

SECTION 24

**FREIGHT VEHICLE
FIELD INSPECTION LIMITS
FOR IN-SERVICE USE**

ROA MANUAL
SCHEDULE OF AMENDMENTS
SECTION 24

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Portions of this Section of the ROA Manual highlighted by red text are superseded by one of the following RISSB Australian Standards: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 7517 Railway rolling stock - Wheelsets
- AS 7519 Railway rolling stock - Bogie structural requirements

The superseding Australian Standard is identified adjacent to the superseded portion.

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24.1 SCOPE

- 24.1.1 This section defines inspection procedures, maximum wear limits where applicable and minimum permissible condition and/or performance requirements for freight vehicle components and assemblies which can be serviced, repaired or maintained in traffic or at light-medium repair facilities such as repair roads, running sheds and 'One-Spot' workshops. The requirements for pre-departure and en-route examinations and inspections shall be as defined in Section 5, Train Examination Procedures.
- 24.1.2 Field inspection requirements are directed principally at those aspects and components which are considered essential for the operational safety and efficiency of personnel and vehicles, and standard configurations required for intersystem compatibility.
- 24.1.3 Defects shall be corrected and faulty components repaired or replaced on site wherever possible. In those instances where on-site rectification is not possible, the vehicle(s) shall be carded in accordance with the provisions of Section 5.6., and forwarded to the appropriate repair facility.
- 24.1.4 Certain inspection parameters and procedures are based on, or referred to, appropriate sections of the latest edition of the Field Manual of the Association of American Railroads Interchange Rules; these sections are referred to in the text as 'AAR Rule '00'.
- 24.1.5 Detailed maintenance and repair procedures and limits are specified in Section 25, Freight Vehicle Maintenance Standards.

24.2 BOGIES

Section 24.2.1 superseded by AS 7514

24.2.1 Wheel Condition

24.2.1.1 Wheels shall be inspected for profile, flange, tread, rim and general physical condition when specified below. Inspection and condition parameters for wheel defects and deficiencies are defined in the Supplement to this Section, titled Identification and Classification of Wheel Defects. Terms used to describe wheel features are illustrated on Diagram 24-2-1, and the location of limiting dimensions is shown on Diagram 24-2-2.

24.2.1.2 Wheel inspections are required to be carried out as follows:

- a) at all train/brake examinations
- b) whenever brake blocks are replaced
- c) whenever a bogie is in a repair facility for any attention to the bogie or vehicle
- d) at all general or major vehicle/bogie inspections, examinations or repairs (to include a back-to-back dimension check as defined at 24.2.1.3.)
- e) whenever a bogie is involved in a derailment or similar incident (to include a back-to-back dimension check as defined at 24.2.1.3.)

Where a visual inspection indicates that the condition of a wheel may be approaching or exceeding any of the limiting parameters or conditions specified hereafter, wheels shall be checked for contour, flange condition and rim thickness using the Standard Wheel and Tyre Gauge (Diagram 17-4-1) applied as shown on Diagram 24-2-3, and for other conditions in accordance with the procedures and limits defined herein.

24.2.1.3 Wheels or wheel-sets shall not remain in service if they exceed the limits imposed by the gauge which represent the following limiting parameters:

- | | | |
|-----|---|-------|
| (a) | Maximum permissible flange height above tread running surface | 35 mm |
| (b) | Maximum permissible tread hollowing | 3 mm |
| (c) | Minimum permissible flange thickness | 19 mm |
| (d) | Minimum permissible rim thickness | |
| | up to 25 tonnes axle load | 20 mm |
| | over 25 tonnes axle load | 22 mm |

Limits on variation in wheel diameter for bogie assembly and application:

Clauses 24.2.1.3 (e) to (g) superseded by AS 7517

- | | | |
|-----|---|--------|
| (e) | Maximum permissible variation in wheel tread diameter per axle (new or re-turned) | 0.5 mm |
| (f) | Maximum permissible variation in wheel tread diameter per bogie | 25 mm |
| (g) | Maximum permissible variation in wheel tread diameter per vehicle | 60 mm |

24.2.1.4 Wheels shall not show any indication of lateral displacement or rotation on the axle wheel seat.

24.2.1.5 Refer to Appendix A for illustrations and severity classification of wheel defects, and the action to be taken with respect to each class of defect.

- 24.2.1.6 When required, wheels shall be checked for back-to-back dimension using the gauge shown on Diagram 17-4-3. This dimension shall be gauged at not less than three (3) locations equally spaced around the rim of the wheels, and shall be within the range of 1357 to 1360 mm for standard gauge wheel sets and 1522 to 1525 mm for broad gauge wheel sets.
A variation of 3 mm or more between any of the back-to-back dimensions on a single wheelset may indicate a bent axle or distorted wheel, and any wheelset showing such a variation shall be forwarded to an appropriate repair facility for further checking by spinning between centres and checking run-out with dial gauges, etc.

24.2.2 Centre Bearings, Centre Pins and Liners

Section 24.2.2 superseded by AS 7519

- 24.2.2.1 **The bogie bolster centre bearing** shall be free of all grease, paint and other foreign matter.
- 24.2.2.2 **Centre bowl liners** where fitted shall not be displaced from the bolster bowl or show significant damage. No securing weld used for retaining metallic liners shall be cracked or broken for more than half its individual length.
- 24.2.2.3 Metallic liners shall not protrude more than 6 mm above the top of the centre plate bowl.
- 24.2.2.4 The maximum permissible diameter of the centre plate bowl shall be:
- a) 318 mm for 300 mm nominal diameter centre plates **without** liners
 - b) 310 mm for 300 mm nominal diameter centre plates **with** liners
 - c) 370 mm for 356 mm nominal diameter centre plates **without** liners.
 - d) 362 mm for 356 mm nominal diameter centre plates **with** liners.
 - e) 420 mm for 406 mm nominal diameter centre plates **without** liners
 - f) 412 mm for 406 mm nominal diameter centre plates **with** liners.
- 24.2.2.5 There shall not be more than 35 mm diametral clearance between the bogie and body centre plates, nor less than 3 mm clearance between the top of the bogie centre plate bowl or liner and the under-face of the body centre plate mounting flange.
- 24.2.2.6 **Centre pins** (king pins) shall not be worn more than 10 mm less than the original diameter at any location, nor bent more than 25 mm from the true straight position over their full length. They shall be of the correct type and size appropriate to the bolster design, bogie and vehicle classes.

24.2.3 Side Bearers - Gap Type

24.2.3.1 ANZR Bogies with 300 mm Centre Plates or Equivalent

24.2.3.1.1 The clearance between the bogie and body side bearer contact surfaces shall be within the range of 10 mm to 14 mm when measured on level track. It may be measured using Clearance Gauge to Diagram 17-3-8, applied as shown on Diagram 24-2-4. The sum of the two side bearer clearances on any bogie shall be within the range of 20 to 28 mm to allow for variations in track levels.

24.2.3.1.2 Side bearer plates on the bogie bolster shall be set up using the Side Bearer Set-up Gauge shown on Diagram 17-3-2, applied as shown on Diagram 24-2-5.

24.2.3.2 AAR Type Bogies

24.2.3.2.1 The clearance between the bogie and body side bearer contact surfaces of all AAR type bogies shall be within the limits of 5 mm to 8 mm when measured on level track. It may be measured using Clearance Gauge to Diagram 17-3-8, applied as shown on Diagram 24-2-4. The sum of the two side bearer clearances on any bogie shall be within the range of 10 to 16 mm to allow for variations in track levels.

24.2.3.3 Bogie side bearer contact plates shall be flat, smooth and intact. There shall be no indication of surface irregularities, distortion or other damage, or cracked or broken attachment welds.

24.2.3.4 Attaching bolts/screws for the wear plates shall not be loose or missing, or have the heads protruding above the contact surface.

24.2.4 Resilient Constant Contact Side Bearers

24.2.4.1 General Requirements

24.2.4.1.1 The installation, in-service condition, and inspection parameters of resilient constant contact side bearers (CCSB's) shall comply with the manufacturer's recommendations and instructions.

24.2.4.1.2 CCSB's shall not continue in service if, when observed or measured on level track:

a) for side bearers with caps, they are so compressed that the indicator markings on the side of the caps have disappeared inside the cage and are no longer visible

OR

b) for side bearers without caps, there is less than 5 mm or more than 11 mm clearance between the top of the metal roller and the vehicle body side bearer wear plate.

24.2.4.1.3 There shall be no loose or missing CCSB attachment bolts or rivets, or cracked or broken welds. Housings shall be intact, with no broken or missing sections and no indications of distortion or incorrect assembly.

24.2.4.3 AAR Bogies with 356 mm or 406 mm Centre Plates

24.2.4.3.1 The dimension from the centre plate seat to the side bearer mounting surface on the bogie bolster shall be checked using the gauge shown on Diagram 17-3-4, applied as shown on Diagram 24-2-6.

24.2.5 Side Frames

Section 24.2.5 superseded by AS 7519

Side frames shall be inspected and repaired according to the methods and limitations specified in AAR Rule 48.

24.2.5.1 Side frames shall not be:

- a) cracked, broken, or bent
- b) incorrectly repaired or patched
- c) corroded or worn in excess of 25% of the original material thickness at any location, except where stipulated otherwise in this Section.
- d) more than one (1) button different in wheel base from the other side-frame in the same bogie
- e) of the wrong type for the bogie

24.2.5.2 When wheel-sets are replaced, or the bogie is dismantled for other attention, the clearance between the side frame columns and bolster gibs shall be measured before disassembly. Side frames and/or bolsters shall be repaired if the total lateral clearance, as illustrated on Diagram 24-2-7 (sum of both sides) exceeds the following limits:

- a) all bogies with AAR Class C or D bearings
(nominal 40t. and 50t. bogies) 28 mm
- b) all bogies with AAR Class E, F, or G bearings
(nominal 70t., 100 t. and 125t. bogies) 38mm

Side frame columns and bolster gib openings shall be measured after disassembly to determine the component(s) to be restored.

24.2.5.3 Column vertical wear plate thickness shall not be less than 6 mm at field inspection. Side frames shall not be returned to service after disassembly from the bolster if the wear plate thickness is less than 8 mm.

24.2.5.4 The bearing pedestal shall not be worn more than:

- a) 3 mm in the roof (ceiling)
OR
- b) 3 mm in the longitudinal opening (width)

24.2.5.5 Side frames shall not be returned to service following disassembly from the bolster if wear exceeds:

- a) 2 mm in the roof of the pedestal
- b) 2 mm in the width of the pedestal
- c) 6 mm in column opening (longitudinal)
- d) 6 mm in the width of the column face (lateral)

or if the side frame does not comply with the condition parameters specified in preceding clauses.

24.2.6 Bolsters

Section 24.2.6 superseded by AS 7519

Bolsters shall be inspected and repaired according to the methods and limitations specified in AAR Rule 47.

24.2.6.1 Bolsters shall not be:

- a) broken, cracked or bent
- b) incorrectly repaired or patched

- c) corroded or worn in excess of 25% of the original material thickness in any location except where stipulated otherwise in this Section
- d) of the wrong type for the bogie

24.2.6.2 Centre plate bowls shall comply with the requirements of 24.2.2 above.

24.2.6.3 Bolster gibs shall be repaired as necessary as specified in 24.2.5.2 above.

24.2.7 Friction Wedges and Dampers

24.2.7.1 The condition of friction wedges shall comply with the requirements of AAR Rule 47 and/or the bogie manufacturer's instructions where applicable.

24.2.7.2 A bogie shall not continue in service when any friction wedge wear indicating notch is obliterated for Ride Control bogies, or is 1 mm or less in depth for National C-1 bogies. They shall not be returned to service following bogie disassembly if the depth of the notch is 3 mm or less; such wedges shall be replaced.

24.2.7.3 Friction wedge rise shall be measured whenever a bogie is in a repair facility. Bogies shall not be returned to service if the rise exceeds the permissible limits, determined by using the following gauges:

	Bogie type	Gauge Number
a)	50t. Ride Control Bogies	17-3-9
b)	70t. and 100t. Ride Control Bogies	17-3-10
c)	50t. National Bogies	17-3-11
d)	70t. National Bogies	17-3-12
e)	100t. National Bogies	17-3-13
f)	50t. Barber Bogies	17-3-14
g)	70t. Barber Bogies	17-3-15
h)	100t. Barber Bogies	17-3-16

24.2.7.4 Application of the above gauges is shown on Diagrams 24-2-8 to 24-2-15 inclusive. If the rise exceeds the gauge dimension, the bogie shall be repaired.

24.2.8 Load Bearing Springs

24.2.8.1 Bogie suspension springs shall not be missing, cracked or broken, misaligned or displaced within the spring seat. Coils shall not be heavily bruised or show flat spots, nicks, gouges, indentations or any corrosion with pit marks greater than 1 mm long.

24.2.8.2 Springs shall be of the correct number, type and capacity appropriate to the bogie model, vehicle class and nominal maximum axle load.

24.2.8.3 There shall be not less than 2 mm clearance between any adjacent coils in any load spring when loaded to the nominal maximum gross mass on rail.

24.2.8.4 Adjacent springs in any concentric spring nest shall of opposite hand winding.

24.2.9 Brake Gear

- 24.2.9.1 Brake block thickness shall not be less than that specified in Section 5.5.9. Blocks shall not permanently overhang the sides of the wheels (indicated by a noticeable shoulder on the block) or bear against the wheel flange. The brake blocks shall be of the correct type applicable to the vehicle.
- 24.2.9.2 Brake heads shall not show excessive wear or indications of damage or distortion. Blocks shall fit the head without interference or excessive clearance.
- 24.2.9.3 Brake beam extensions shall not have interference or excessive clearance with the beam shelf in the side-frame which inhibits the correct movement of the beam or adversely affects the correct application and release of the brakes.
- 24.2.9.4 The opening in the brake beam strut shall not permit the bogie lever to adopt an angle which adversely affects the alignment of the bogie brake system or that of the pullrods.
- 24.2.9.5 Brake beams shall not be bent, misaligned or otherwise distorted. There shall be no cracks or other damage or defects, and all welds shall be intact.
- 24.2.9.6 All pins, bushes and securing devices shall be intact and of the correct size and type. Clearance between pins and holes shall not be more than 3 mm at any location. Thickness of bush walls shall not be less than 3 mm. The diameter of pins at any point shall not be more than 3 mm less than the original nominal diameter. 'R' type clips and other spring type retaining pins shall not be used for securing any pins located below the axle centre line.
- 24.2.9.7 The brake beam pocket liner in the side frame shall not be broken, distorted, displaced or worn to a thickness of 1 mm or less. Bogies shall not be returned to service following brake beam disassembly if the liner thickness is less than 2 mm.
- 24.2.9.8 The bogie lever system shall be so adjusted that the live lever remains within the permitted range of movement, and the relationship between the bogie levers is maintained within those limits which ensure efficient and effective brake operation. Excessive angularity of levers shall be avoided.
- 24.2.9.9 For bogies with rod-through-bolster type brake gear, the bogie live lever shall not be closer than 50 mm to the face of the bolster with brakes applied under all permissible conditions of equipment of operations.
- 24.2.9.10 The brake levers and vehicle pullrod shall not be closer than 50 mm to the axle under all conditions of operation and loading.
- 24.2.9.11 For bogies with brake gear of the 'rod-under-the-bolster' type, safety loops or equivalent items shall be fitted. These components shall not be so damaged or distorted as to be incapable of performing their intended function, and shall not foul or interfere with the correct operation of any of the bogie brake system or other equipment.

Section 24.2.10 superseded by AS 7515

24.2.10 Axles

24.2.10.1 Inspection and repair of axles shall be in accordance with the relevant requirements of AAR Rule 43.

24.2.10.2 Axles shall not:

- a) be cracked, broken, bent or otherwise distorted
- b) be damaged due to overheating or other bearing failures
- c) have transverse or circumferential scoring, grooves or other marks in the section between the wheels which are more than 3 mm deep
- d) show indications of damage or marking due to arc welding, flame cutting, grinding, etc.

24.2.11 Axle Bearings

Section 24.2.11 superseded by AS 7516

24.2.11.1 *Roller Bearing Package Units*

The inspection and condition of roller bearing package units and adaptors shall be in accordance with the relevant requirements of AAR Rules 36 and 37.

24.2.11.1.1 **Roller bearing package units** shall not have:

- a) Seals which are loose in the counterbore of the bearing outer ring (able to be moved or rotated by hand using a suitable blunt probe), misaligned, visibly damaged or distorted, or which show evidence of recent leakage or loss of grease
- b) loose or missing cap screws or locking plate
- c) damaged or distorted end cap or locking plate
- d) visible evidence of overheating or a temperature at inspection considerably greater than that of the other units in the same bogie or vehicle
- e) visible evidence of water damage, submersion or penetration
- f) visible evidence of damage caused by arc welding, flame cutting, etc.
- g) any other visible evidence or indication of external damage
- h) loose or damaged backing ring

24.2.11.1.2 **Bearing adaptors** shall not be:

- a) Cracked, broken or missing
- b) Cocked or misaligned
- c) Worn so that bright wear bands extend to the edges of the bearing unit outer ring
- d) Worn on the top surface (crown) so that the roof of the side frame pedestal bears on the original relief (depressed) areas at the centre and/or the ends
- e) Incompatible with the class of bearing fitted e.g. Class D adaptors must be fitted to Class D bearings, etc.

24.2.11.2 *Axle Box Type Roller Bearings*

Inspection of axle-box type bearings shall be in accordance with the bearing manufacturer's instructions and procedures specified by the owning system.

24.2.11.2.1 **Axle box type bearings** shall not :

- a) Be displaced or misaligned in the side frame pedestal
- b) show visible evidence of overheating or a temperature at inspection considerably greater than that of the other units in the same bogie or vehicle
- c) show visible evidence of water damage, submersion or penetration
- d) show visible evidence of damage caused by arc welding, flame cutting, etc.
- e) show any other visible evidence or indication of external damage
- f) have loose, missing or damaged back covers and/or fixing screws
- g) have loose, missing or damaged end plugs or grease nipples where these are required

24.2.11.2.2 The end face and plug of axle-boxes shall be marked with a specific colour which defines the re-lubrication period. Axle-boxes shall fall due for re-greasing, and shall be attended to at a repair/maintenance facility, in the year indicated by the colour code tabulated below.

Year Grease Due	Colour	Year Grease Due	Colour
1990	Green	1996	Purple
1991	Yellow	1997	Green
1992	Pink	1998	Yellow
1993	Orange	1999	Pink
1994	White	2000	Orange
1995	Light Blue		and then continue in sequence

24.2.11.2.3 Axle boxes shall be inspected and, if satisfactory, the required type and quantity of grease shall be applied. The end plug shall be fitted with a new seal, replaced and tightened to the specified torque. The end face of the axle box and the end plug shall then be spray painted to indicate the year that re-greasing is next due using the above colour code table.

24.2.11.4 During the year in which re-greasing is due, vehicles/bogies shall not be carded for re-greasing alone; this shall be attended to only in conjunction with other repairs/attention. After the end of that year, bogies and axle boxes shall be carded for immediate re-greasing when found to be one (1) year overdue i.e in the year immediately following the due year indicated by the axle box colour. For example, in the year 1994 all boxes with a white plug will be inspected and relubricated when located in a repair facility, while those with an orange plug (one year overdue) will be carded by field staff for bearing attention.

Section 24.2.11 superseded by AS 7516

24.3 COUPLERS AND OTHER INTER-VEHICLE CONNECTORS

24.3.1 Coupler Bodies

- 24.3.1.1 Coupler bodies shall be visually examined for the presence of cracks, broken welds, unsatisfactory wear plate condition and other defects.
- 24.3.1.2 Couplers shall not:
- a) be so bent, twisted or otherwise distorted as to prevent normal operation
 - b) have cracked or broken out sections in the head or shank
 - c) show wear more than 6 mm deep on the shank from contact with the carrier or underframe structure or components
- 24.3.1.3 Wear plates shall not be less than 3 mm thick.
- 24.3.1.4 Coupling pin bushes shall not be loose, cracked, broken, missing or have a wall thickness less than 3 mm.
- 24.3.1.5 Coupling pins shall not be worn more than 3 mm diametrically at any location.
- 24.3.1.6 With the knuckle pulled outwards, Gauges 17-7-1 and 17-7-6 shall not pass vertically through the contour with points A and B contacting the guard arm.
- 24.3.1.7 With the knuckle removed, the guard arm distortion shall be checked using Gauge 17-7-7, and the pin protector and buffing shoulder checked using Gauge 17-7-8.

24.3.2 Knuckles

- 24.3.2.1 Knuckles shall be checked in position in the coupler for nose contour wear using gauge 17-7-1 for freight couplers and Gauge 17-7-2 for passenger couplers. The nose shall not be worn past the condemn recess.
- 24.3.2.2 Knuckles when removed from the coupler shall be checked for nose wear and stretch limit using Gauges 17-7-3 or 17-7-4 as appropriate. The locking face of the knuckle shall be checked using Gauges 17-7-9 or 17-7-10 as appropriate.
- 24.3.2.3 Knuckle pins shall be straight and not worn more than 3 mm on the diameter. The pins shall be correctly retained using round split cotter pins of the correct size.

24.3.3 Operating Mechanism

- 24.3.3.1 The uncoupling mechanism, lock lifters and locking blocks shall be checked for alignment and correct and easy operation and for any wear which impairs the operation; if faulty, the parts shall be replaced or the vehicle carded for attention.
- 24.3.3.2 The locking block shall drop freely into position when the knuckle is closed by hand.
- 24.3.3.3 The anti-creep features shall be checked for correct operation.

24.3.4 Articulated Connectors

- 24.3.4.1 Articulated connectors consist of male and female interlocking parts, each of which is permanently attached to one of the adjacent units of an articulated (shared bogie) vehicle. The two parts are secured together by a connecting pin, with a bearing block, follower block and a separate wedge acting under gravity to take up any slack in the assembly resulting from component wear.
- 24.3.4.2 Wedge condition is assessed by viewing through the inspection holes incorporated into the sides of the body of the female portion of the connector. If the view through to the opposite side of the body is **totally** obstructed, the wedge may be worn past permissible limits, and the vehicle shall be green carded to the appropriate repair facility for attention.
- 24.3.4.3 The minimum diameter and depth of the centre plate spigot shall be that specified in 24.8.4 for body centre plates of equivalent nominal diameter.

24.3.5 Slackless Couplers

24.3.6 Solid Drawbars

24.4 DRAFT GEAR AND ATTACHMENTS

24.4.1 **The draft gear package** shall be inspected for wear and condition.

24.4.1.1 The package shall not be mis-aligned in the pocket and shall rest upon the carriers. There shall be no clearance between the package, follower plate and the stops in the draft gear pocket.

24.4.1.2 The draft gear package shall not:

- a) have a broken, cracked or split housing
- b) have the rear housing wall bulged or distorted more than 5 mm
- c) have broken, cracked or otherwise damaged friction components which bear against the follower or yoke
- d) be loose within the draft pocket or have a free length less than 568 mm
- e) have broken, loose, or missing retaining bolts where these are an integral part of the package design
- f) be stuck or jammed in one position
- g) show evidence of damage by fire, corrosion, welding, cutting, or other mistreatment

24.4.2 **Carrier plates** and similar support components shall be intact and correctly located.

24.4.2.1 Carrier plates shall not be worn to less than 75% of their original thickness.

24.4.2.2 Carrier wear plates shall not be less than 3 mm thick, and there shall be no cracked or broken welds on carriers or wear plates liable to adversely affect the integrity of the carrier assembly.

24.4.2.3 Bolts and other fasteners shall be tight and firmly secured against loosening.

24.4.3 **Followers** shall not be:

- a) broken or missing
- b) worn more than 3 mm at any location
- c) bent more than 12 mm in any plane
- d) of the wrong type for the draft gear package which is fitted to the vehicle

24.4.3 **Draft gear yokes**

24.4.3.1 Yokes shall be correctly aligned in the pocket and with the draft gear package, with no lateral displacement or angularity.

24.4.3.2 Yokes shall not :

- a) have wear plates less than 3 mm thick, or cracked or broken wear plate attachment welds liable to adversely affect the retention of the wear plates.
- b) have top or bottom straps worn to less than 75% of the original material thickness or width
- c) be broken, bent, cracked or distorted
- d) have bushes which are missing, broken, damaged or displaced, or so worn that the wall thickness is less than 3 mm or that the clearance between the bush and the coupling pin is more than 3 mm

24.4.4 **Striking castings** shall be intact and firmly attached to the vehicle underframe.

24.4.4.1 Striking castings shall not:

- a) be loose, bent or broken or otherwise distorted
- b) have cracked or broken attachment or structural welds liable to adversely affect the integrity of the assembly
- c) have a wear plate thickness less than 3 mm
- d) have the front face less than 90 mm from the rear face of the coupler head in the uncoupled condition
- e) have the opening for the coupler shank so reduced that it prevents or impairs the normal lateral and longitudinal operational movement of the coupler

24.5 STEPS AND HANDRAILS

- 24.5.1 Steps and handrails shall be inspected and shall comply with the requirements specified in Section 5.5.20. The attachment of these components and their support brackets shall be in accordance with the requirements of Section 10.2. Vehicles on which defects are found shall be repaired on site or carded for attention in accordance with Section 5.6.

24.6 UNCOUPLING RODS

- 24.6.1 Uncoupling rods shall comply with the requirements of Section 5.5.20.5. They shall not be so distorted that correct operation of the mechanism is prevented or impaired. Defective components shall be repaired or replaced as necessary, on site wherever possible.

24.7 VEHICLE BRAKE SYSTEM

- 24.7.1 When a vehicle enters a maintenance facility for attention to the air brake system, all air brake components, pipes and fittings shall be examined and checked for correct operation and the presence of leaks and any leaks corrected. Before returning to service, the vehicle shall be subjected to a Single Car Test in accordance with the procedures specified in Section 7.7.
- 24.7.2 Flexible couplings between vehicles shall not be damaged or leaking and shall be correctly coupled with unused couplings correctly fitted to the dummy coupling heads. End cocks shall be intact, correctly supported and with no missing or damaged handles. Defective components shall be repaired or replaced as necessary.
- 24.7.3 The brake cylinder piston stroke shall be within the limits specified in Section 5.5.7.
- 24.7.4 Slack adjuster travel shall be within the limits specified in Section 5.5.8.
- 24.7.5 The alignment and orientation of the vehicle brake rigging, where fitted, (levers, pullrods, etc.) shall ensure that the correct and adequate operation of the total brake system is not restricted. Pullrods, connecting rods, transfer and primary levers etc. shall not foul any underframe member or component, axles or bogie frames and levers shall be free to move within the required range without fouling support brackets, carriers, or similar components. Where the brake gear installation requires pullrods to pass over the top of the bogie bolster, the pullrod is permitted to be in contact with the top surface of the bolster provided that:
- a) the pullrod is not worn more than 6 mm on the diameter
 - b) the pullrod, clevises, pins etc. do not foul any other part of the bogie frame or equipment and are not misaligned or subjected to forces liable to cause damage or prevent the correct operation of the equipment
 - c) the pullrod is not bent or otherwise distorted
- The rigging shall not be prevented from operating correctly because of fouling or contamination due to spilt loading, corrosion or other impediments.
- 24.7.6 All pins shall be of the correct size and correctly installed and secured. There shall be no more than 3 mm clearance between pins and bushes/holes.
- 24.7.7 Mounting and support brackets for brake equipment shall be firmly and adequately attached to the vehicle frame. There shall be no cracked or broken welds liable to affect the integrity of the equipment, no loose, missing or incorrect fasteners, and there shall be no distortion which may affect the correct operation of the lever-pullrod system.
All components shall be firmly secured to the vehicle structure or mounting brackets with the correct type and number of fasteners. Safety loops, where appropriate, shall be fitted and in place.
- 24.7.8 The slack adjuster shall operate correctly, and shall not show evidence of damage to either the slack adjuster, control rod or control lever.
- 24.7.9 The handbrake system shall be fully functional, and the handbrake mechanism shall be fitted with the correct handwheel. There shall be slack, but not excessive slack in the operating chain in the released position, and the chain-pullrod system shall not foul any other vehicle component. The release lever shall not be damaged or distorted, and shall be easily operated.
- 24.7.10 All pipe work shall be of the correct size, adequately supported, and shall not show indications of damage or distortion which may reduce the pipe diameter or adversely affect the operation of the equipment. Fittings shall be of the correct size and type for the pipe used, and shall not impose stress on the pipes or components.

24.8 UNDERFRAME AND BODY

- 24.8.1 The vehicle underframe shall be inspected for structural damage and/or failure of components. There shall be no indication of excessive distortion, buckling, bending or other damage in any load carrying member. There shall be no loose or missing fasteners.
- 24.8.2 Support and mounting brackets for attachments, brake gear and similar devices shall be in good condition and properly secured to the underframe or body. There shall be no cracked or broken welds liable to adversely affect the integrity of the assembly. Fasteners shall be of the correct type and size and properly installed and tightened.
- 24.8.3 Body side-bearers shall be correctly located with the clearances complying with Section 24.2.3.1 or 24.2.4 as applicable. Wear plates shall not be less than 5 mm thick, and shall be securely fastened to the brackets. Shims shall be applied or removed as necessary to restore the correct clearances. There shall be no cracked or broken welds which may result in failure in service, and no distortion of the brackets.

Body side-bearers shall be set up to the body centre plate using the following set-up and application gauges:

Vehicle and side-bearer type	Gauge diagrams
a) vehicles with 300 mm diameter centre plates and ANZR type bogies, gap type side bearers	17-3-1 and 24-8-1
b) vehicles with 356 and 406 mm diameter centre plates, built for AAR type bogies, AAR side bearers, any type	17-3-3 and 24-8-2
c) end sills at the shared bogie of articulated vehicles	17-3-6 and 24-8-3
d) existing ANZR vehicles on AAR bogies, standard constant contact side bearers	17-3-7 and 24-8-4
e) existing ANZR vehicles on AAR bogies, low height constant contact side bearers	17-3-8 and 24-8-5

- 24.8.4 Body centre plates shall be intact with no cracks or other defects. There shall be no loose, missing or incorrectly applied fasteners. Where centre plates are welded to the underframe there shall be no cracked or broken welds. The minimum dimensions of centre plate spigots shall be :

- 285 mm diameter and 35 deep for standard 300 mm nominal diameter centre plates (to be measured using gauge number 17-5-1 applied as shown on Diagram 24-8-6).
- 330 mm diameter and 35 deep for standard 356 mm nominal diameter centre plates (to be measured using gauge number 17-5-2 applied as shown on Diagram 24-8-7).
- 330 mm diameter and 80 deep for extended-spigot 356 mm diameter centre plates used on ANZR vehicles with AAR bogies (to be measured using gauge number 17-5-3 applied as shown on Diagram 24-8-8).
- 380 mm diameter and 48 deep for standard 406 mm nominal diameter centre plates (to be measured using gauge number 17-5-4 applied as shown on Diagram 24-8-9).

- 24.8.5 Body structural and load retaining components shall be in good condition with no excessive distortion, bending or other damage. There shall be no cracked or broken welds liable to result in failure in service, and all fasteners shall be tight and correctly located and installed.
- 24.8.6 Doors and mechanisms shall operate freely and correctly. There shall be no distortion, misalignment or other damage which prevents or impairs correct operation. Door securing, operating and latching mechanisms shall be in good condition, functional and correctly installed. There shall be no indication of product loss or leakage in transit.

- 24.8.7 Load securing components and systems shall be in good condition and fully functional. They shall be correctly and adequately installed and fastened to the vehicle. Unused equipment shall be safely and correctly stored and secured to prevent loss or damage.
- 24.8.8 Filling and discharge systems, including hatches, valves and other similar openings, shall be in good condition, easily operated and fully functional. There shall be no indication of product loss in transit.
- 24.8.9 Ladders, walkways and their supports and attachments shall be intact and correctly and securely fastened, with no loose, broken or missing components. There shall be no excessive distortion or damage which may affect the safe and correct use of these components.

24.9 ATTACHMENTS

- 24.9.1 Shunting pads shall not be so damaged, distorted or missing as to be unuseable for their intended purpose. There shall be at least two (2) pads per vehicle located diagonally opposite above the uncoupling rod at the outer extremity of the headstock.
- 24.9.2 Emergency towing fixtures shall not be so distorted or damaged as to be unuseable for their intended purpose.
- 24.9.3 Waybill clips shall not be missing or so damaged that they cannot perform their intended function.

DIAGRAM 24-2-1

STANDARD TERMINOLOGY - WHEEL FEATURES

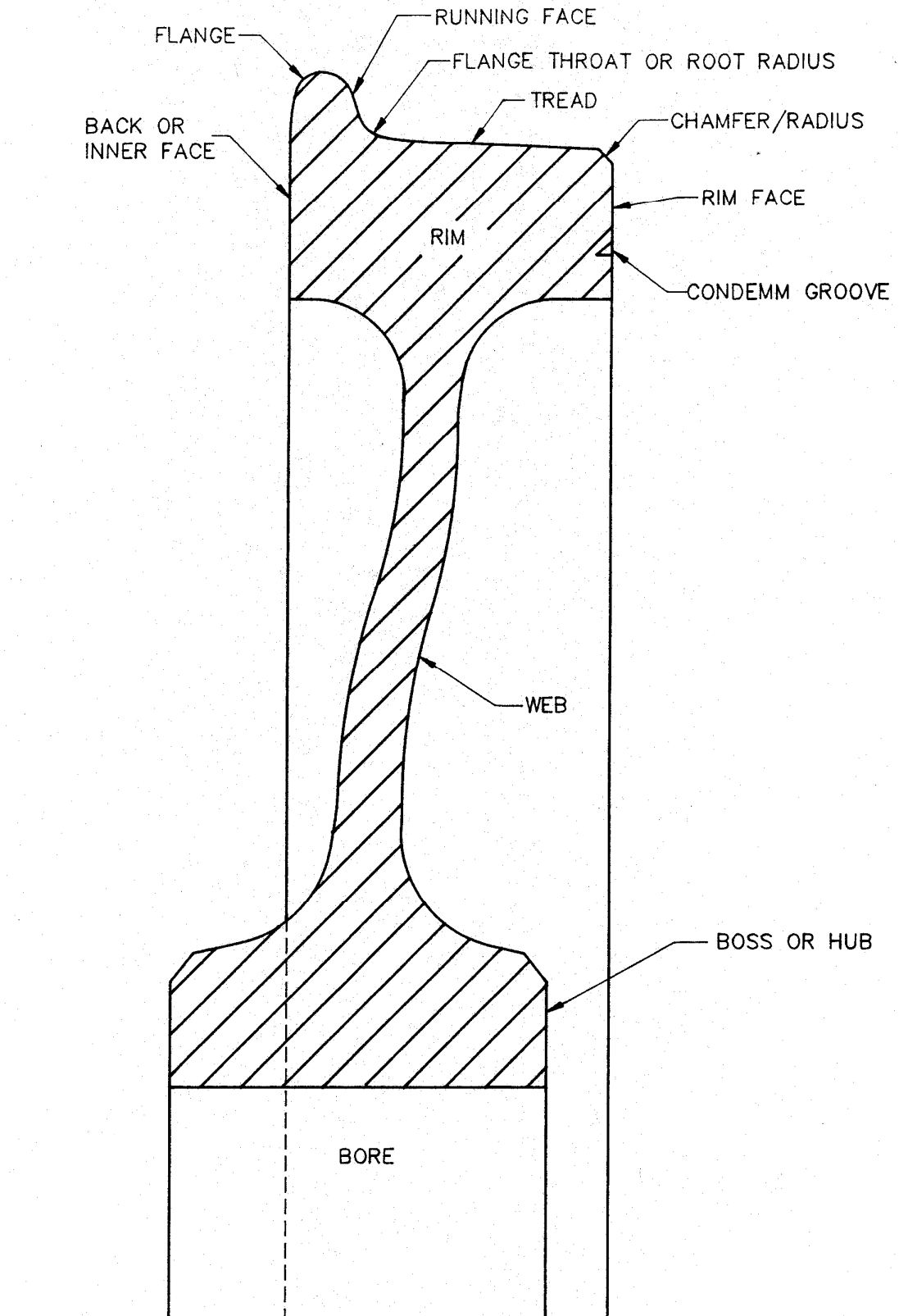


DIAGRAM 24-2-2

LOCATION OF LIMITING DIMENSIONS

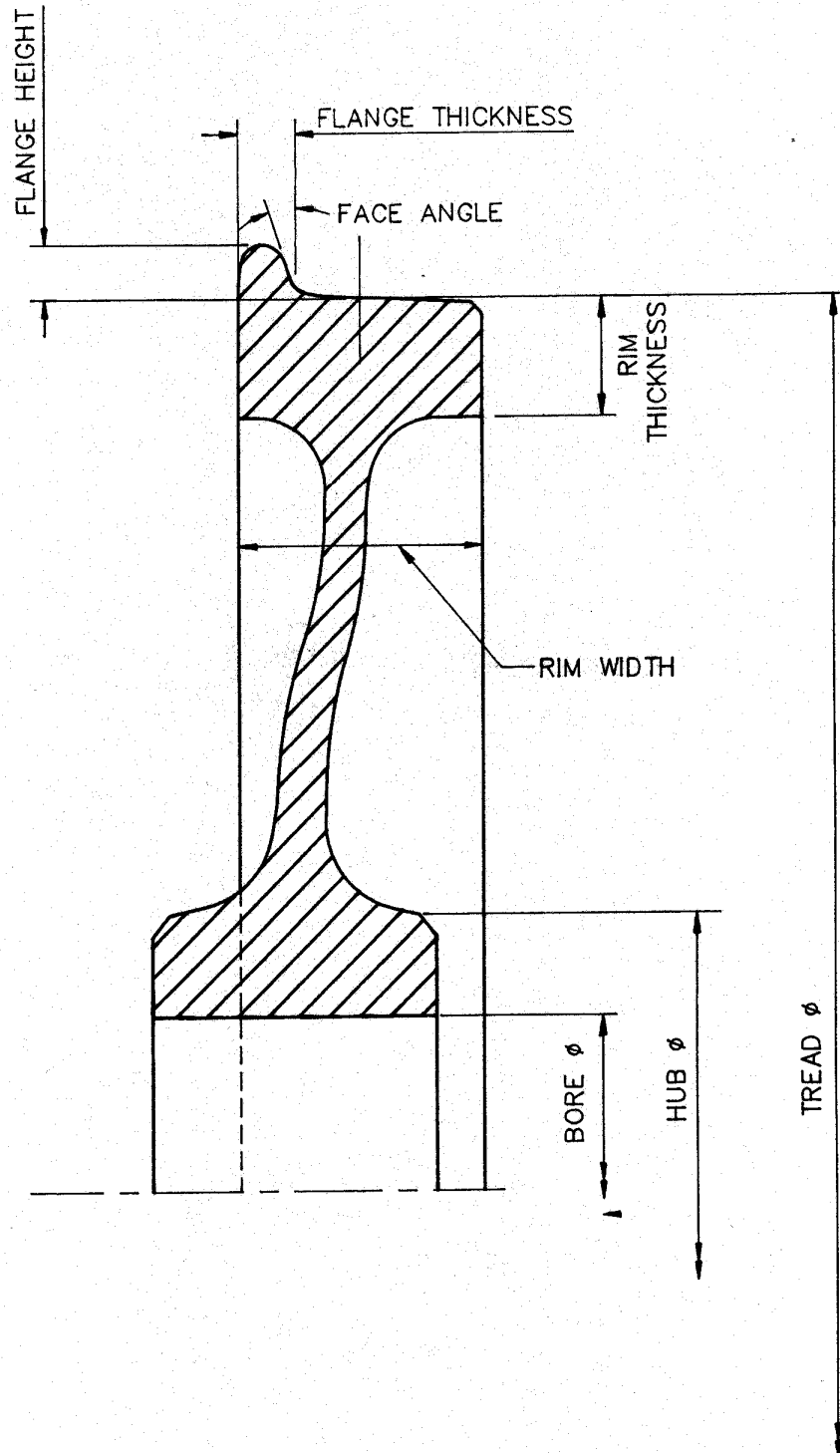
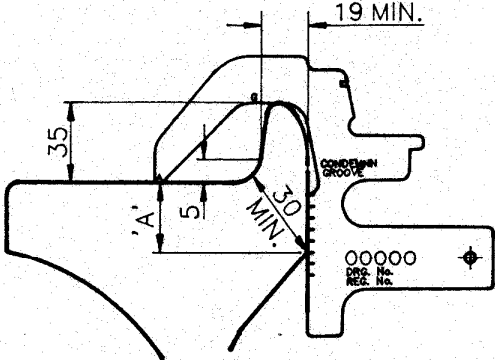


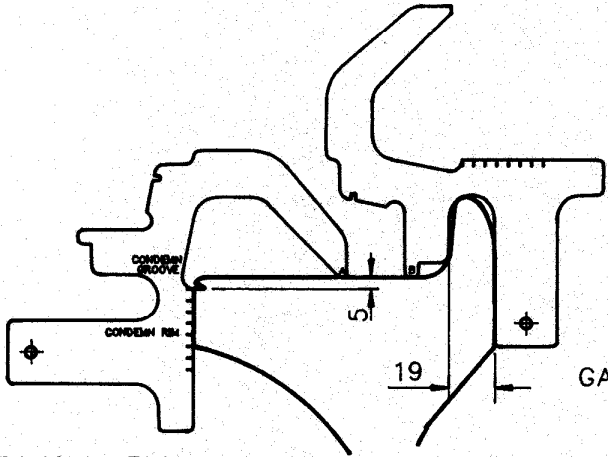
Diagram 24-2-3 superseded
by AS 7514

DIAGRAM 24-2-3

APPLICATION OF STANDARD WHEEL GAUGE

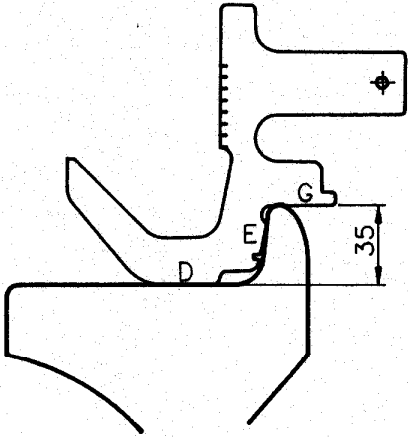


GAUGING:
'A' FROM INNER RIM CONDEMN THICKNESS 20
'G' FLANGE HEIGHT CONDEMN HEIGHT 35



GAUGING FROM
CONDEMNING GROOVE

GAUGING FLANGE THICKNESS
CONDEMN 19



GAUGING
'G' FLANGE HEIGHT (ALTERNATIVE POSITION)

DIAGRAM 24-2-4

GAP-TYPE SIDE BEARERS

MEASUREMENT OF CLEARANCE
MEASUREMENT OF CLEARANCE

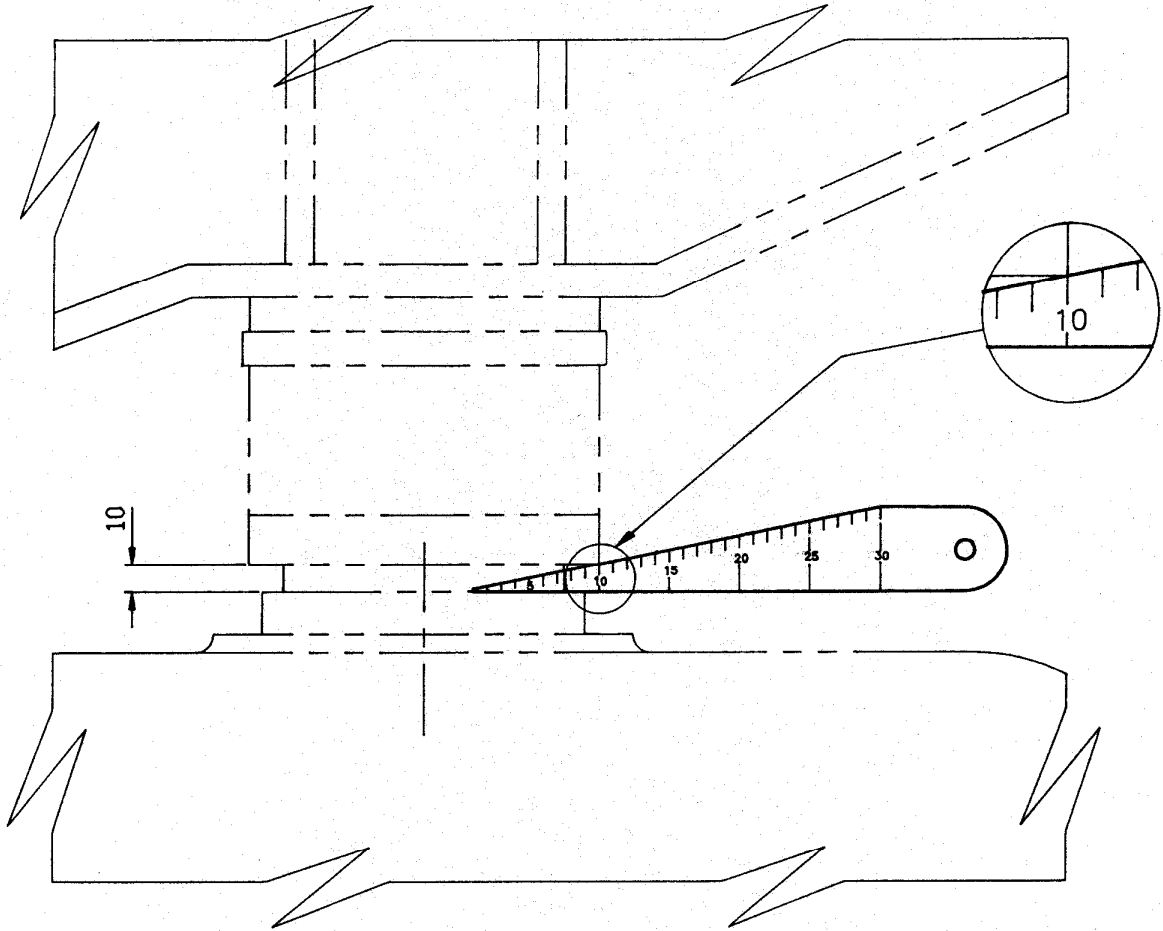


DIAGRAM 24-2-5

BOGIE SIDE-BEARER SET-UP

ANZR BOGIES
ANZR BOGIES

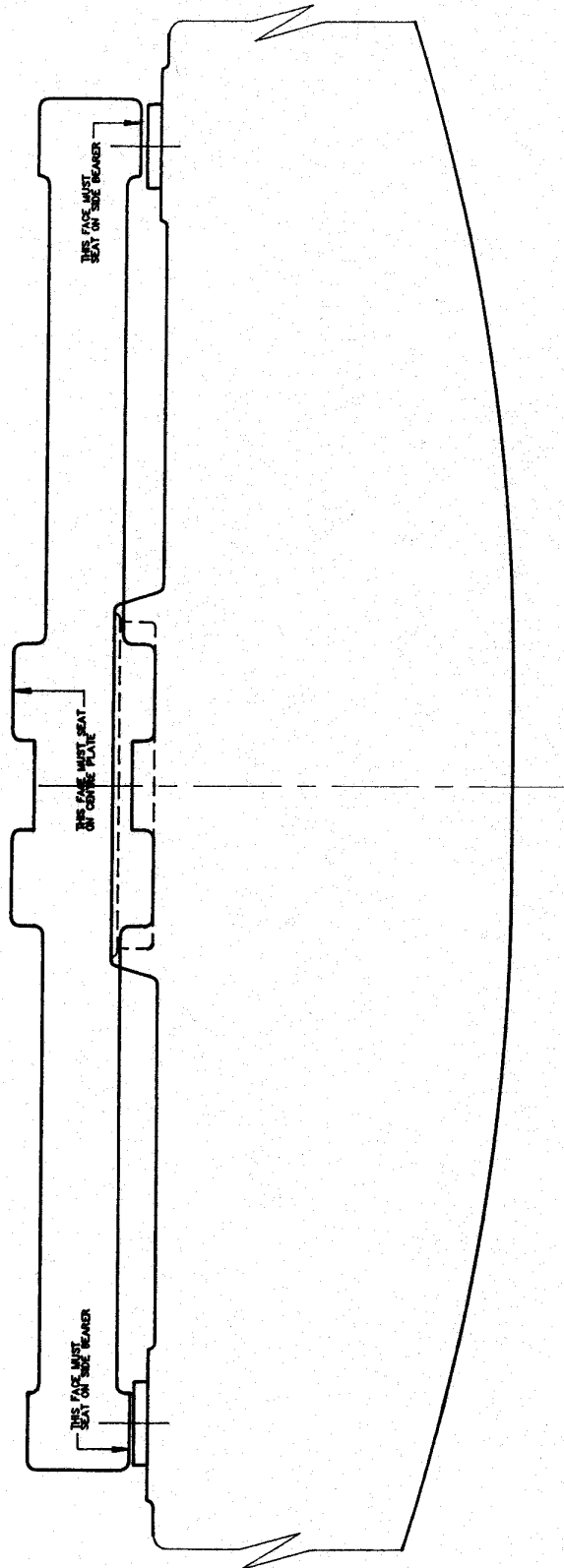


DIAGRAM 24-2-6

BOGIE SIDE-BEARER SET-UP

AAR BOGIES

AAR BOGIES

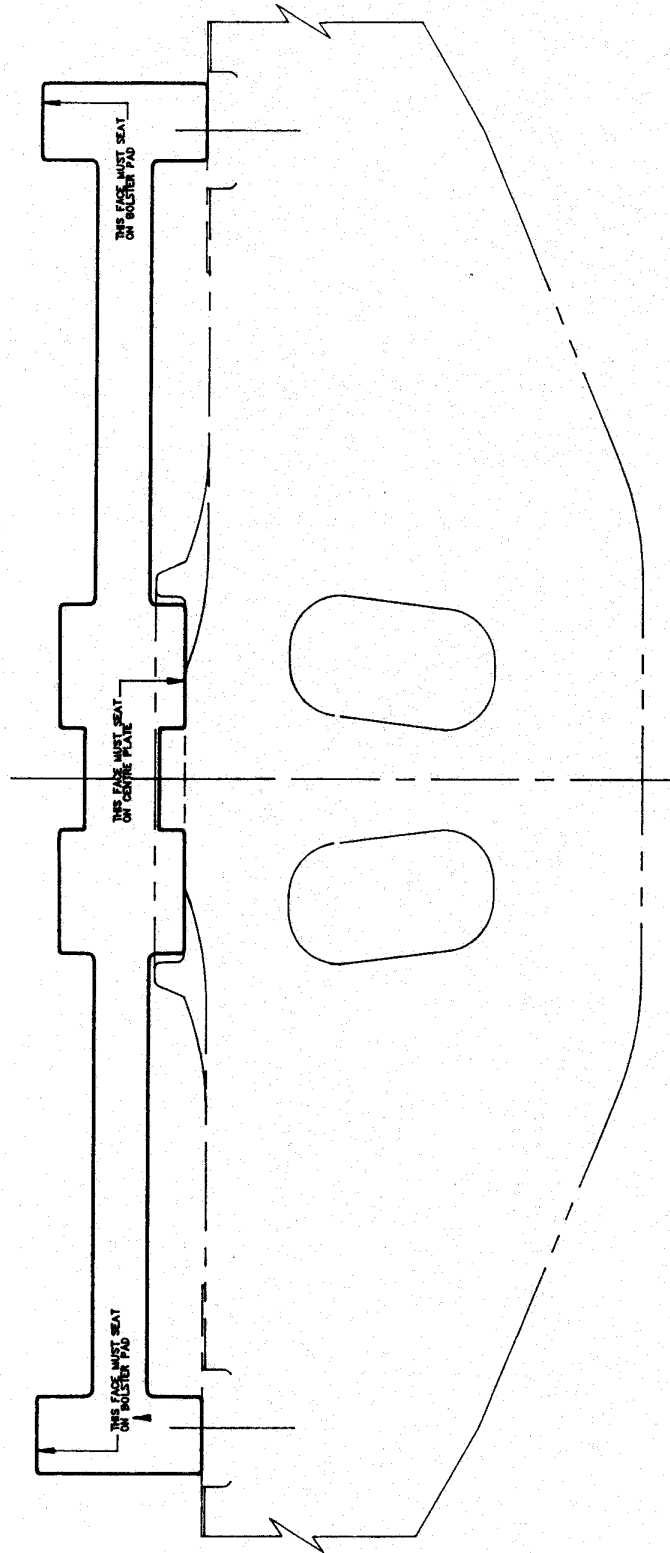
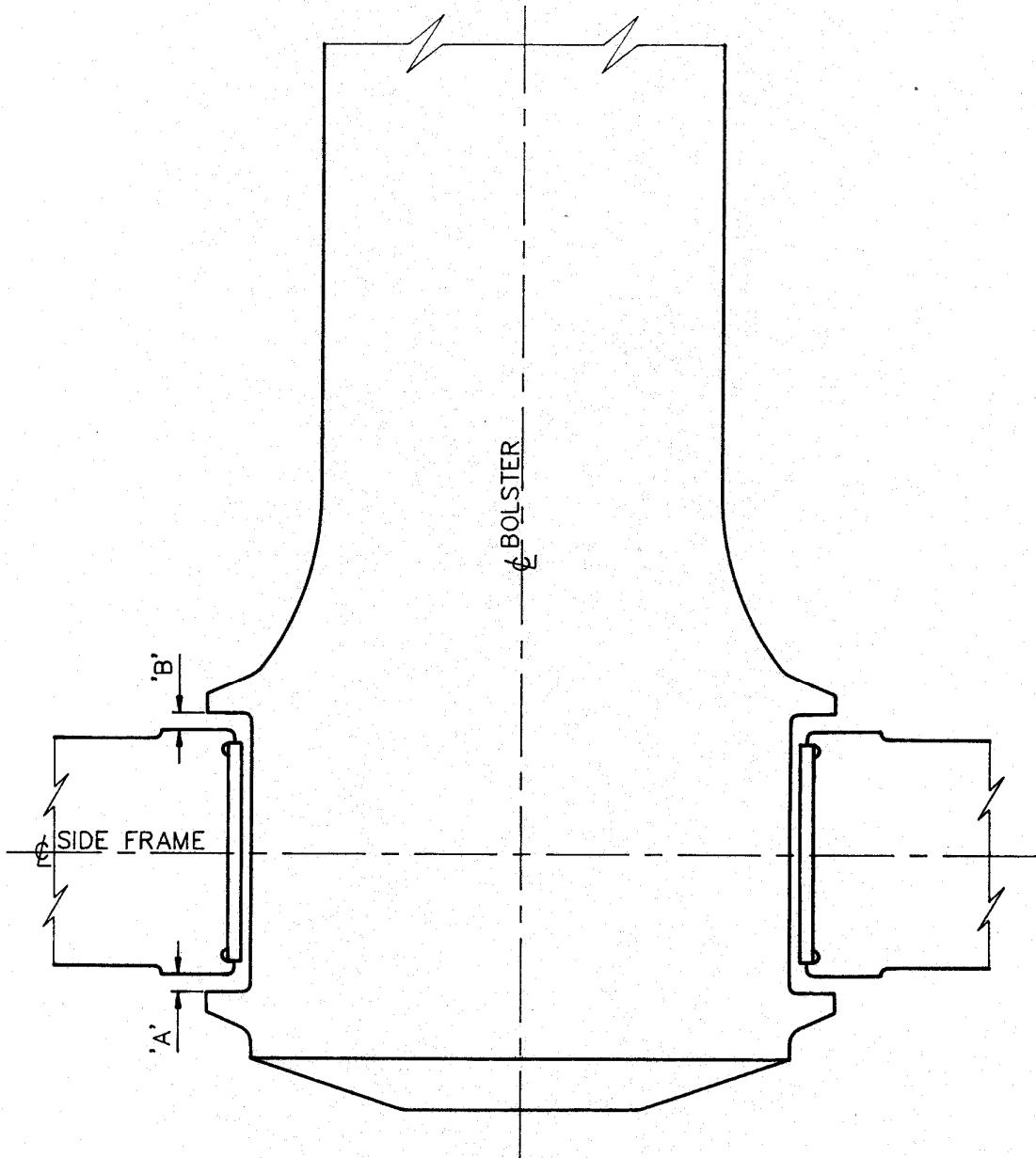


DIAGRAM 24-2-7

BOLSTER GIB CLEARANCE

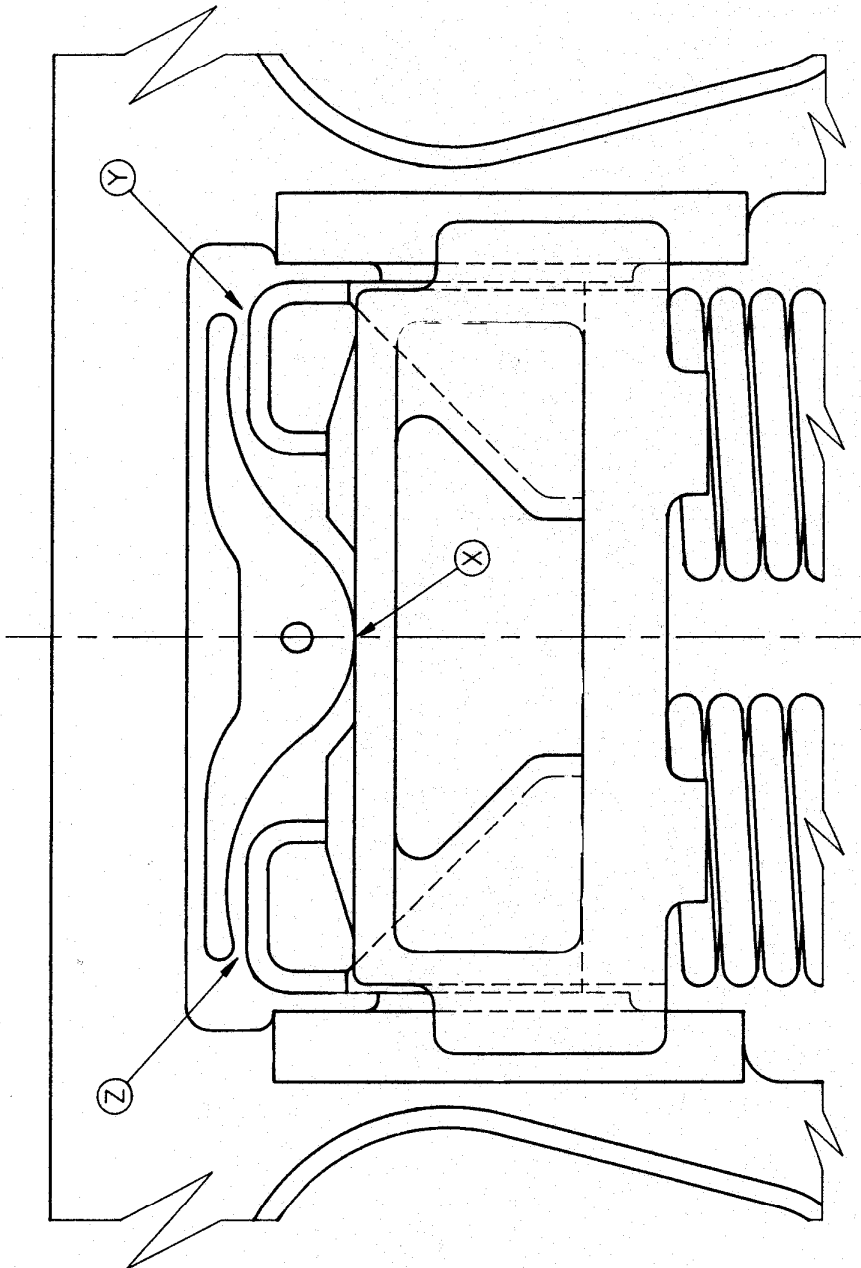
LIMITING DIMENSIONS

LIMITING DIMENSIONS



BOLSTER & SIDE FRAME NEED REPAIR WHEN TOTAL
CLEARANCE A & B EXCEEDS 28mm (40t & 50t)
38mm (70t & 100t)

DIAGRAM 24-2-8
MEASUREMENT OF WEDGE RISE
50 T. RIDE CONTROL BOGIES
50 T. RIDE CONTROL BOGIES

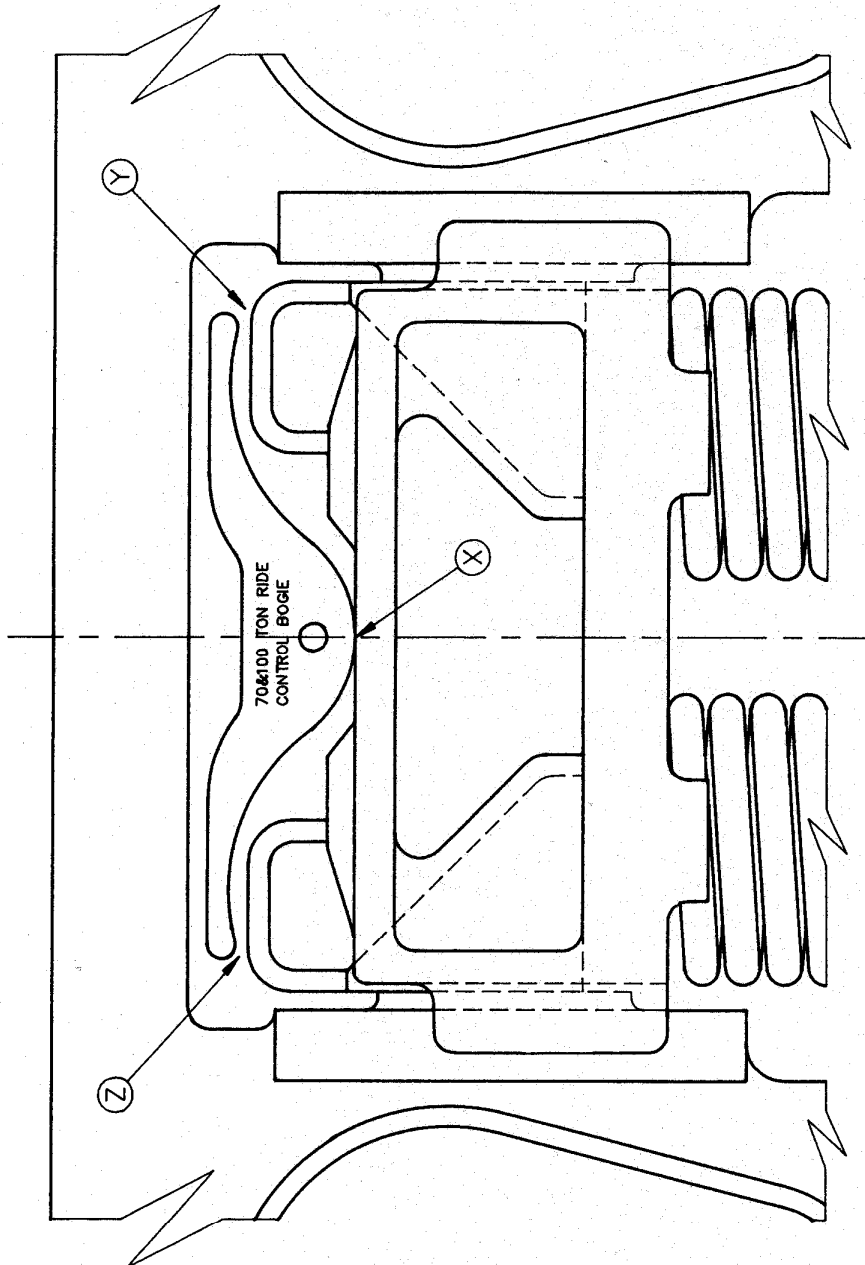


RIDE CONTROL ELEMENTS ARE IN WORKING ORDER WHEN GAUGE CONTACTS BOLSTER AT 'X' AS ILLUSTRATED.
COMBINED LIMIT OF WEAR HAS BEEN REACHED WHEN GAUGE CONTACTS FRICTION CASTINGS AT 'Z' & 'Y'.

DIAGRAM 24-2-9

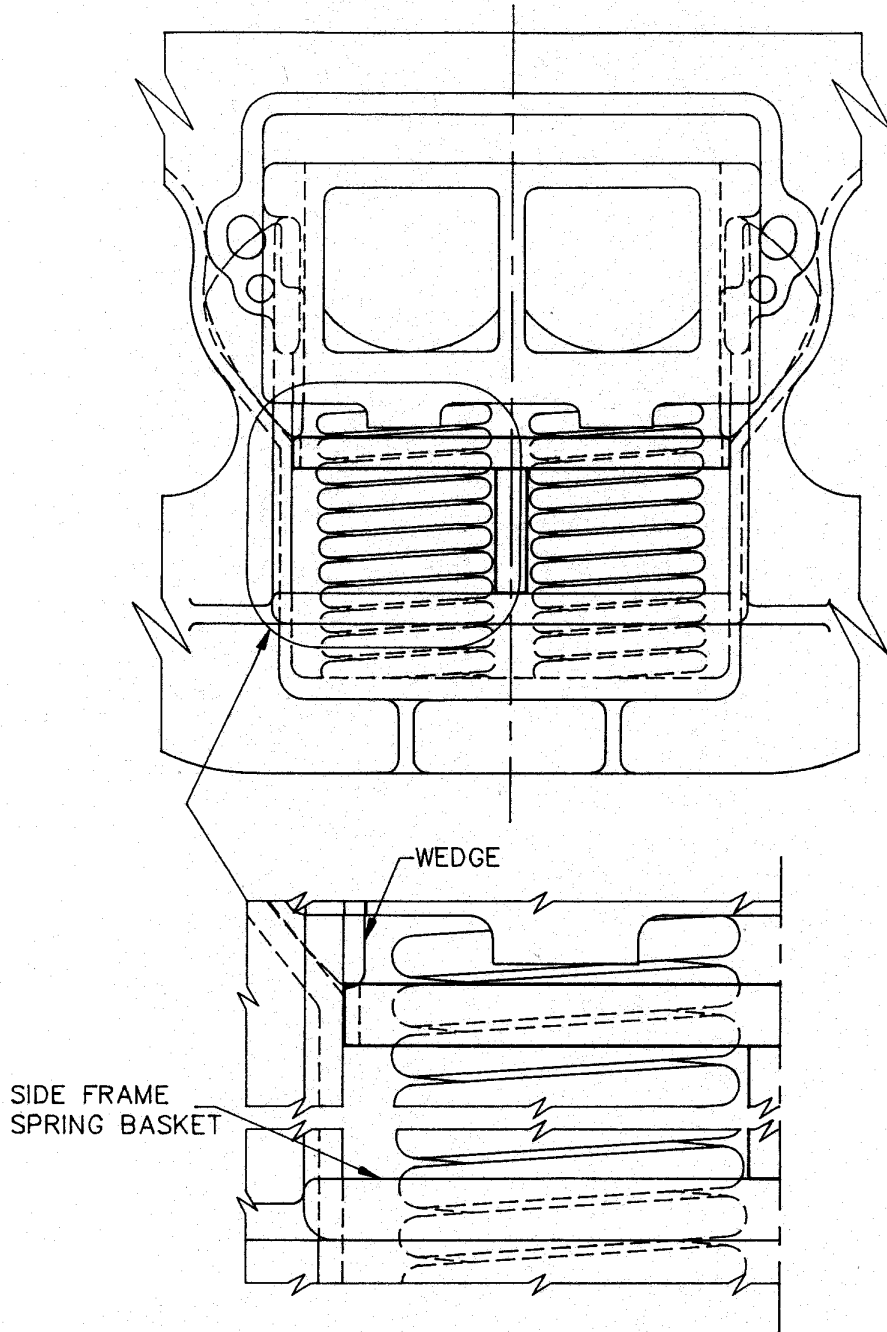
MEASUREMENT OF WEDGE RISE

70 T AND 100 T RIDE CONTROL BOGIES



RIDE CONTROL ELEMENTS ARE IN WORKING ORDER WHEN GAUGE CONTACTS BOLSTER AT 'X' AS ILLUSTRATED.
COMBINED LIMIT OF WEAR HAS BEEN REACHED WHEN GAUGE CONTACTS FRICTION CASTINGS AT 'Z' & 'Y'.

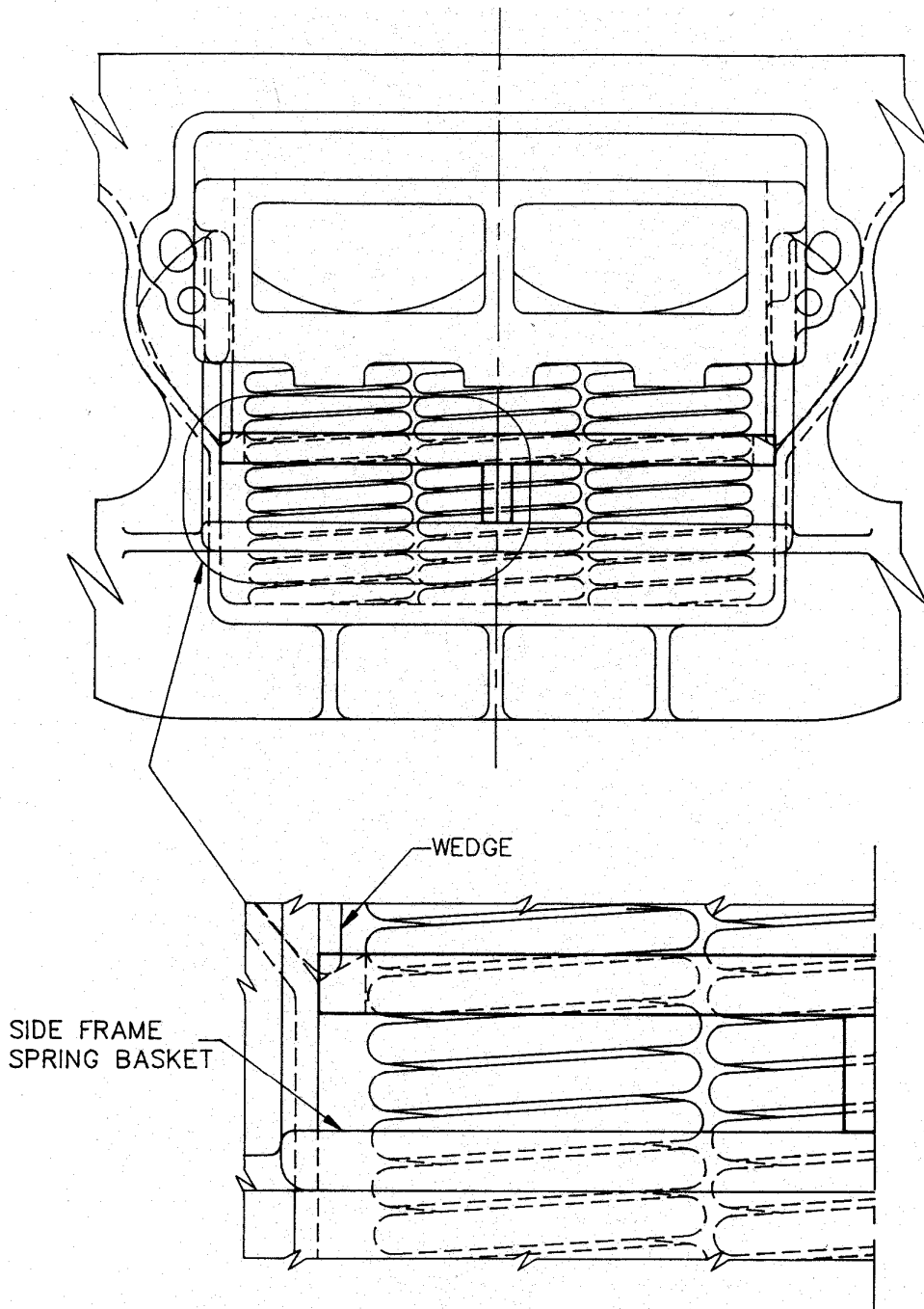
DIAGRAM 24-2-10
MEASUREMENT OF WEDGE RISE
50 T NATIONAL BOGIES



SEAT GAUGE AGAINST BOTTOM PORTION OF WEDGE.

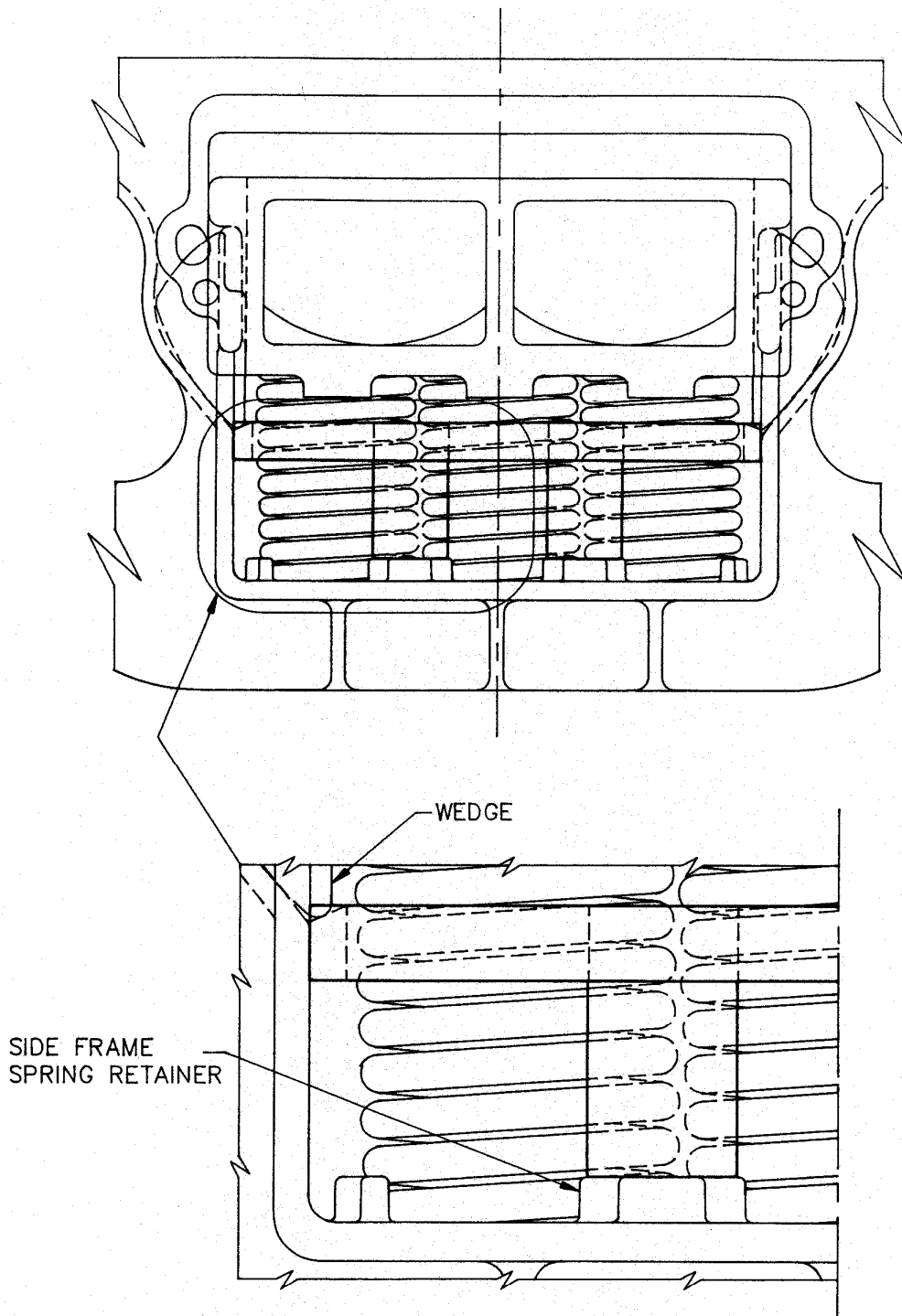
WHEN BOTTOM LEG OF GAUGE DOES NOT PASS OVER SIDE FRAME SPRING BASKET, REPAIR WORK IS INDICATED.

DIAGRAM 24-2-11
MEASUREMENT OF WEDGE RISE
70 T NATIONAL BOGIES



SEAT GAUGE AGAINST BOTTOM PORTION OF WEDGE.
WHEN BOTTOM LEG OF GAUGE DOES NOT PASS OVER SIDE FRAME
SPRING BASKET, REPAIR WORK IS INDICATED.

DIAGRAM 24-2-12
MEASUREMENT OF WEDGE RISE
100 T NATIONAL BOGIES



SEAT GAUGE AGAINST BOTTOM PORTION OF WEDGE.

WHEN BOTTOM LEG OF GAUGE DOES NOT PASS OVER SIDE FRAME SPRING RETAINER, REPAIR WORK IS INDICATED.

DIAGRAM 24-2-13
MEASUREMENT OF WEDGE RISE
50 T BARBER BOGIES

**NO DIAGRAM IN ORIGINAL
PRINTED DOCUMENT**

DIAGRAM 24-2-14
MEASUREMENT OF WEDGE RISE
70 T BARBER BOGIES

**NO DIAGRAM IN ORIGINAL
PRINTED DOCUMENT**

DIAGRAM 24-2-15
MEASUREMENT OF WEDGE RISE
100T BARBER BOGIES

**NO DIAGRAM IN ORIGINAL
PRINTED DOCUMENT**

DIAGRAM 24-8-1

BODY SIDE-BEARER SET-UP

ANZR BOGIES - GAP TYPE SIDE-BEARERS

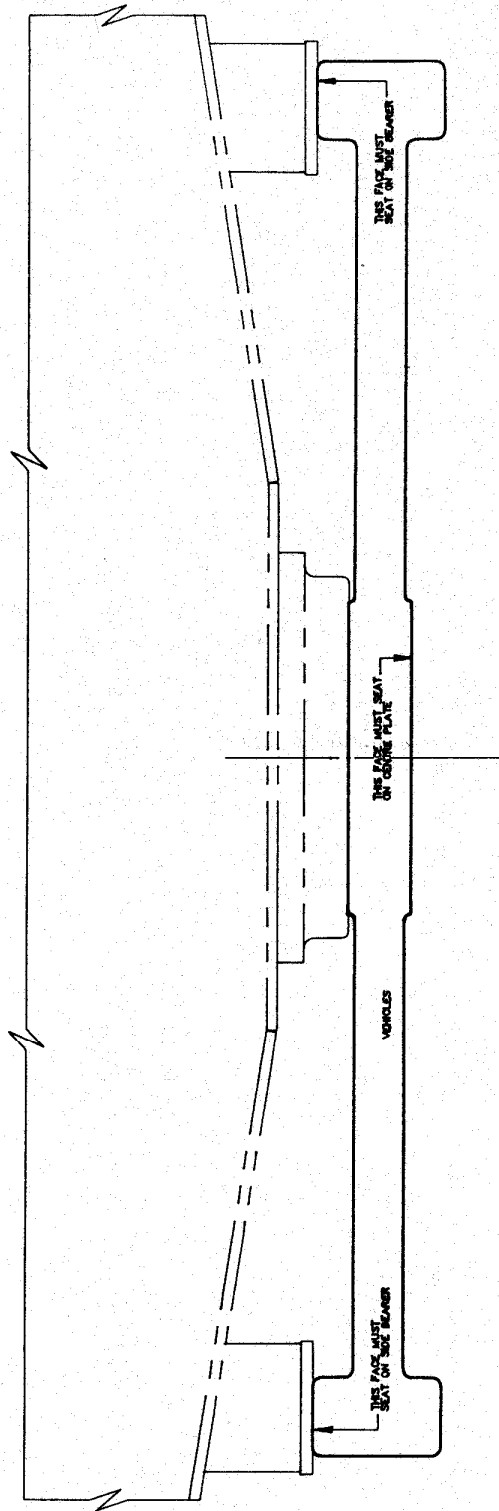


DIAGRAM 24-8-2

BODY SIDE-BEARER SET-UP

AAR BOGIES - AAR SIDE-BEARERS

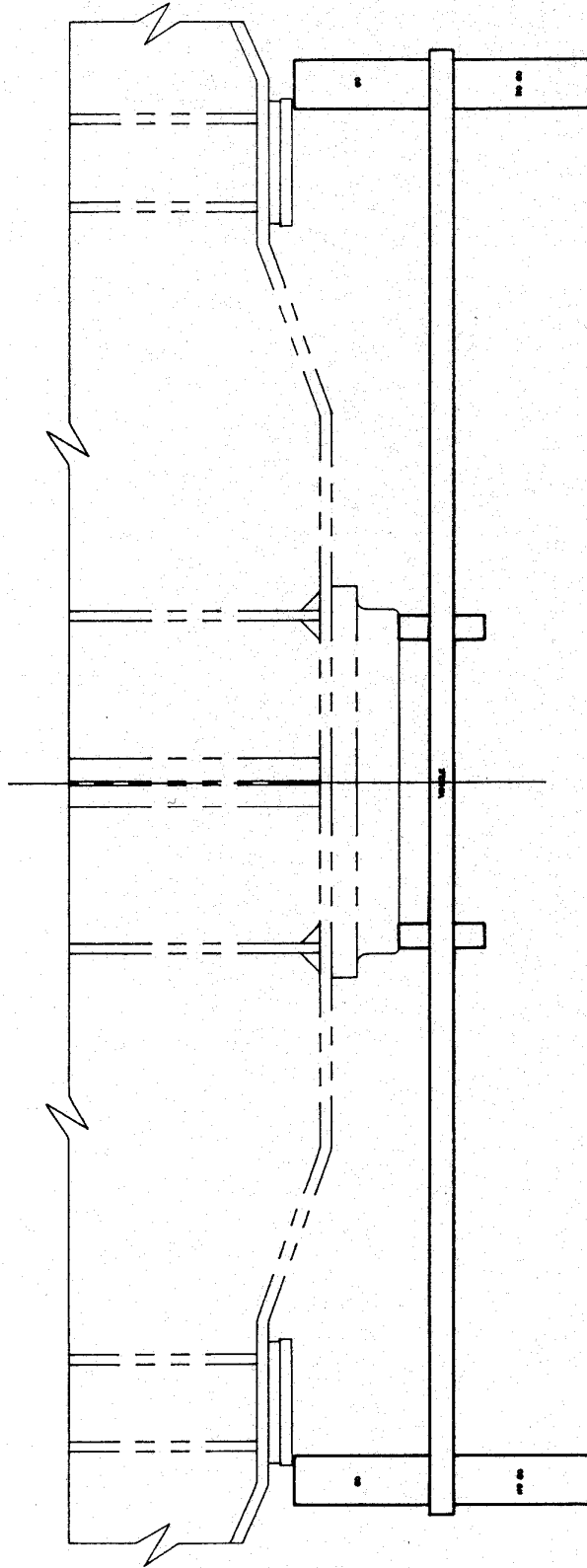


DIAGRAM 24-8-3

BODY SIDE-BEARER SET-UP

SHARED BOGIES - ARTICULATED VEHICLES

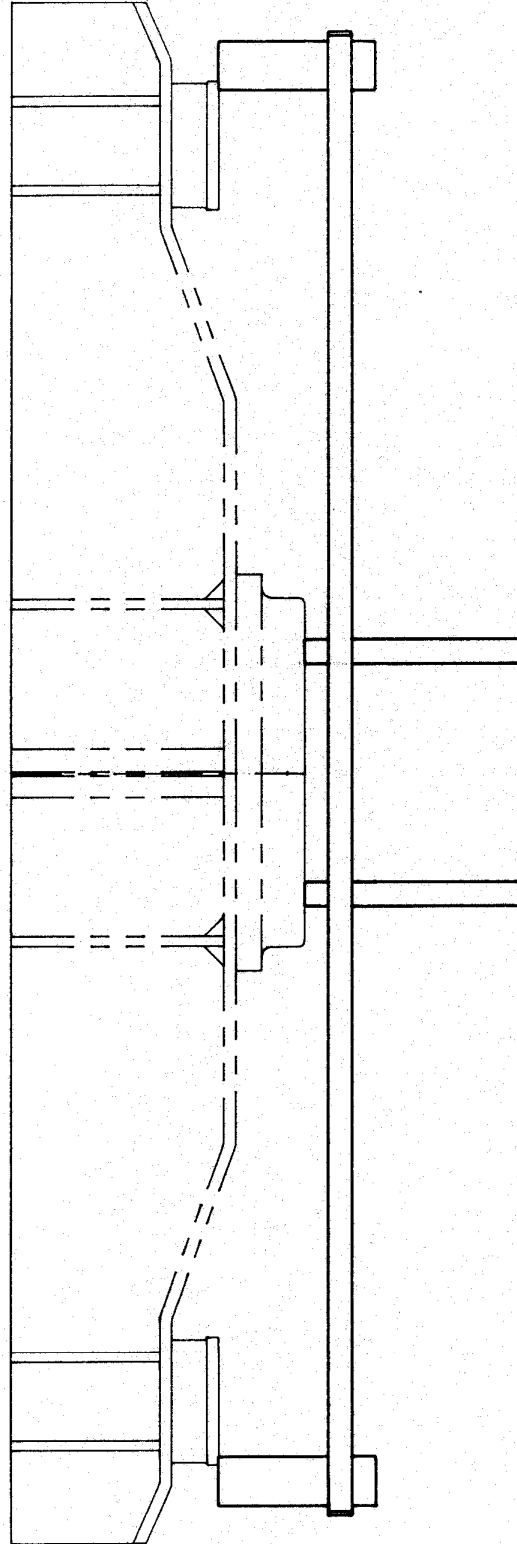


DIAGRAM 24-8-4

BODY SIDE-BEARER SET-UP

ANZR VEHICLES - AAR BOGIES - STANDARD CCSB'S

**PAGE MISSING FROM ORIGINAL
PRINTED DOCUMENT**

DIAGRAM 24-8-5

BODY SIDE-BEARER SET-UP

ANZR VEHICLES - AAR BOGIES - LOW HEIGHT CCSB'S

**PAGE MISSING FROM ORIGINAL
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DIAGRAM 24-8-6
BODY CENTRE PLATE- 300 DIA
MINIMUM DIMENSIONS

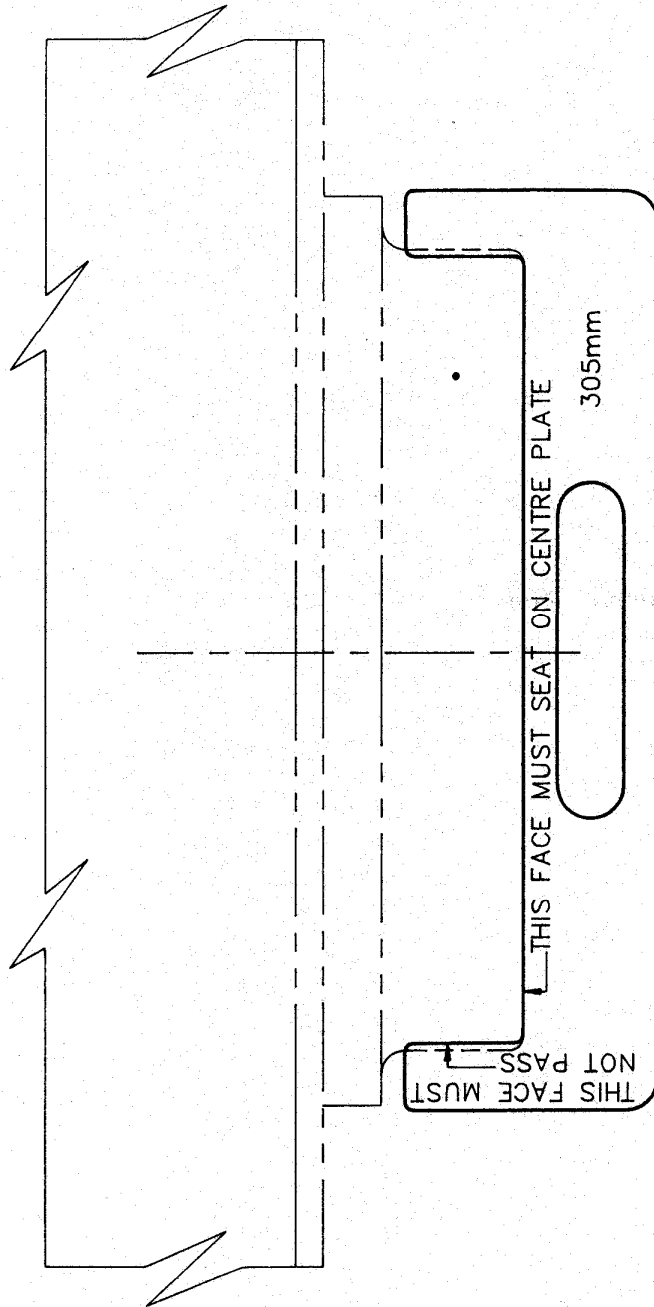


DIAGRAM 24-8-7

BODY CENTRE PLATE - 356 DIA

MINIMUM DIMENSIONS

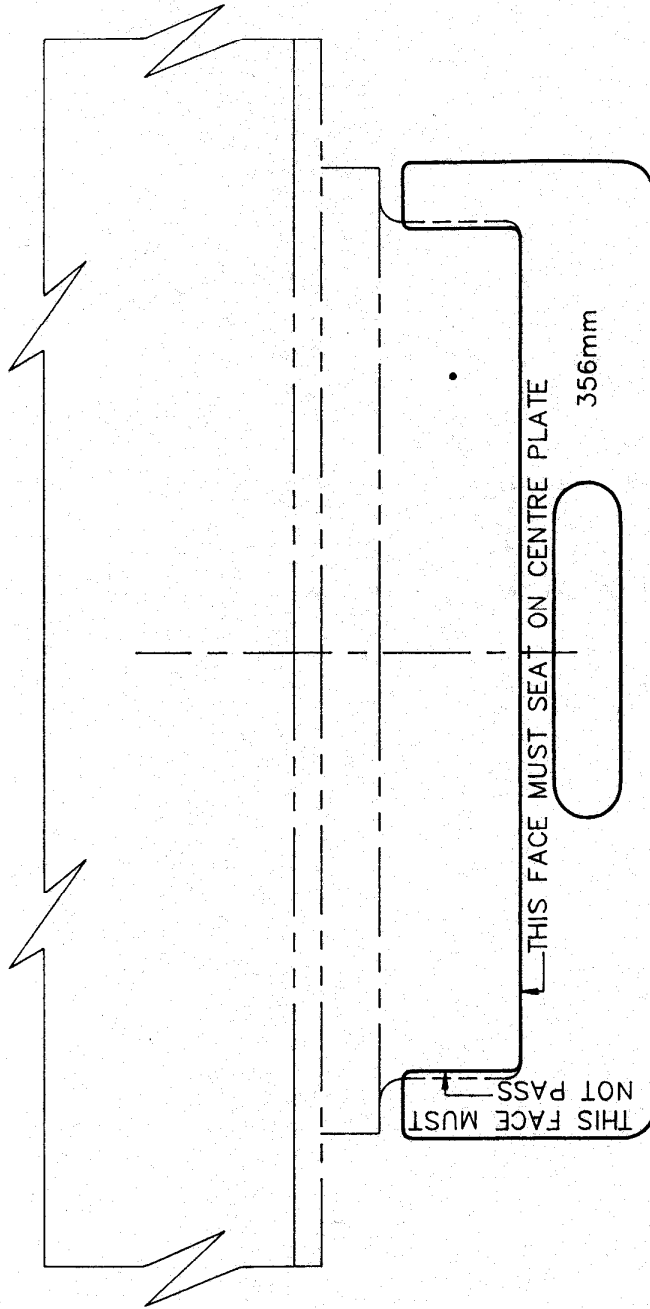


DIAGRAM 24-8-8

BODY CENTRE PLATE - 356 DIA., LONG SPIGOT

MINIMUM DIMENSIONS

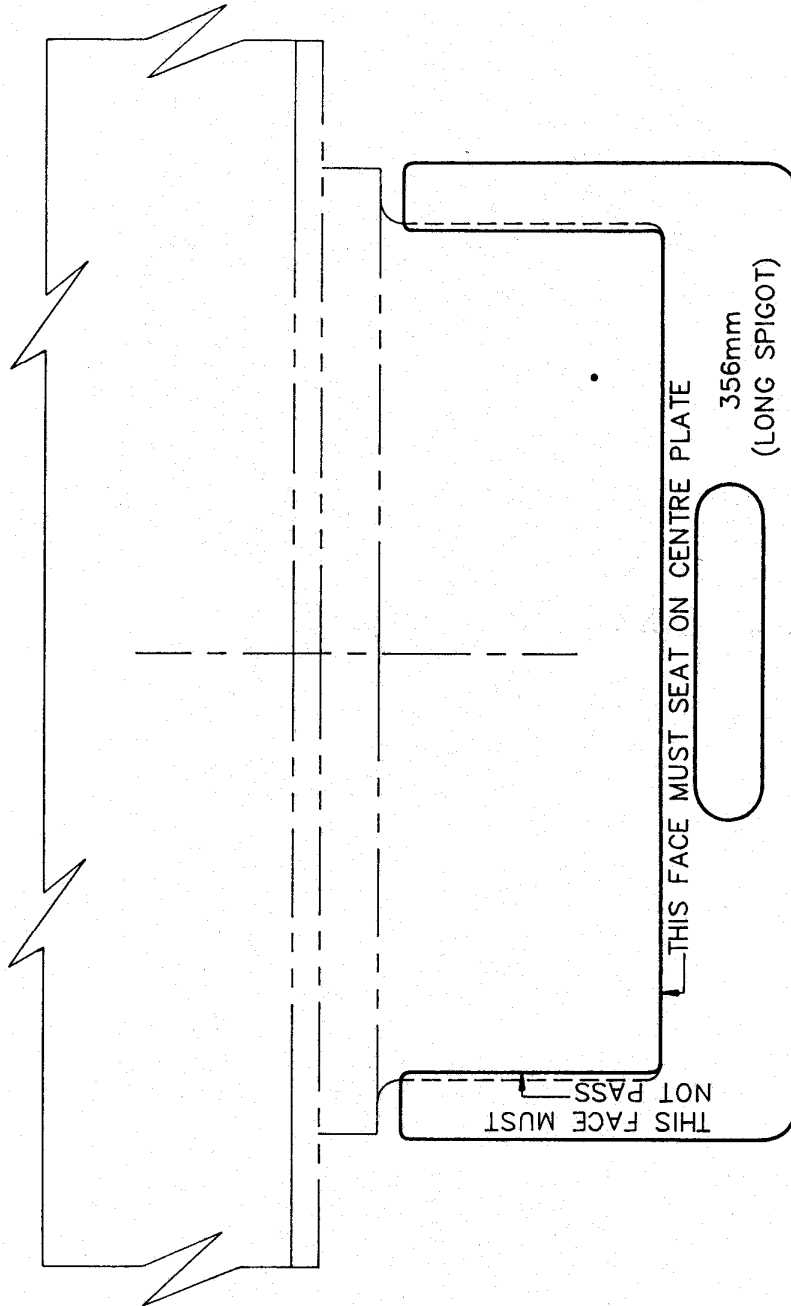


DIAGRAM 24-8-9

BODY CENTRE PLATE - 406 DIA

MINIMUM DIMENSIONS

