

SECTION 6

FREIGHT VEHICLE BOGIES

ROA MANUAL
SCHEDULE OF AMENDMENTS
SECTION 6

AMENDMENT NUMBER	PAGES AMENDED	AMENDMENT SUMMARY	DATE ISSUED

Portions of this Section of the ROA Manual highlighted by red text are superseded by one of the following RISSB Australian Standards:

- AS 7514 Railway rolling stock - Wheels
- AS 7515 Railway rolling stock - Axles
- AS 7516 Railway rolling stock - Axle bearings
- AS 7519 Railway rolling stock - Bogie structural requirements

The superseding Australian Standard is identified adjacent to the superseded portion.

TABLE OF CONTENTS

Section	Description	Page No.
6.1	SCOPE	6-1
6.2	BOGIE CONFIGURATION AND ENVELOPE	6-1
6.2.1	Three Piece Construction.....	6-1
6.2.1.1	General.....	6-1
6.2.1.2	Sideframe (Cast and Fabricated).....	6-1
6.2.1.3	Bolster (Cast and Fabricated).....	6-1
6.2.2	Rigid Frame Construction.....	6-2
6.2.2.1	General.....	6-2
6.2.2.2	Bogie Frames (Cast and Fabricated).....	6-2
6.3	SPRINGS	6-2
6.3.1	Helical.....	6-2
6.3.2	Laminated.....	6-2
6.3.3	Metal/Rubber.....	6-2
6.4	SNUBBERS AND DAMPERS	6-2
6.4.1	Friction.....	6-2
6.4.2	Hydraulic.....	6-2
6.5	WHEELS (CAST AND WROUGHT STEEL)	6-3
6.6	AXLES	6-3
6.7	AXLE BEARINGS AND ADAPTORS	6-3
6.8	BRAKEGEAR	6-3
6.9	CENTRE PIVOT AND SIDEBEARERS	6-4
6.10	RIDE QUALITY	6-4
6.11	BOGIE IDENTIFICATION AND PAINTING	6-4
6.12	MAINTENANCE/OPERATING REQUIREMENTS	6-4
Diagram 6-1	Intersystem Wheel Profile.....	6-5
Diagram 6-2	Axle Markings.....	6-6
Diagram 6-3	Centre Plate - Side Bearer Height.....	6-7

6.1 SCOPE

These standards and practices shall be applicable to all new standard gauge freight bogies purchased or manufactured (or existing bogies substantially modified) for intersystem working.

The principles embodied in this Section shall be applied as far as is practicable for existing bogies, new bogies purchased prior to the application date of this Section, and for broad gauge bogies. These bogies shall comply with the requirements of Section 4 of the ANZR Manual of Standards and Recommended Practices where the principles of this Section cannot be applied.

6.2 BOGIE CONFIGURATION AND ENVELOPE

6.2.1 THREE PIECE CONSTRUCTION

Section 6.2 superseded by AS 7519

6.2.1.1 General

The standard rail freight bogie configuration shall incorporate the following characteristics of the AAR four wheel three-piece bogie designation '2E', namely:

- (a) 6" x 11" (150 mm x 280 mm) axle journal size
- (b) 33" (840 mm) wheel diameter
- (c) 14" (356 mm) centre plate diameter
- (d) rod through bolster brakegear arrangement
- (e) brake rigging to have 4:1 brake ratio or bogie mounted brake cylinders
- (f) 25½" (650 mm) height from rail to bogie centre wearing surface

AAR bogie types "2F" and "2G" may also be used depending on maximum axle loads as shown by the following list of characteristics in Table 6-1 below.

**TABLE 6-1
BOGIE CHARACTERISTICS**

AAR Designation	Gross Axle Load on Rail (tonnes)	Journal Size (inches)	Wheel Dia. (mm)	Centre Plate Dia. (mm)
*2E	25	6 x 11	840	356
2F	30	6½ x 12	920	356
2G	36	7 x 12	965	406

* for gross axle loads on rail of less than 25 tonnes, the bogie may be resprung by removing inner or outer springs (603) to obtain the required gross mass on rail characteristics for the particular vehicle design

Each bogie type shall conform to the controlling dimensions shown in AAR Standards S-301, S-302 and S-304 and shall fully comply with the requirements of the Rolling Stock Outlines (Section 18).

The standard height from carbody centreplate (male centre pivot) to carbody sidebearer wear plate shall be 110 ±0.5 mm as shown on diagram 6-3.

6.2.1.2 Sideframe (Cast and Fabricated)

Each sideframe shall be an approved narrow pedestal opening type meeting AAR Specification M-203 and Standard S-325 with tolerances, markings and the method of mating sideframes conforming to the requirements of the AAR Manual. In the case of "2G" type bogies, the pedestal opening shall be in accordance with AAR Standard S-326.

6.2.1.3 Bolster (Cast and Fabricated)

Each bolster must be an approved type meeting AAR Specifications M-202 and limiting outline Standard S-310 with tolerances and markings conforming to the requirements of the AAR Manual. The AAR Standard Outline S-311 shall apply to "2G" type bogies.

Bolsters shall be suitable for both rod through and bogie mounted brake cylinders.

6.2.2 RIGID FRAME CONSTRUCTION

Section 6.2 superseded by AS 7519

6.2.2.1 General

The rigid frame freight bogie shall incorporate the same characteristics as those specified in Clause 6.2.1.1 (a)-(f) and Table 6-1 wherever applicable.

Spherical centre plates to DIN Specification 26 009 may be used in rigid frame construction.

Each such bogie type shall fully comply with the requirements of the Rolling Stock Outline (Section 18).

The standard height from carbody centreplate (male centre pivot) to carbody sidebearer wear plate shall be 110 ±0.5 mm as shown on Diagram 6-3 wherever applicable.

6.2.2.2 Bogie Frames (Cast and Fabricated)

All bogie frames shall be of a design meeting the material, marking, static and dynamic test requirements of AAR Specification M-213 or other internationally recognised standards or specifications.

6.3 SPRINGS

6.3.1 HELICAL

All load bearing and snubber springs, where used, shall meet AAR Specifications M-114, with free length tolerances as per AS 2903, preferably conform to AAR Standards S-332 to S-338 inclusive, and be used in groups shown in S-339 to S-343 inclusive. First preference shall be given to the D7 (108 mm travel) group, followed by the D5 (94 mm travel) group.

Equivalent metric bar diameters to Australian Standards AS 2903, AS 1447/XK 9261S Silicon Manganese and XK 5160S Chromium Carbon Steel may be used for springs manufactured in Australia.

6.3.2 LAMINATED

Each laminated spring shall be manufactured in accordance with the requirements of the relevant Australian and/or British Standards.

6.3.3 METAL/RUBBER

Each metal/rubber spring shall be manufactured to the requirements of the purchasing System and designed using the Engineering Design with Natural Rubber Handbook (Malaysian Rubber Producers Research, Herts, England) or an equivalent text.

6.4 FRICTION SNUBBERS AND HYDRAULIC DAMPERS

6.4.1 FRICTION

All friction snubbers (wedges) shall comply with the relevant requirements of the AAR Manual and satisfy the performance criteria of Section 3, Road Worthiness Acceptance Standards For Rail Freight Vehicles.

6.4.2 HYDRAULIC

All hydraulic dampers (stabilisers) shall comply with the appropriate AAR requirements, be of robust construction, have easily accessible fluid level indicators and satisfy the performance criteria of Section 3, Road Worthiness Acceptance Standards For Rail Freight Vehicles.

6.5 WHEELS (CAST AND WROUGHT STEEL)

Section 6.5 superseded by AS 7514

All wheels shall comply with AAR Specifications M-107 or M-208 and shall be either 840 mm or 920 mm nominal diameter, with 64 mm offset and 140 mm width. Wheels may be either fully machined or shot peened. Wheel diameters for other approved AAR bogie types are shown in Table 6-1. All wheels shall have the tread machined to the ROA Intersystem Profile (Diagram 6-1).

In addition, each wheel shall be Brinell Hardness tested and each cast wheel shall have all risers ground flush with the wheel web. All wheels shall be of low stress design and the wheel material shall be either AAR class B or, where approved by the System concerned, class C.

6.6 AXLES

Section 6.6 superseded by AS 7515

All axles shall comply with AAR Specification M-101 and be of the raised wheelseat design (without the collar) to the appropriate journal size shown in Table 6-1.

Wheelseat lengths shall accommodate a back-to-back wheel dimension of 1357^{0}_{+3} mm. Each axle shall be legibly stamped on both ends with the axle number, owning System's initials, year of manufacture and wheel assembly dates as shown on Diagram 6-2.

6.7 AXLE BEARINGS & ADAPTORS

Section 6.7 superseded by AS 7516

Axle roller bearings (packaged bearings) shall meet AAR Specifications M-934 and shall be of the NFL (No Field Lubrication) type with rotating endcaps. Axle roller bearing adaptors, where used, shall also meet AAR Specifications M-924 and shall suit the appropriate axle bearing size.

6.8 BRAKEGEAR

6.8.1 Brakegear shall incorporate:

- (a) 4:1 brake ratio, straight arrangement (see AAR limiting outlines S-301 & S-303) and through the bolster connecting rod or bogie mounted brake cylinders
- (b) standard high friction brake block (38 mm thick) to AAR Specification M-926
- (c) brake pins as per the requirements of AAR Standards S-375 with appropriate steel retention pins
- (d) standard live and dead brake levers/bushes

6.8.2 Bogie levers and pins to be designed in accordance with AAR Standard S-401. All brake levers and struts to be bushed with hardened steel bushes.

6.8.3 Brake gear shall be assembled to provide left or right hand bogies as required.

The method of identifying left or right bogies shall be as follows:

"When standing between the rails facing the bogie at the live lever end, the left hand bogie has the pull rod connection point on the left hand side and the right hand bogie has the pull rod connection point on the right hand side."

6.9 CENTRE PIVOT & SIDEBEARERS

- 6.9.1 Centre pins of bogies shall be 1¾" (45 mm) diameter and shall project a distance of not less than 180 mm or more than 330 mm above the centre plate surface.
- 6.9.2 Sidebearers, shall preferably, meet the requirements of AAR Specifications M-948. The design of the sidebearer arrangement shall be such as to satisfy the twist test requirements of Section 3, Roadworthiness Acceptance Standards for Rail Freight Vehicles for vehicles with the minimum allowable sidebearer clearance and bogies in the 'as new' condition.
- 6.9.3 Centre bearings shall be fitted with wear liners either of 10-14% manganese steel or asbestos free non metallic material to AAR Standards S-305, S-306, S-307, S-308 and Recommended Practices RP-300 and RP-301, or other internationally recognised standards applicable to the design of centre plate used.

6.10 RIDE QUALITY

Vehicle ride quality shall comply with Section 3, Road Worthiness Acceptance Standards For Rail Freight Vehicles.

6.11 BOGIE IDENTIFICATION AND PAINTING

- 6.11.1 Each bogie manufacturer shall mark the bolster and side frame in accordance with AAR Standard S-313 and S-915.
- 6.11.2 Bogie classification and numbering shall be in accordance with Section 23, Classification and Numbering of Vehicles and Bogies.
- 6.11.3 Bogie lettering and marking shall be in accordance with Section 22, Lettering and Marking of Freight Vehicles.

6.12 MAINTENANCE/OPERATING REQUIREMENTS

Refer to Section 17, Gauging and Testing for appropriate bogie maintenance gauges.

Refer to Section 24 for bogie maintenance and operating requirements.

DIAGRAM 6-1

Diagram 6-1 superseded by AS 7514

ROA INTERSYSTEM WHEEL PROFILE

CO-ORDINATES OF CENTRES			
CENTRE	X (mm)	Y (mm)	RADIUS (mm)
C1	-16.4794	-329.5885	330
C2	13.1727	-33.0672	32
C3	22.6196	-13.1984	10
C4	47.5359	-17.3319	12
C5	-14.7644	-2.6802	76

CO-ORDINATES OF END POINTS		
END POINT	X (mm)	Y (mm)
E1	-78.7643	9.6387
E2	-72.7643	3.6387
E3	0.0000	0.0000
E4	16.3568	-1.2260
E5	26.9128	-4.1672
E6	32.0165	-9.7782
E7	36.2596	-21.4361
E8	59.2172	-20.0791
E9	61.2356	-2.6802

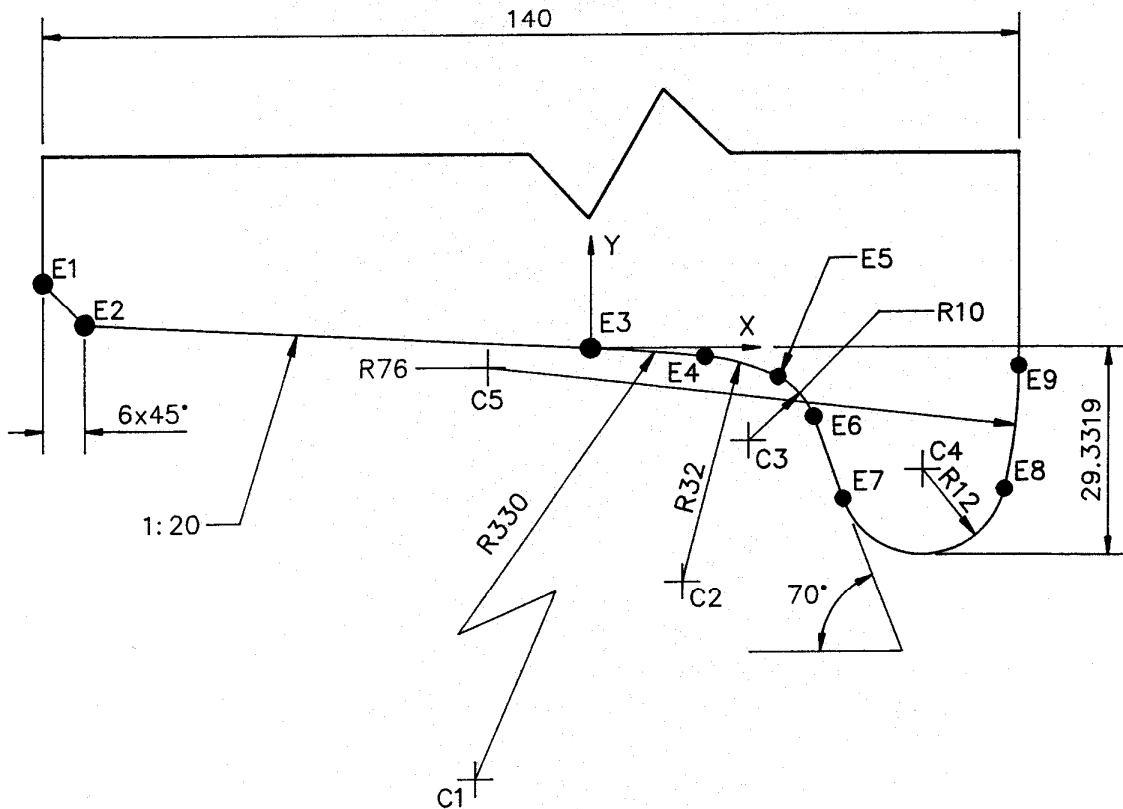
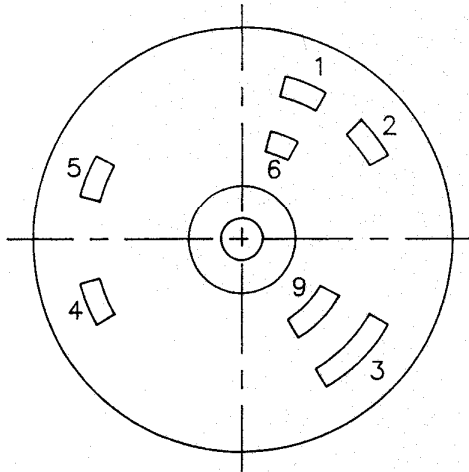


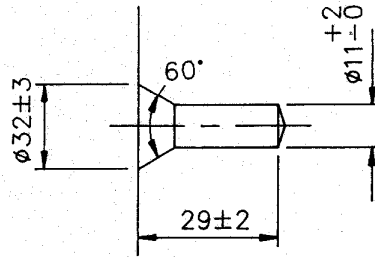
DIAGRAM 6-2

Diagram 6-2 superseded by AS 7515

AXLE MARKINGS



BRAND MARKINGS



DETAIL OF CENTRE

1. OWNER'S INITIALS.
2. MANUFACTURER'S NAME OR INITIALS.
3. AXLE SERIAL NUMBER. (ALLOTTED BY SYSTEM OR MANUFACTURER)
4. HEAT NUMBER
5. YEAR ULTRASONICALLY OR MAGNETICALLY TESTED.
6. WHEEL MOUNTING FIRM'S NAME OR INITIALS.
7. SIZE OF BRANDING 5mm MIN. TO 8mm MAX.
8. THE AXLE NUMBER SHALL BE STAMPED ON BOTH, THE LEFT AND RIGHT HAND ENDS OF THE AXLE. ALL OTHER BRANDINGS SHALL BE ON THE RIGHT HAND END OF THE AXLE ONLY.
9. L AND R TO BE STAMPED ON THE LEFT AND RIGHT HAND ENDS OF EACH AXLE.

NOTE: TO FACILITATE ULTRASONIC TESTING ALL BRANDING TO BE DRESSED FLUSH.

DIAGRAM 6-3

CENTRE PLATE - SIDE BEARER HEIGHT

