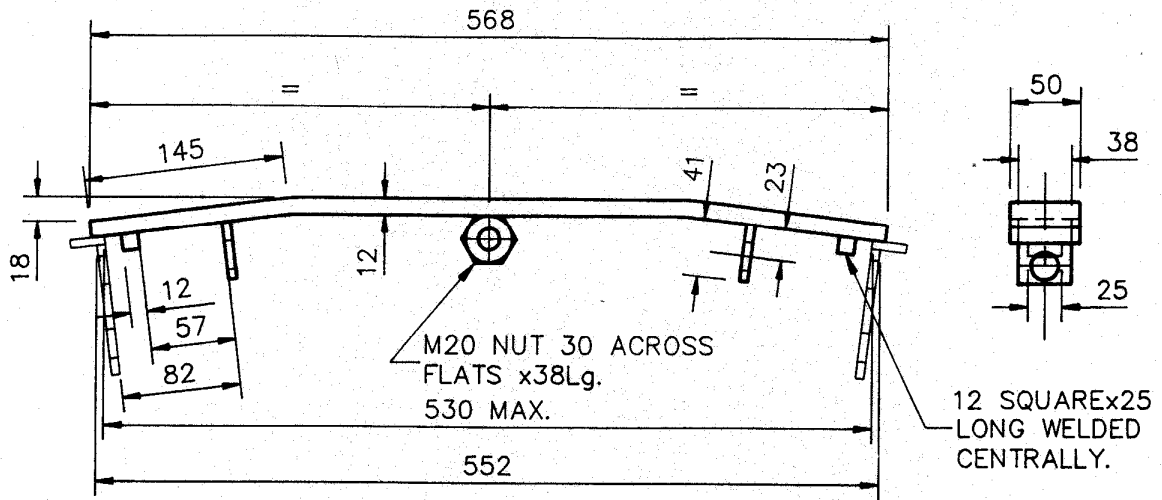
WHEEL CHOCK DETAILS



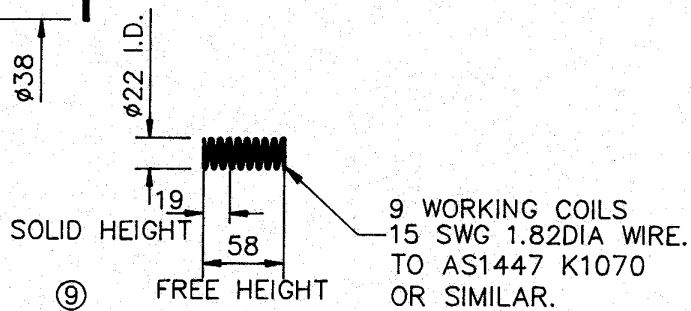
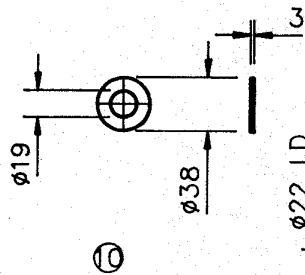
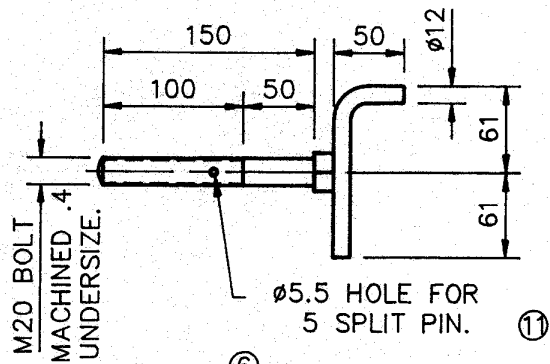
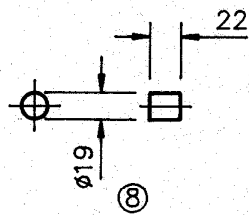
12	ϕ M20 CASTELLATED NUT	1	STEEL
11	ϕ 5 SPLIT PIN	3	-
10	WASHER	4	STEEL
9	SPRING	2	15 SWG (1.82)PIANO WIRE
8	DOWEL	4	ϕ 19 BAR AS3679
7	LOCKING PIN (ASSY.)	2	1 AS DRAWN 1 OPP.HAND
6	ADJUSTING SCREW (ASSY.)	1	-
5	SLIDING BAR (ASSY.)	1	-
4	FIXED BAR (ASSY.)	1	-
3	SIDE BEARER	2	1 AS DRAWN 1 OPP.HAND
2	SIDE PLATE	2	-
1	CHOCK BAR	1	AS1074
Item	Detail	No./ASSY.	Material and Remarks

DIAGRAM 21-6C

WHEEL CHOCK DETAILS



④

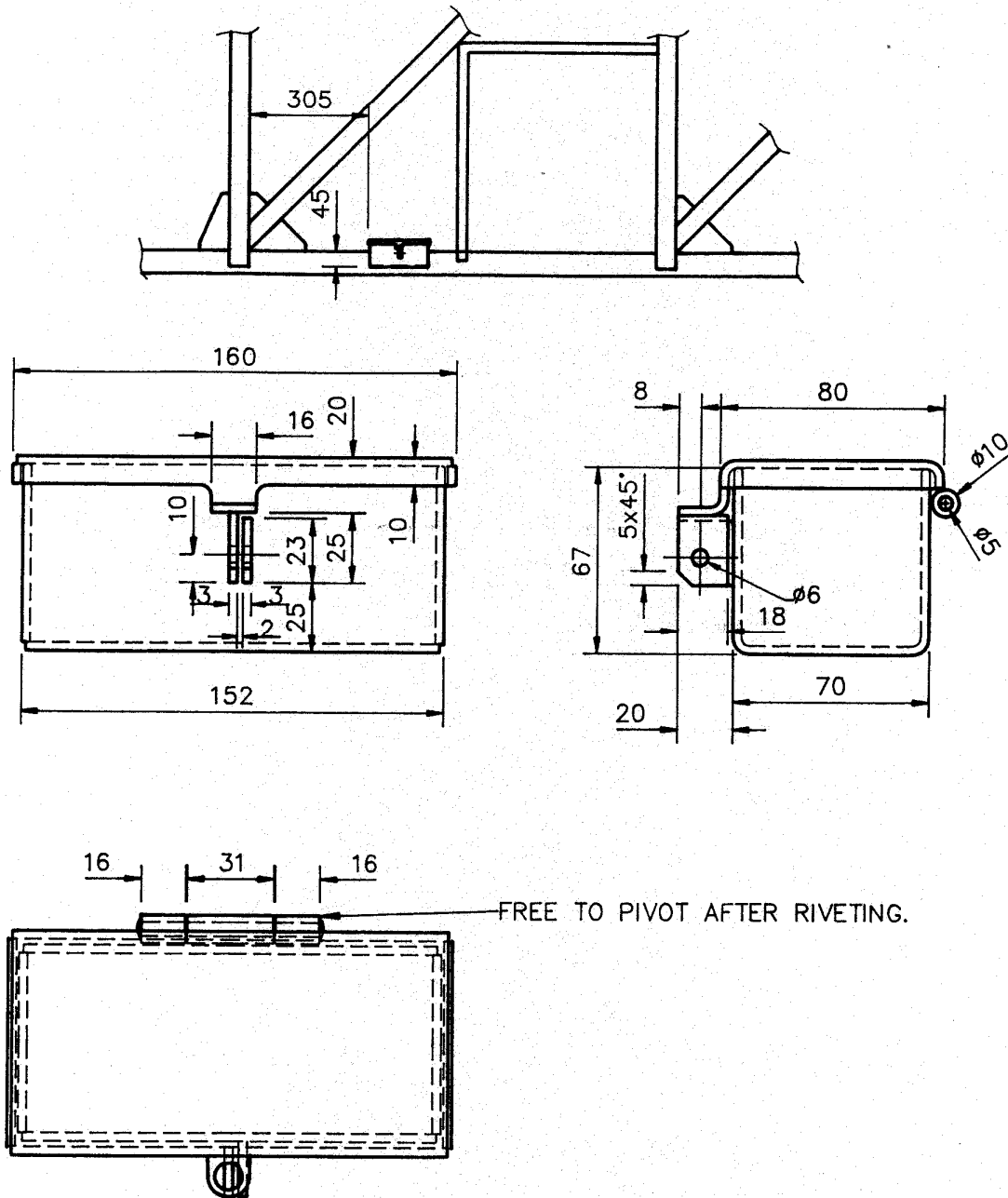


NOTE:

- 1.MATERIAL: STEEL AS3678 OR 3679, GRADE 250 UNLESS OTHERWISE SPECIFIED.
- 2.ALL WELDS: 5mm FILLET.
- 3.ALL PARTS TO BE PAINTED RED OXIDE EXCLUDING THREADS.

DIAGRAM 21-7

KEY BOX



MATERIAL: 3mm PLATE AS3678. ALL CORNERS TO BE GROUND SMOOTH. ONE BOX ONLY REQUIRED PER WAGON.

DIAGRAM 21-8

TYPICAL PRESSURE DISCHARGE VEHICLE

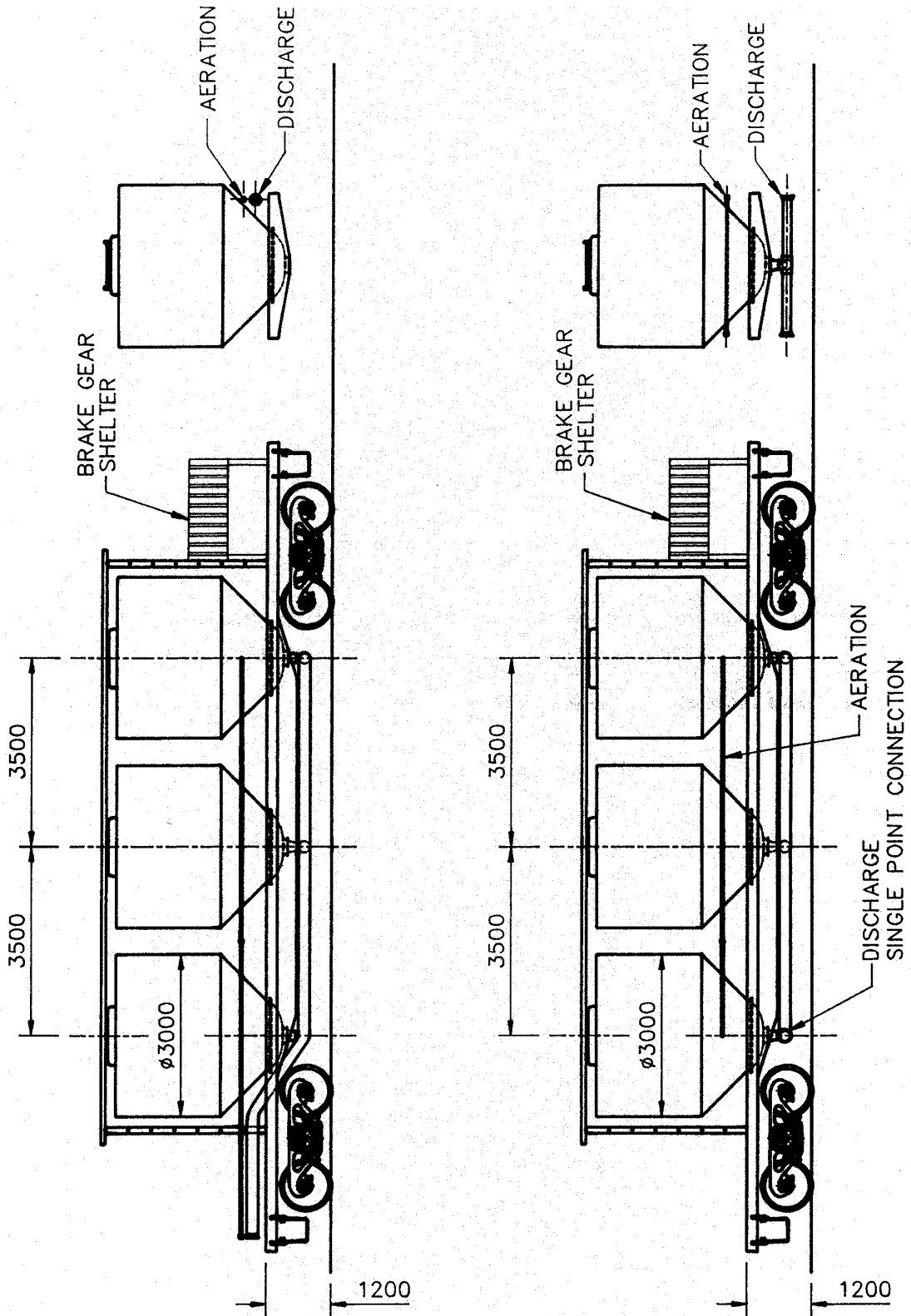


DIAGRAM 21-9

TYPICAL VACUUM DISCHARGE VEHICLE

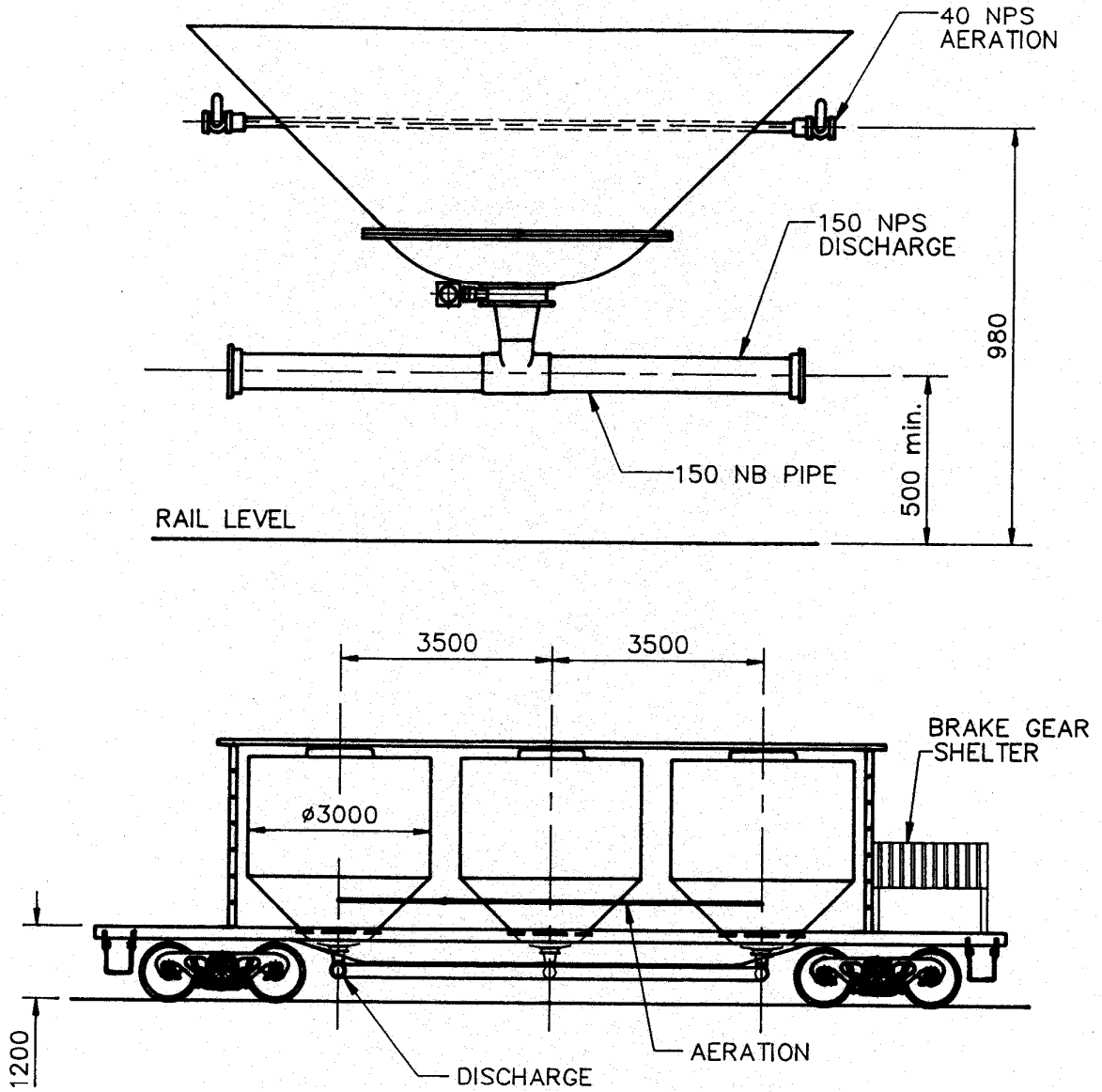
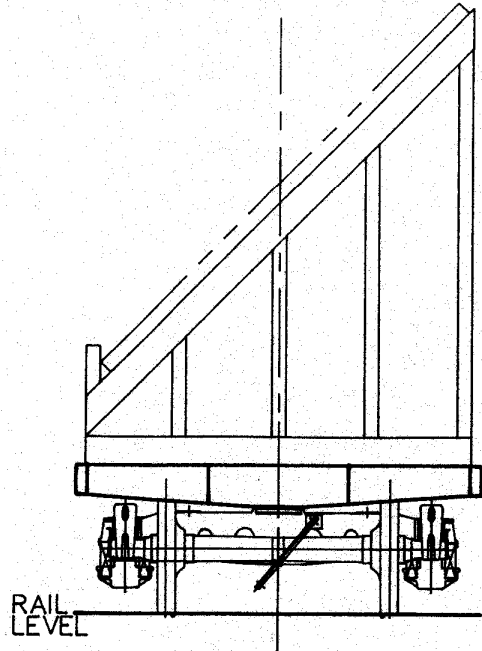
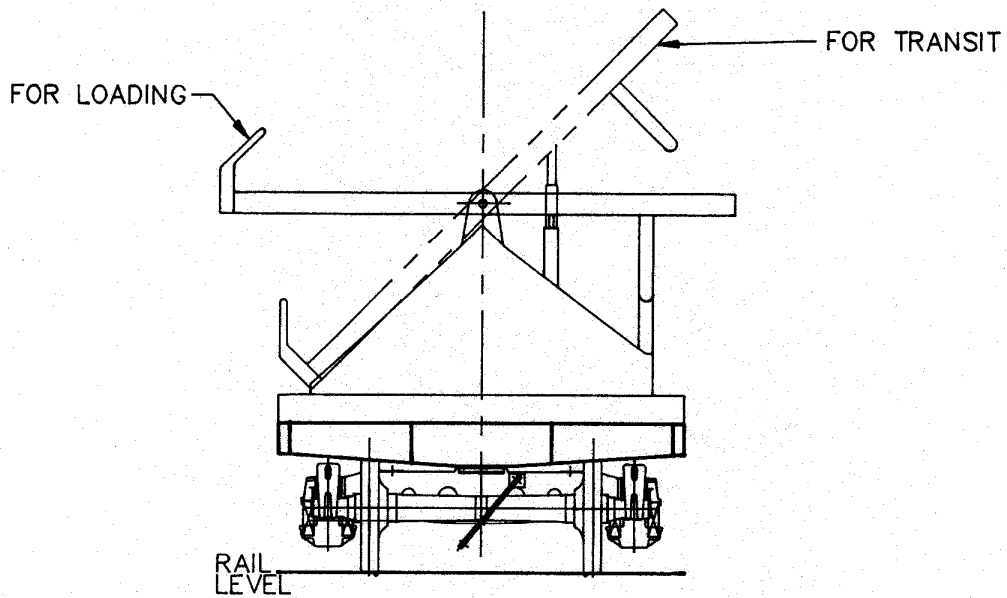


DIAGRAM 21-10

TYPICAL WIDE PLATE SUPPORT



FIXED SUPPORT STRUCTURE



ROTATING SUPPORT STRUCTURE

DIAGRAM 21-11

TYPICAL VEHICLE FOR STEEL SLABS

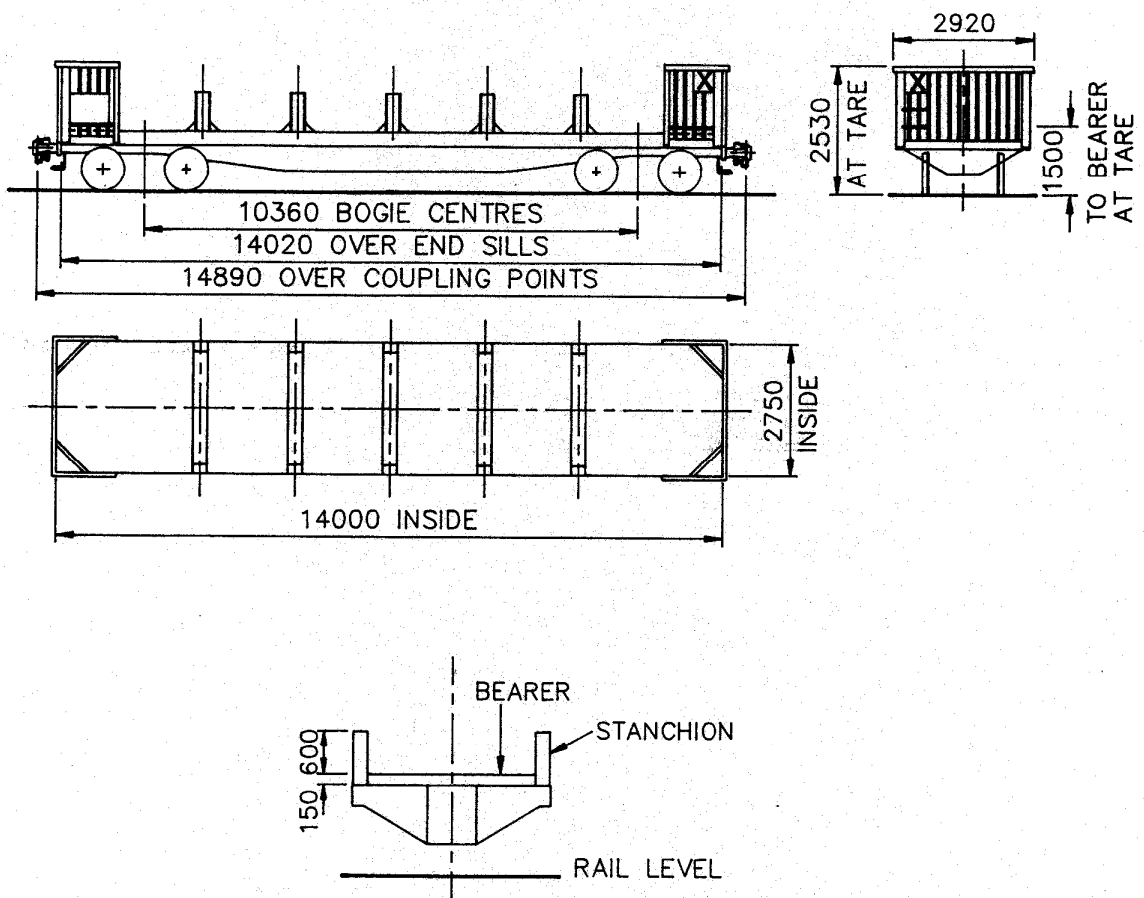


DIAGRAM 21-12

TYPICAL VEHICLE FOR SHORT RAILS

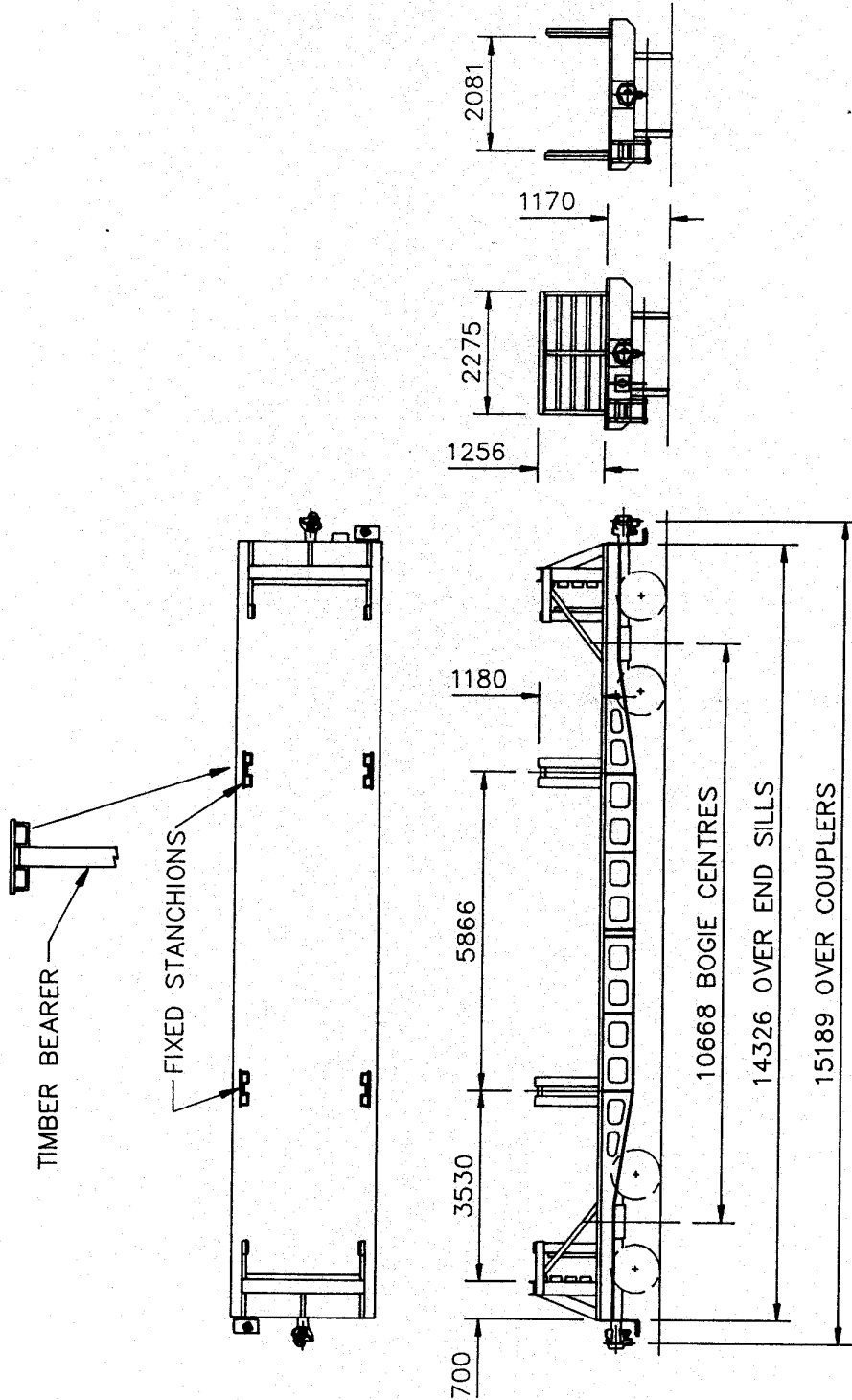
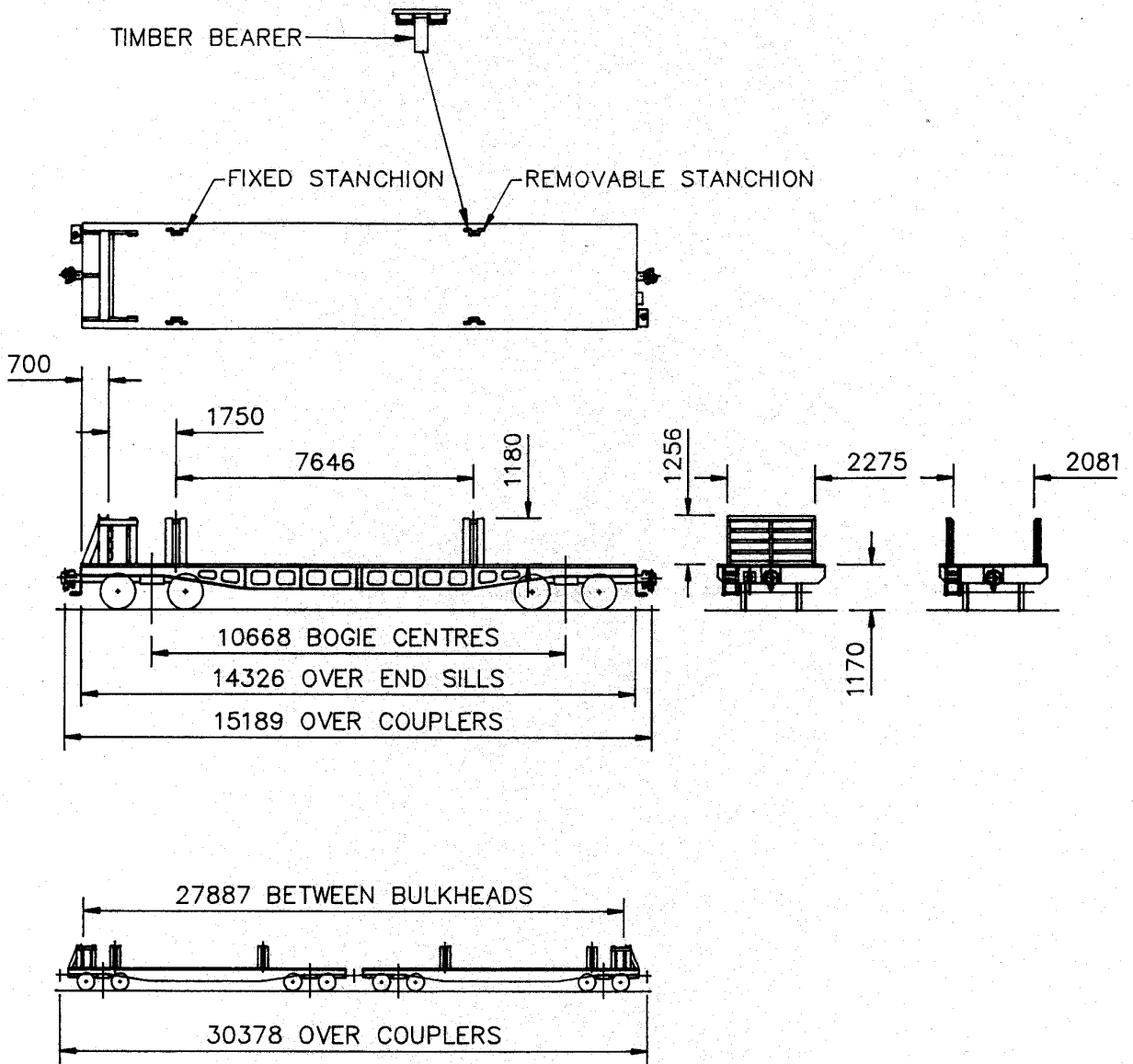


DIAGRAM 21-13

TYPICAL VEHICLE FOR LONG RAILS



WAGONS ARE PERMANENTLY COUPLED IN PAIRS FOR CARRIAGE OF LONG RAILS (27.4m).

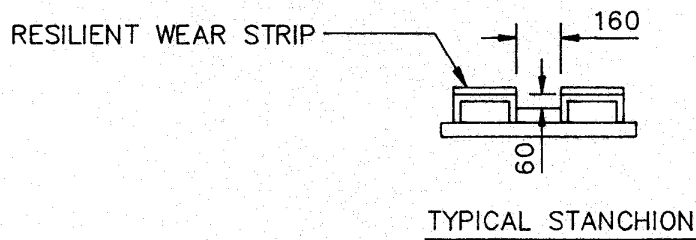


DIAGRAM 21-14

ELECTRICALLY POWERED CONTAINERS -
VEHICLE LAYOUT

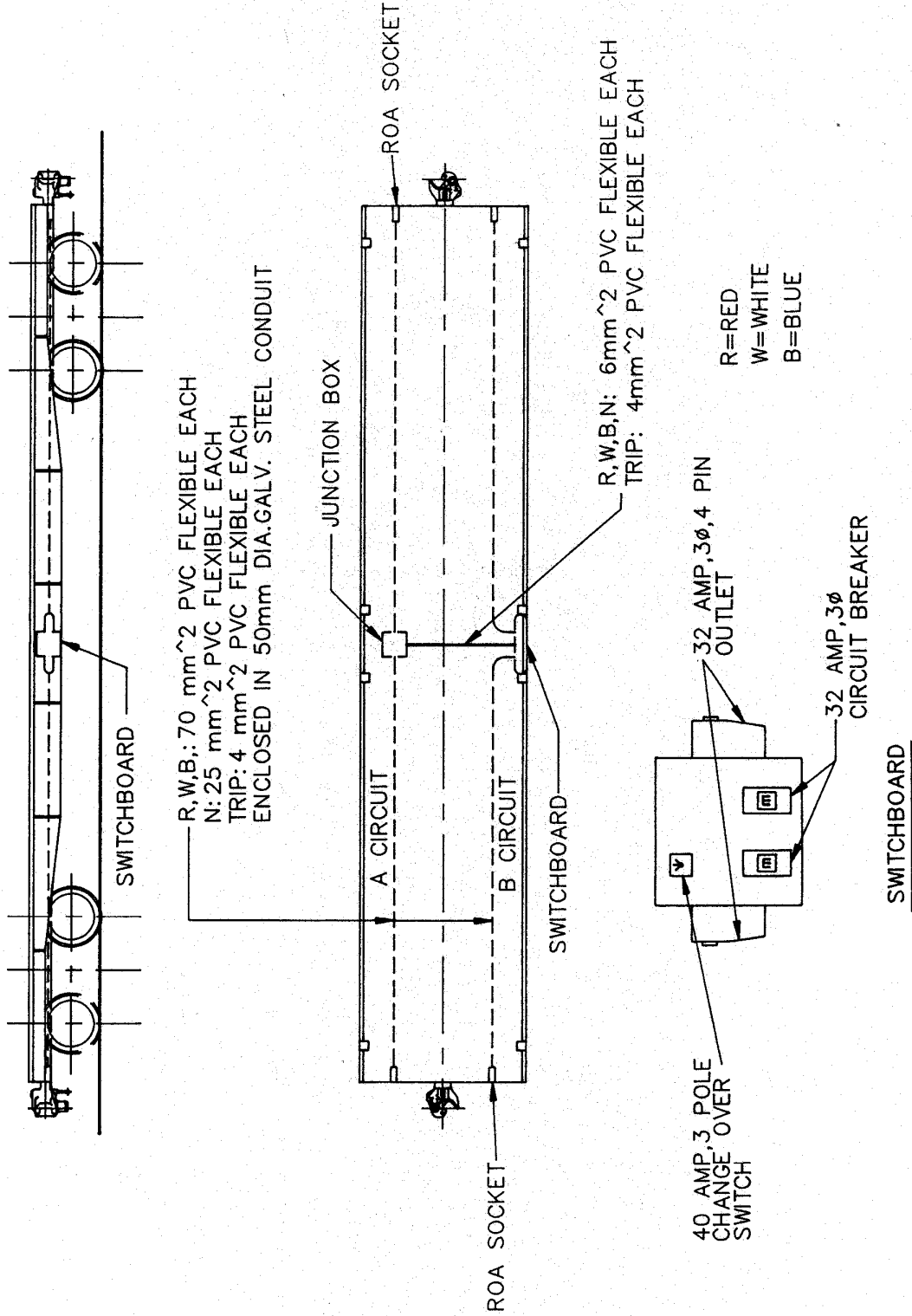


DIAGRAM 21-15

ELECTRICALLY POWERED CONTAINERS -
VEHICLE SCHEMATIC

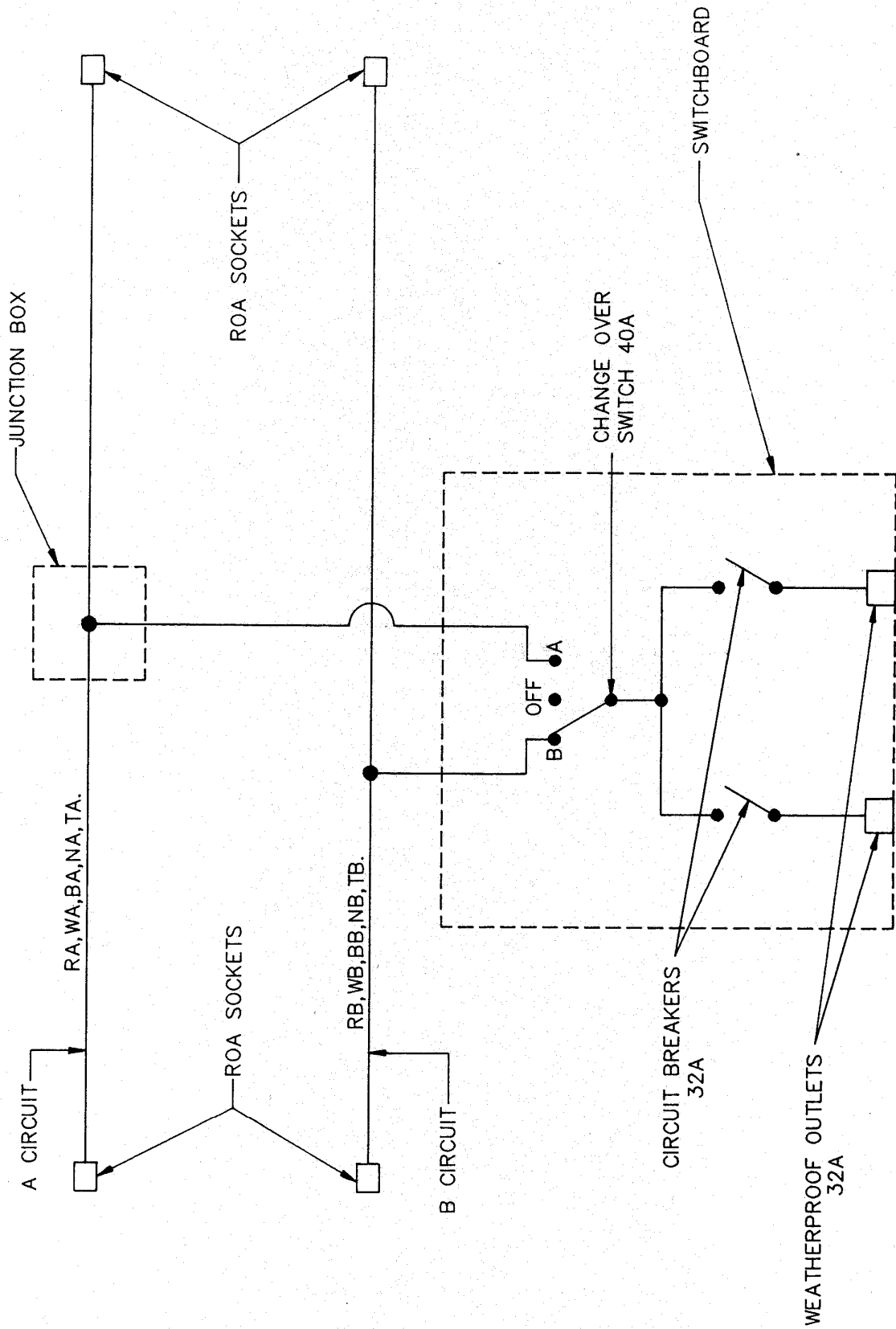


DIAGRAM 21-16

TYPICAL VEHICLES FOR COILED STEEL STRIP

