

SECTION 27

BEARINGS

27 BEARINGS

27.1 *GENERAL*

Bearings are provided in bridge structures to enable:

- the transmission of forces between the superstructure and the substructure
- relative movement between the superstructure and substructure without creating additional stresses.

Bearings are normally referred to as either "fixed", "restrained" or "expansion" and are denoted on General Arrangement drawings by the letters F, R and E.

Fixed Bearings allow transfer of vertical and/or horizontal loads as well as rotational movement.

Restrained Bearings allow transfer of vertical loads, minor rotational movement and minor horizontal movement

Expansion Bearings allow transfer of vertical loads as well as rotational and horizontal movement.

Bearing types, other than elastomeric strip bearings, shall be sufficiently detailed to allow for full inspection, maintenance and replacement. The design position for the jacks required for the future lifting of the superstructure to replace the bearings shall be shown on the drawings. The calculated jacking loads and method of jacking (simultaneous) shall also be also specified on the drawings.

27.2 *REDUCED LEVELS OF BEARINGS*

Where bearings are to be set on nominal thickness mortar pads, the reduced level for the top of the bearing shall be given so that any variation of design levels may be "taken out" in the thickness of the mortar pad.

Where bearings are to be set on concrete plinths or where elastomeric pad/strip bearings are used and are set directly on the concrete surface, the reduced level for the concrete surface shall be given.

27.3 *BEARING TYPES*

The main types of bearings commonly used are:

- Elastomeric Bearing Strips and Pads
- Laminated Elastomeric Bearings
- Proprietary types such as confined Elastomers, Spherical and Pot

27.3.1 *Elastomeric Bearing Strips and Elastomeric Bearing Pads*

Sizes of these types of bearings shall conform to details given in AS 5100.4.

Elastomeric Bearing Strips shall be detailed complete with width, thickness, length, hole size and spacing for dowels where applicable. (See Figure 27.3.1)

Nominal bearing strip sizes are:

65 x 20mm Thick, 95 x 20mm Thick and 125 x 25mm Thick

Reference should be made to RTA Bridge Policy Circular 98/15 – “Multi Span Plank Bridges with Link Slabs – Guidelines for Bearing Selection” for guidance on the appropriate size to be used for each application.

Elastomeric Bearing Pads do not normally require detailing, however, length, width and thickness shall be given in all instances. Bearings should be shown in sufficient detail to enable correct orientation and placement within the structure.

27.3.2 Laminated Elastomeric Bearings

Generally Laminated Elastomeric Bearings shall conform to AS 5100.4 with Part Numbers from AS 5100.4 being quoted on the drawings. “Standard” bearings require no specific detail except where holes are required for dowel pins etc. Any modifications to 'standard' bearings shall be sufficiently detailed to enable manufacture, i.e. size, location and depth of required holes.

Non-Standard Bearings, where used shall be sufficiently detailed to enable manufacture. The following information shall be given:

- Overall physical dimensions
- Number and thickness of internal rubber layers
- Number, size and thickness of steel plates
- Cover thickness to steel plates
- Hole details (including location and depth)
- Cover thickness to holes for steel plates (where hole detailed)
- Table of bearing performance requirements.

Figure 27.3.1 shows required detailing and performance table for Non-Standard Elastomeric Bearings.

RTA Standard Bridge Drawing No RTAB033G shows the required level of detailing for the installation of Elastomeric Bearings where used with PSC Super T girders.

RTA Standard Bridge Drawing No RTAB050 shows the required level of detailing for the installation of Elastomeric Bearings where used with PSC I girders.

27.3.3 Proprietary Bearing Types

Several different types of proprietary bearings are extensively used in bridge designs. These include confined elastomer ('POT TYPE') as well as spherical which have a combination of elastomeric, metal and/or PTFE components.

Other types of proprietary bearings have combinations of metal elastomeric and/or PTFE components arranged in different forms to cater for the necessary restraints and movements. Brand names for proprietary bearings shall not be shown on the drawings and proprietary bearings shall not be fully detailed. However, it is necessary to draw the outline of the bearing based on the dimension shown in the manufacturer's catalogue. Figures 27.3.3(a) and 27.3.3(b) show the typical level of detailing required.

The only dimensions given on the drawings shall be:

- bearing height (excluding additional attachment plates)
- overall height of the bearing assembly including necessary attachment plates.

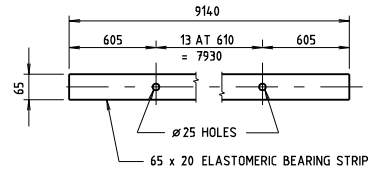
- plan dimensions of the upper and lower surfaces in contact with the attachment plates, or with the bridge structure where attachment plates are unnecessary.
- spacing of bearing anchor bolts.

Attachment plates are required to be provided to allow for the future removal or replacement of the bearings. Attachment plates shall be shown as separate items and shall be fully detailed to enable fabrication. (See Clause 29.5 of this Manual).

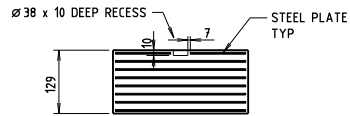
All necessary bolts, nuts, washers, screws, dowels and other attachment devices for fastening bearings to attachment plates and for anchoring the bearings or attachment plates to the bridge structure shall be called up in detail. Standard bolts, screws etc. shall not be detailed separately but must be fully described. Non-standard fasteners shall be drawn in detail with all necessary dimensions to enable fabrication.

In addition to the above, bearing performance requirements for each size and type of bearing used in the bridge structure shall be provided in a table format as shown in Figure 27.3.3(b).

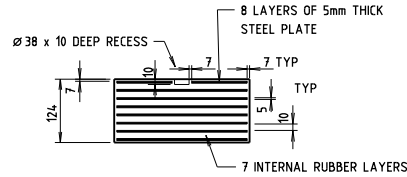
General notes relating specifically to bearing drawings are shown on RTA Standard Bridge Drawing No RTAB029 and where applicable, shall be used.



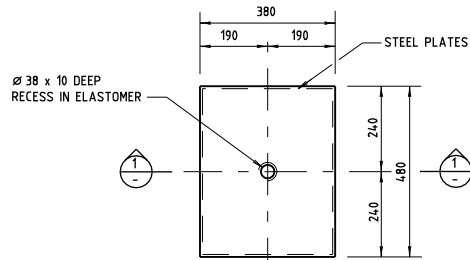
PLAN
ELASTOMERIC BEARING STRIP
REQUIRED
NOT TO SCALE



SECTION 1
NOT TO SCALE

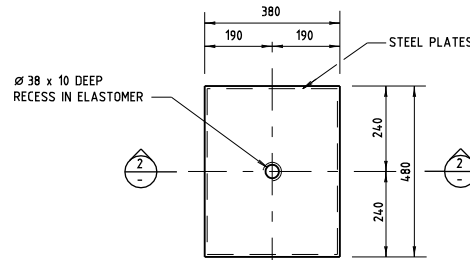


SECTION 2
NOT TO SCALE



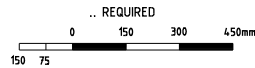
ELASTOMERIC BEARING (MODIFIED STANDARD)

AS PART NUMBER 070908R AS SPECIFIED IN AS 5100.4
MODIFIED AS SHOWN
.. REQUIRED



ELASTOMERIC BEARING (NON STANDARD)

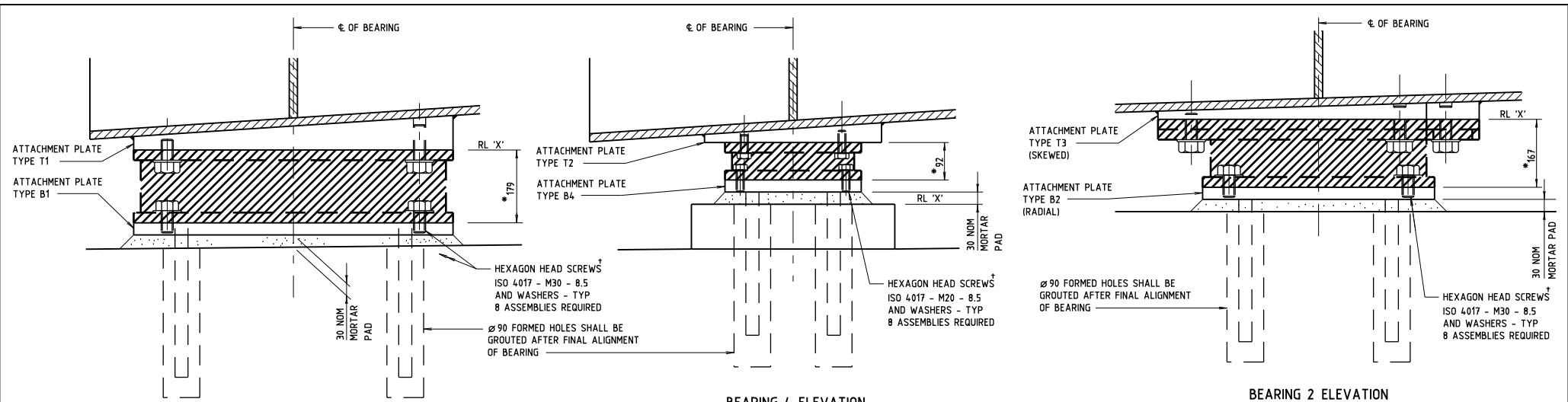
FOR BEARING PERFORMANCE REQUIREMENTS SEE TABLE I



BEARING PERFORMANCE REQUIREMENTS										
No OF INTERNAL RUBBER LAYERS	OVERALL HEIGHT mm	CALCULATED COMPRESSIVE STIFFNESS AT ZERO SHEAR 10^3 kN/m	MEAN SHEAR STIFFNESS 10^3 kN/m	CALCULATED ROTATIONAL STIFFNESS kNm/rad	SHEAR DEFLECTION CAPACITY mm	RATED LOAD AT ZERO ROTATION		RATED LOAD AT MAX ROTATION		AS PART No
						AT MAX SHEAR kN	AT ZERO SHEAR kN	AT MAX SHEAR kN	AT ZERO SHEAR kN	

THIS TYPE OF TABLE IS REQUIRED FOR STANDARD MODIFIED ELASTOMERIC BEARINGS AND NON-STANDARD ELASTOMERIC BEARINGS WHERE THE EXTENT OF THE MODIFICATION ALTERS THE CHARACTERISTICS OF THE BEARINGS

FIGURE 27.3.1

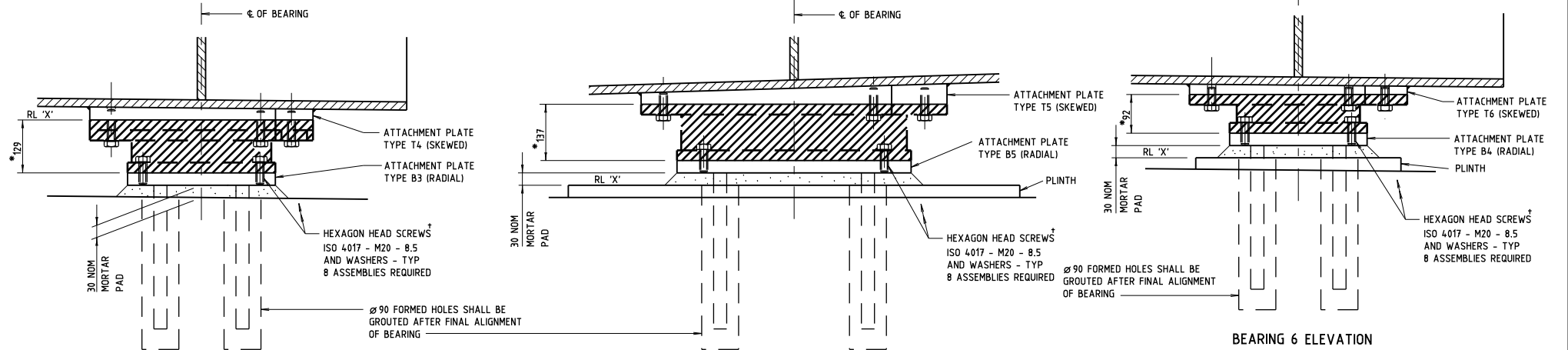


BEARING 1 ELEVATION

BEARING 4 ELEVATION

BEARING 2 ELEVATION

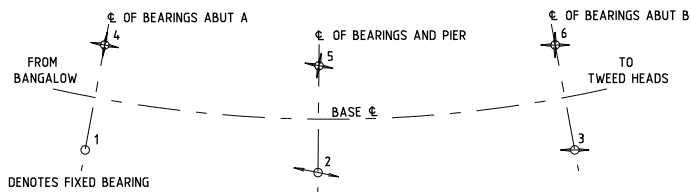
DIRECTION OF TRAFFIC (TYP)



BEARING 3 ELEVATION

BEARING 5 ELEVATION

BEARING 6 ELEVATION



BEARING LOCATION LAYOUT
NOT TO SCALE

TABLE I
BEARING LEVELS

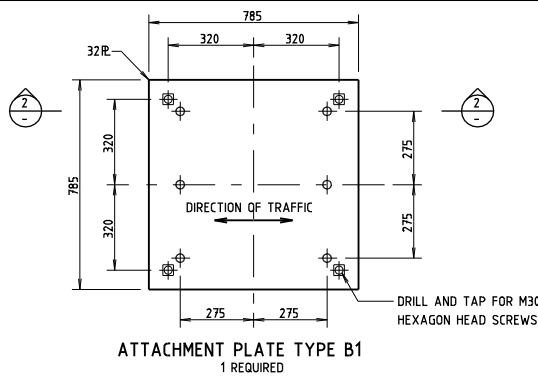
LOCATION	BEARING	RL 'X'
ABUTMENT A	1	102.666
ABUTMENT A	4	102.689
PIER	2	104.728
PIER	5	104.727
ABUTMENT B	3	105.235
ABUTMENT B	6	105.242

GENERAL NOTES

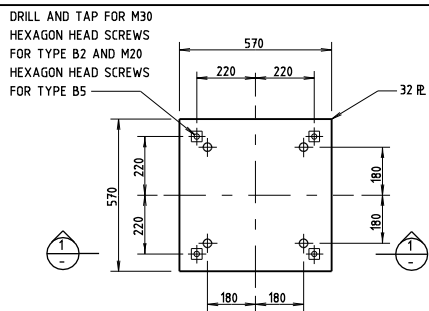
SCALE 0 100 200 300mm OR AS SHOWN.

- MINIMUM 28 DAY COMPRESSIVE STRENGTH OF MORTAR SHALL BE 40MPa. MORTAR SHALL BE DRY PACKED.
- * DENOTES DIMENSIONS BASED ON THE NOMINAL HEIGHTS OF BEARINGS. ACTUAL DIMENSIONS TO BE ASCERTAINED FROM THE BEARING MANUFACTURER BEFORE ABUTMENT HEADSTOCK AND PIER COLUMN CONSTRUCTION, AND THE DIMENSIONS OF THE MORTAR PADS AND/OR CONCRETE SURFACES ADJUSTED ACCORDINGLY.
- HEXAGON HEAD SCREWS SHALL CONFORM TO AS 1110.2.
- FLAT ROUND WASHERS FOR HIGH STRENGTH STRUCTURAL BOLTING SHALL CONFORM TO AS/NZS 1252.
- SCREWS AND WASHERS SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH AS 1214.
- + THE LENGTH OF HEXAGON HEAD SCREWS AS DETERMINED BY THE BEARING MANUFACTURER AND SHALL PROVIDE FOR FUTURE REMOVAL AND REPLACEMENT OF BEARING.
- FOR OTHER GENERAL NOTES RELATING TO THIS SHEET SEE SHEET No XX.

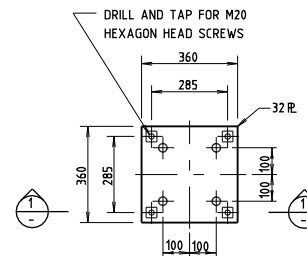
ISSUE	DATE	REVISION	PREP	CHECK	AUTH
ROADS AND TRAFFIC AUTHORITY OF NSW					
FIGURE 27.3.3(a)					
		PREPARED BY BRIDGE ENGINEERING 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8857-0802 FACSIMILE (02) 8857-0065			
		PREPARED DESIGN _____ DRAWING _____	CHECKED _____ _____	REGISTRATION No of PLANS _____ _____	
MANAGER, BRIDGE DESIGN PROJECTS		SHEET No _____		ISSUE _____	



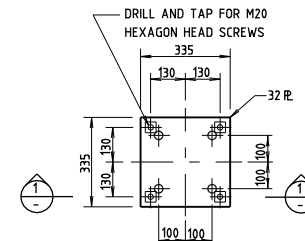
ATTACHMENT PLATE TYPE B1
1 REQUIRED



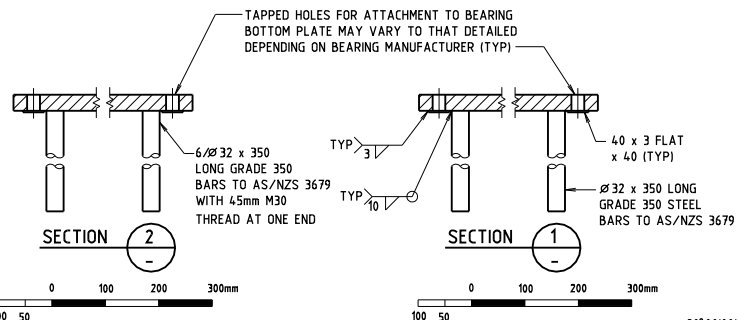
ATTACHMENT PLATE TYPES B2 AND B5
1 REQUIRED TYPE B2, 1 REQUIRED TYPE B5



ATTACHMENT PLATE TYPE B3
1 REQUIRED



ATTACHMENT PLATE TYPE B4
2 REQUIRED



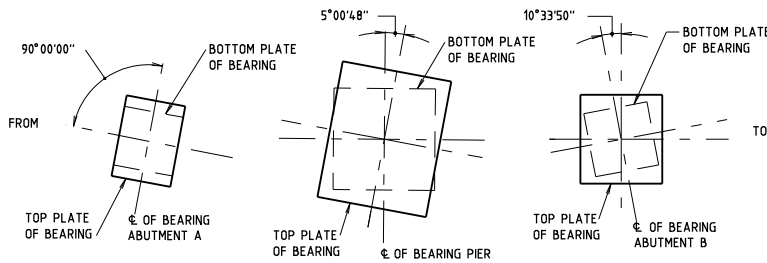
GENERAL NOTES

SCALE 0 100 200 300 400 500mm OR AS SHOWN.
100 50

STEEL PLATES AND FLATS SHALL CONFORM TO AS 3678 GRADE 350. THE WELD CATEGORY SHALL BE GP IN ACCORDANCE WITH AS/NZS 1554 PART 1. WELDING SYMBOLS COMPLY WITH AS 1101 PART 3. ALL ATTACHMENT PLATES SHALL BE HOT-DIP GALVANIZED AFTER FABRICATION. STEEL PLATES SHALL BE WELDED TO ATTACHMENT PLATES PRIOR TO PROTECTIVE TREATMENT. EDGES TO BE PROTECTIVE TREATED SHALL BE ROUNDED TO A RADIUS OF 1.5mm IF NO DIMENSION SHOWN. FOR DETAILS OF TOP ATTACHMENT PLATES, SEE SHEET No XX.

INSTALLATION NOTES

THE TOP OF THE BEARING SHALL BE SET LEVEL TO RL'S SHOWN ON SHEET No XX AND BEARING SUPPORTED ON STEEL PACKING PRIOR TO THE PACKING OF MORTAR. SUPPORTS SHALL NOT BE REMOVED UNTIL MORTAR REACHES A STRENGTH OF 40MPa. THE BEARING ASSEMBLIES SHALL BE HELD TOGETHER WITH TRANSIT BOLTS TO PREVENT MISALIGNMENT AND DAMAGE TO THE COMPONENTS DURING TRANSIT AND ERECTION. THE TRANSIT BOLTS SHALL NOT BE REMOVED UNTIL AFTER FINAL INSTALLATION. THE PTFE/STAINLESS STEEL INTERFACES OF ALL BEARINGS SHALL BE HEAVILY LUBRICATED WITH AN APPROVED LUBRICANT AT TIME OF ASSEMBLY.



HORIZONTAL ROTATION OF TOP PLATE OF BEARING
NOT TO SCALE

TABLE II BEARING PERFORMANCE REQUIREMENTS

BEARING No	LOCATION	TYPE AND DESCRIPTION OF BEARING	VERTICAL LOADS (kN)		HORIZONTAL LOAD (kN)	HORIZONTAL MOVEMENT		MAXIMUM ROTATION (RADIAN)	No REQUIRED
			MAX	MIN		LONGIT	TRANS		
1	ABUTMENT A	FIXED POT TYPE LONGITUDINALLY AND TRANSVERSELY RESTRAINED	2000	650	385 TRANS 900 LONGIT	-	-	.007	1
2	PIER	GUIDED SLIDING POT TYPE TRANSVERSELY RESTRAINED	6500	3300	870	±21	0	.007	1
3	ABUTMENT B	GUIDED SLIDING POT TYPE TRANSVERSELY RESTRAINED	2500	900	415	±45	0	.007	1
4	ABUTMENT A	FREE SLIDING POT TYPE	2000	450	-	0	1	.007	1
5	PIER	FREE SLIDING POT TYPE	6500	3250	-	±21	±1	.007	1
6	ABUTMENT B	FREE SLIDING POT TYPE	2000	450	-	±45	±1	.007	1

TYPICAL POT-TYPE BEARINGS AND ASSOCIATED ATTACHMENT PLATES ARE DETAILED ON THE DRAWINGS. THE CONTRACTOR SHALL SUBMIT DETAILS OF PROPOSED BEARING MANUFACTURER AS REQUIRED BY THE SPECIFICATION. ANY BEARING TYPE PROPOSED SHALL COMPLY WITH THE FOLLOWING:
a) THE PERFORMANCE REQUIREMENTS SHOWN IN TABLE II.
b) THE VARIATIONS OF THE PHYSICAL DIMENSIONS OF THE BEARINGS, INCLUDING THE ATTACHMENT PLATES, FROM THOSE DETAILED ARE SUCH THAT THE ALTERNATIVE BEARING ASSEMBLY CAN BE ACCOMMODATED WITHIN THE STRUCTURE.
c) THE REQUIREMENT TO DESIGN AND DETAIL THE BEARING FOR FUTURE REMOVAL AND REPLACEMENT.

ISSUE	DATE	REVISION	PREP	CHECK	AUTH
ROADS AND TRAFFIC AUTHORITY OF NSW					
FIGURE 27.3.3(b)					
		PREPARED BY BRIDGE ENGINEERING 110 GEORGE STREET PARRAMATTA NSW 2150 PHONE (02) 8857-0002 FACSIMILE (02) 8857-0065			
		PREPARED DESIGN _____ DRAWING _____	CHECKED _____ _____	REGISTRATION No of PLANS _____ RTA BRIDGE NUMBER _____ ISSUE STATUS: _____ SHEET No _____ ISSUE	
<small>MANAGER, BRIDGE DESIGN PROJECTS</small> <small>CAD No KP2P2734B</small>					