Drafting and Design Presentation Standards
Volume 3: Structural Drafting Standards

Chapter 18: Expansion Joints and Miscellaneous Details

November 2011

Queensland Government

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Chapter 18 Amendments

Revision register

Issue/Rev No.	Reference Section	Description of Revision	Authorised by	Date
1	–	First Issue.	Manager (Structural Drafting)	April 2011
2	–	Document name change.	Manager (Structural Drafting)	Nov 2011
	18.3	Add sections on expansion joint installation width and gap between decks		

Contents

18 Expansion Joints and Miscellaneous Details

18.1 Glossary of terms

For a complete glossary of terms refer Chapter 1 – *Introduction.*

18.2 Figures and examples shown in this volume

The figures and examples shown in this volume are for presentation purposes only, and may contain some details that are now superseded. These details have been included for ease of reference, to illustrate typical solutions, and to show the required standard of drafting presentation. The details are not to be used without an engineering check and certification by a Structural RPEQ to confirm that the details are appropriate for the specific project.

18.3 Bridge Expansion Joints

Bridge expansion joint systems come in a variety of types and shapes. The expansion component of the system may be a flexible filler material, a flexible neoprene gland or a finger joint. For details of the Department of Transport and Main Roads' approved expansion joint systems refer to the *Bridge Components* on the departmental website.

The most common expansion joint system used on departmental bridges is an extruded aluminium joint with a neoprene gland. This joint consists of two aluminium sections bolted across the bridge. If the bridge has a concrete deck, the sections are bolted to M16 cast in sockets which are cast into the deck. If the bridge does not have a deck, the sections are bolted directly to stainless steel M16 cast in sockets which are cast into the PSC deck units. A neoprene gland slotted into each section completes the expansion joint.

Many of the details that are required to produce expansion joint drawings have been standardised and are shown on standard deck design sheets which have been developed in Bridge Design Branch and are used as the standard for design and presentation in the production of departmental bridge drawings. Engineers may use these standard details, modifying them to be project specific, and issue them as design sheets. Drafters use the standard sheets in their AutoCAD form to produce detailed deck drawings. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches*. For an example drawing refer *Appendix A Example Expansion Joint Detail Drawing*.

Neoprene Gland Size

The size of the gland needs to be considered on a project specific basis. It is usually determined by the amount of expansion that the joint is designed to accommodate, however, departmental policy is to use a 125 gland as standard, even though it may be over designed. This allows for construction tolerance, it means that the gland may not need to be removed during bearing replacement, and it is better suited to skewed bridges. This gland can accommodate approximately 125 mm of expansion. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches – Sheet 1*.

Neoprene Gland Type

The type of the gland needs to be considered on a project specific basis. The neoprene gland can be manufactured as a flush (*F*) seal or a draped (*D*) seal.

A flush seal is superior as it keeps road grit from falling into the joint and clogging it up. The drawback with the flush gland is that it does not suit bridges with a large skew. Therefore a flush seal shall be used on bridges skewed up to and including 20˚.

For bridges skewed greater than 20˚ and up to and including 45˚, a draped seal shall be used.

For bridges skewed greater than 45˚ the expansion joint system shall be considered on an individual basis. The options include using a draped seal, a finger joint, or a continuous relieving slab. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches – Sheet 1*.

Expansion Joint Installation Width

Typically the installation width for a 125 gland is 50 mm, however, this must always be confirmed by the Design Engineer to ensure it allows for sufficient expansion and contraction. *F* seal glands require a minimum closed gap to allow room for the gland. Typically this gap is 20 mm. This must be considered when the installation gap is designed. Refer Figure 18.3-1 *Flush (F) Seal Minimum Closed Gap.*

Figure 18.3-1 Flush (F) Seal Minimum Closed Gap

D seal glands are not as bulky as *F* seal glands, and can therefore close to zero gap. Refer Figure 18.3-2 *Draped (D) Seal Minimum Closed Gap*.

Figure 18.3-2 Draped (D) Seal Minimum Closed Gap

Gap Between Decks

Depending on the size of the gland and thickness of the deck wearing surface, the gland will usually hang below the top face of the deck. The gap between decks shall allow for a gland thickness of 20 mm when the joint is closed. Typically the gap is designed to be 50 mm, however, this must always be confirmed by the Design Engineer to ensure it allows for sufficient contraction of the joint.

M10 Cast in Sockets for Deep Epoxy Mortar under an Extruded Aluminium Expansion Joint System

For bridges without a cast insitu deck, the effects of crossfall and hog may result in particularly deep DWS thicknesses at abutments and piers. Because the top of an extruded aluminium expansion joint finishes flush with the top of the DWS, an expansion joint bolted directly onto deck units may need to be seated on a deep layer of epoxy mortar.

When the thickness of epoxy mortar beneath the expansion joint exceeds 70 mm, the epoxy mortar shall be reinforced. In Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches* this is referred to as deep DWS. Epoxy mortar that does not need to be reinforced is referred to as shallow DWS.

Reinforcing the epoxy mortar is done with stainless steel 12AT bars which are screwed into stainless steel M10 sockets cast in the deck units and bent on site. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches – Sheets 1, 2 and 9*. On bridges with a crowned running surface, the thickness of the epoxy mortar may be such that the 12AT bars are not required on some of the outer deck units.

M16 Cast in Sockets for Attachment of an Extruded Aluminium Expansion Joint System

The stainless steel M16 cast in sockets which an extruded aluminium expansion joint bolts onto shall be spaced at 150 mm centres when they are cast into a concrete deck. If they are cast directly into deck units, the spacing will be determined by the prestressing strands and the holding down bolt hole recess. The M16 cast in sockets shall be positioned inside a reinforcing bar to add strength to the joint. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches – Sheets 1, 2 and 9*.

Expansion Joint Washer

Deck units with a slotted holding down bolt hole for expansion require a galvanised slotted washer to guide the holding down bolt as the unit moves. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches – Sheet 1*.

Expansion Joint Cover Plate

For aesthetics, the gaps in the kerbs/parapets at an expansion joint shall be covered with a stainless steel cover plate. The plates are fabricated from stainless steel because the holes in them are drilled on site. The plate must be attached to the bridge on the side of the expansion joint which faces the oncoming traffic. Should a vehicle slide into the plate, this will reduce damage to both the plate and vehicle. For gaps no larger than 150 mm, the plate shall be 3 mm thick stainless steel and does not need to be located inside a recess. For gaps larger than 150 mm, the plate shall be 10 mm thick and sit inside a 10 mm deep recess. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, Appendix A Deck Design Sketches – Sheet 1*.

18.4 Miscellaneous Details

A Miscellaneous Details drawing is used to show details that are not suited to other major drawings, for example, the Girder or Deck drawings. These details are so small in drawing size that they do not warrant their own specific drawing. Therefore, they are combined together on the Miscellaneous Details drawing. Typically these details are for expansion joints, cover plates, lamp standard brackets, and other minor pieces of steelwork. Refer *Appendix B – Example Miscellaneous Details Drawings*.

If a particular detail does not fit easily on a major drawing, it may be able to be moved to the Miscellaneous Details drawing provided that it is not an integral part of the major drawing.

A Miscellaneous Details drawing is not required for all bridge types. The following are typical guidelines for straightforward bridges only, and the need for a Miscellaneous Details drawing shall be assessed on a project specific basis:

Deck Unit Bridge with Cast Insitu Kerbs without an Expansion Joint

A Miscellaneous Details drawing is not required.

Deck Unit Bridge with Cast Insitu Kerbs with an Expansion Joint

A Miscellaneous Details drawing is required and shall show the following details:

- Expansion joint details
- Cover plate details
- Expansion joint washer details.

It is acceptable to show these details on the Cast Insitu Kerbs drawing rather than creating an additional Miscellaneous Details drawing. This will result in one full drawing sheet rather than two drawings that are half blank.

Deck Unit Bridge with a Reinforced Concrete Deck without an Expansion Joint

A Miscellaneous Details drawing is not required.

Deck Unit Bridge with a Reinforced Concrete Deck with an Expansion Joint

A Miscellaneous Details drawing is required and shall show the following details:

- Cover plates
- Expansion joint washers.

The expansion joint details should go on the Deck drawings because they show the interaction between the M16 cast in sockets and the reinforcing steel that goes around them.

Girder Bridge with a Reinforced Concrete Deck without an Expansion Joint

A Miscellaneous Details drawing is required and shall show the following details:

- Restraint angles and wedges. Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components*
- Bearing restraint plates. Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components*
- Layout diagrams for the girder anchorages and bearing restraint plates (if the complexity of the bridge requires them). Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components*
- Girder anchorages. Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components*

Girder Bridge with a Reinforced Concrete Deck with an Expansion Joint

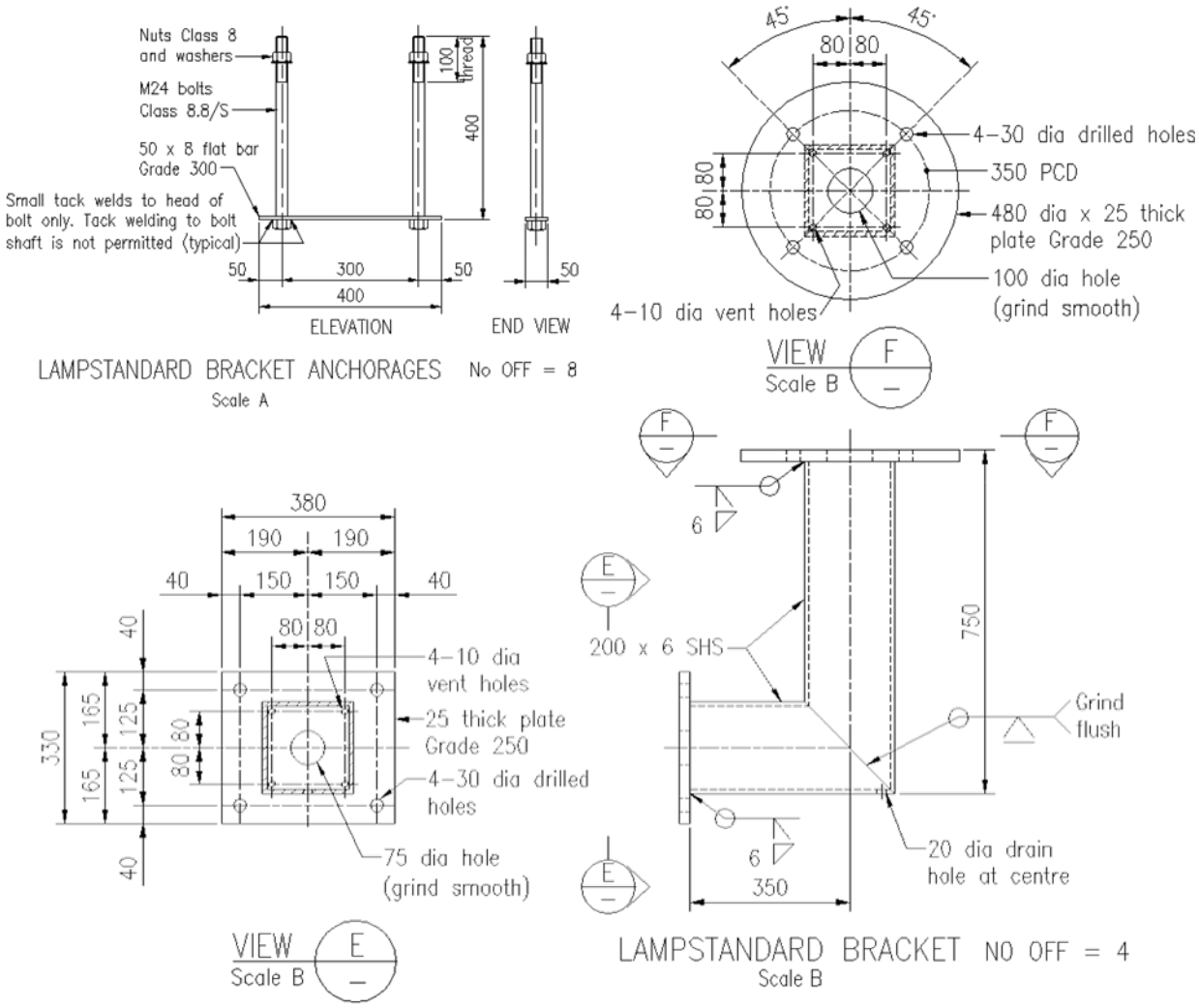
A Miscellaneous Details drawing is required and shall show the following details:

- Restraint angles and wedges. Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components*
- Bearing restraint plates. Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components*
- Layout diagrams for the girder anchorages and bearing restraint plates (if the complexity of the bridge requires them). Refer Chapter 14 – *Prestressed Concrete Girders, 14.6 Miscellaneous Girder Components* and Chapter 11 – *General Arrangements, Figure 11.7.5 – Girder Layout Diagram*.
- Girder anchorages. Refer Chapter 14 – *Prestressed Concrete Girders, 14.7 Girder Anchorage Details*
- Cover plates
- The expansion joint details should go on the Deck drawings because they show the interaction between the M16 cast in sockets and the reinforcing steel that goes around them.

Additional Items that may need to be shown on the Miscellaneous Details Drawings

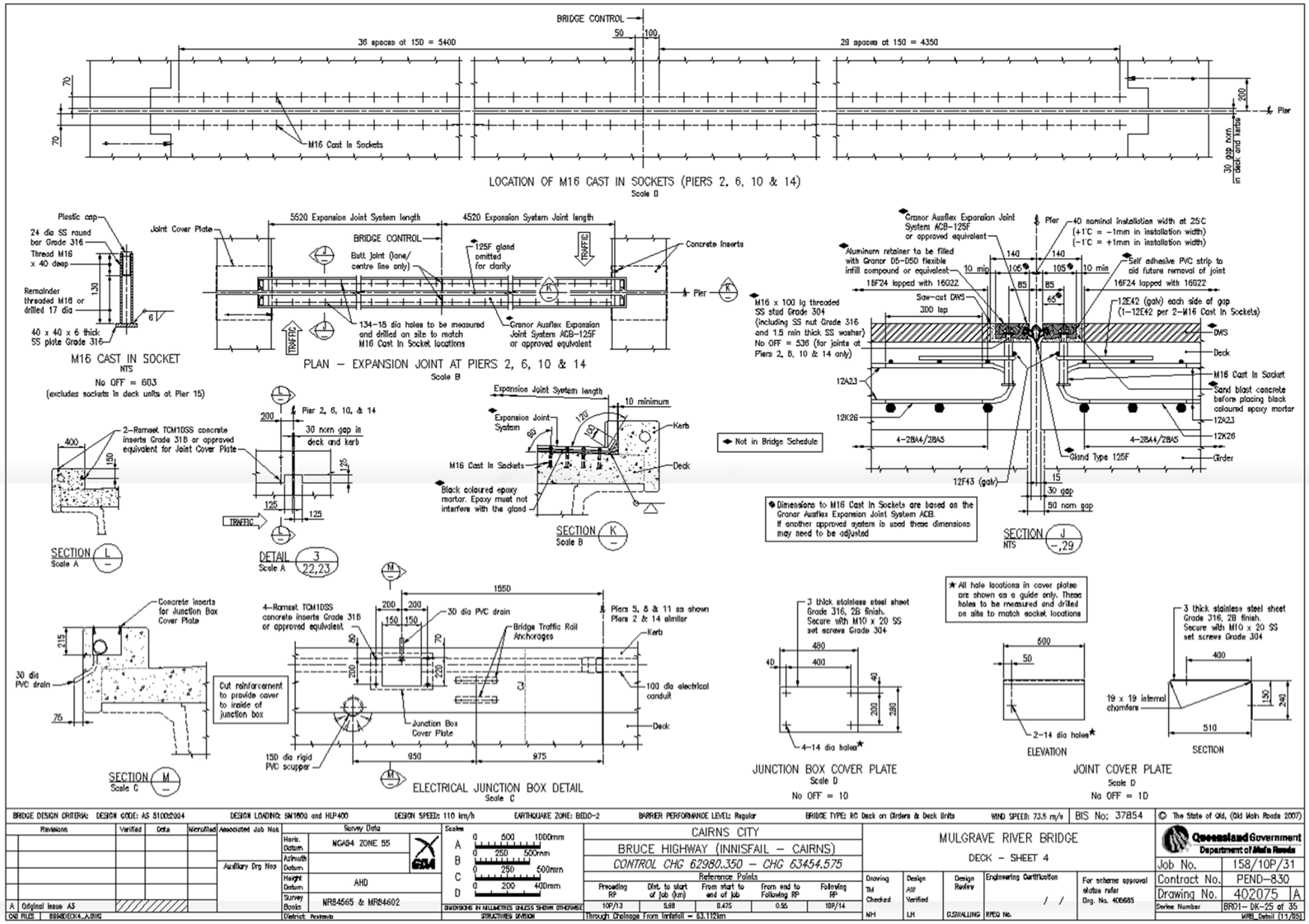
- Junction box cover plates. Refer Chapter 17 – *Cast Insitu Kerbs and Decks, 17.13 Junction Boxes*
- Lampstandard brackets and anchorages. For an example of the details required, refer Figure 18.4-1 *Example Lampstandard Bracket and Anchorage Details*
- Fabrication details for steelwork
- Layout diagrams for steelwork
- Service brackets
- Collection and disposal of stormwater from the bridge. Refer *Appendix C Example Drain Drawings*

Figure 18.4-1 Example Lampstandard Bracket and Anchorage Details



Appendix A – Example Expansion Joint Detail Drawing

Appendix A – Example Expansion Joint Detail Drawing

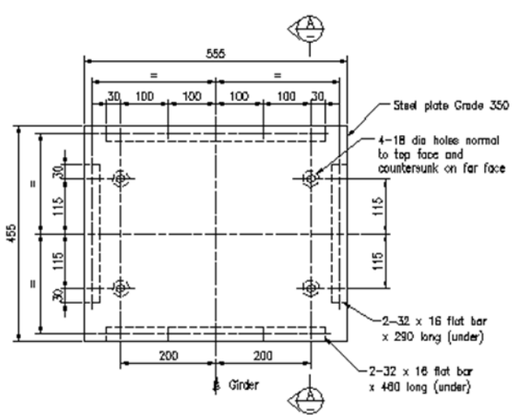


Appendix B – Example Miscellaneous Details Drawings

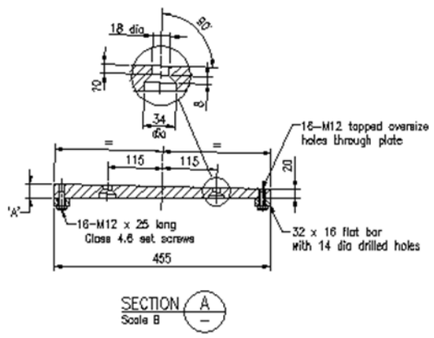
Appendix B – Example Miscellaneous Detail Drawings – Sheet 1

BEARING RESTRAINT PLATES

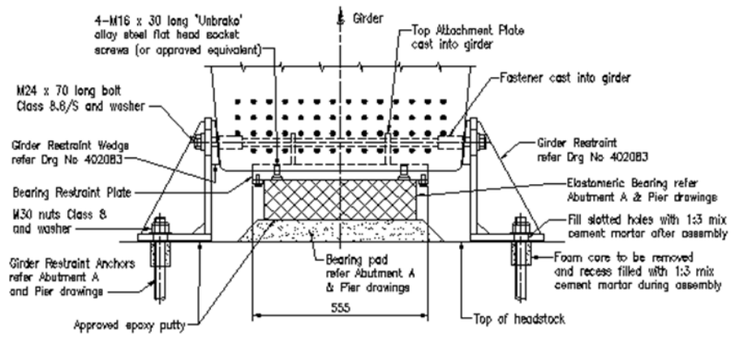
TYPE	DIM. 'A'	No OFF
1	30	75
2	24	75



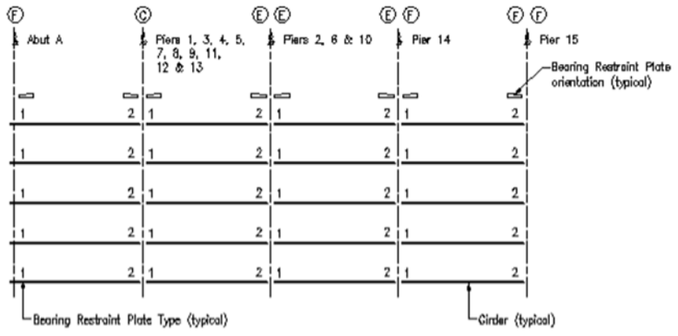
BEARING RESTRAINT PLATE – TYPES 1 & 2
Scale B



SECTION A–A
Scale B



GIRDER ANCHORAGE DETAILS
Scale A



LAYOUT DIAGRAM FOR BEARING RESTRAINT PLATES
NTS

CONSTRUCTION PROCEDURE

1. Install non–compressible temporary packers on top of the headstock positioned to support the Girders. Temporary packers to be of sufficient strength to support the weight of the Girders and of such a height under load that the soffit of the Girders will clear the top of the bearings by 1 to 3mm at the closest point.
2. Immediately prior to installing the Girders apply a 5mm nominal thick epoxy skim to the bearings top surface.
3. Lower the Girders carefully on to the temporary packers allowing the excess epoxy to be displaced and cleaned off immediately.
4. Removal of temporary packers to take place a minimum of 48 hours after placement of the Girders.
5. During erection the Girders shall be restrained longitudinally and laterally by the installation of the Girder Restraints.
6. The Girder Restraints are not to be permanently positioned until after the deck has been cast.

NOTES

1. STEELWORK to be fabricated to the requirements of MRS 11.78 Fabrication of Structural Steelwork.
   Steel plate to be Grade 250/350 to AS/NZS 3678.
   Set screws Class 4.6 to AS 1111.
   Bolts Class 8.8, nuts Class 8 and washers for Class 8.8 bolts to AS/NZS 1252.
   All bolts and nuts to be hot dip galvanised to AS 1214. All other steelwork to be hot dip galvanised to AS/NZS 4680 unless shown otherwise. Prior to galvanising all weld splatter and welding slag is to be removed.
   'Unbrako' screws Grade 10.9 to BS 4168 or approved equivalent.
   'Unbrako' screws to be mechanically zinc plated.
   Members to be branded with suitable identification after fabrication.
2. WELDING symbols conform to AS 1101.3.
   Structural Steel
   Welding to conform to AS/NZS 1554.1.
   All welds to be SP category.
   Welding consumables to be controlled hydrogen type: E48XX or W50X unless shown otherwise.

BRIDGE DESIGN CRITERIA: DESIGN CODE: AS 5100:2004 | DESIGN LOADING: SM1600 and HLP400 | DESIGN SPEED: 110 km/h | EARTHQUAKE ZONE: BEDC–2 | BARRIER PERFORMANCE LEVEL: Regular | BRIDGE TYPE: RC Deck on Girders & Deck Units | WIND SPEED: 73.5 m/s | BIS No: 37654 | © The State of Qld, (Qld Main Roads 2007)

Revisions	Verified	Date	Microfilmed
A Original Issue A3			

CAD FILES: B88BNRSC1_A.DWG

Associated Job Nos | Auxiliary Drg Nos

Survey Data: Horiz. Datum: MGA94 ZONE 55 (ADA) | Azimuth Datum | Height Datum: AHD | Survey Books: MR84565 & MR84602 | District: Penmure

Scales: A 0 200 400mm; B 0 100 200mm
DIMENSIONS IN MILLIMETRES UNLESS SHOWN OTHERWISE
STRUCTURES DIVISION

CAIRNS CITY
BRUCE HIGHWAY (INNISFAIL – CAIRNS)
CONTROL CHG 62980.350 – CHG 63454.575

Reference Points

Preceding RP	Dist. to start of Job (km)	From start to end of Job	From end to Following RP	Following RP
10P/13	5.98	0.475	0.56	10P/14

Through Chainage From Innisfail – 63.112km

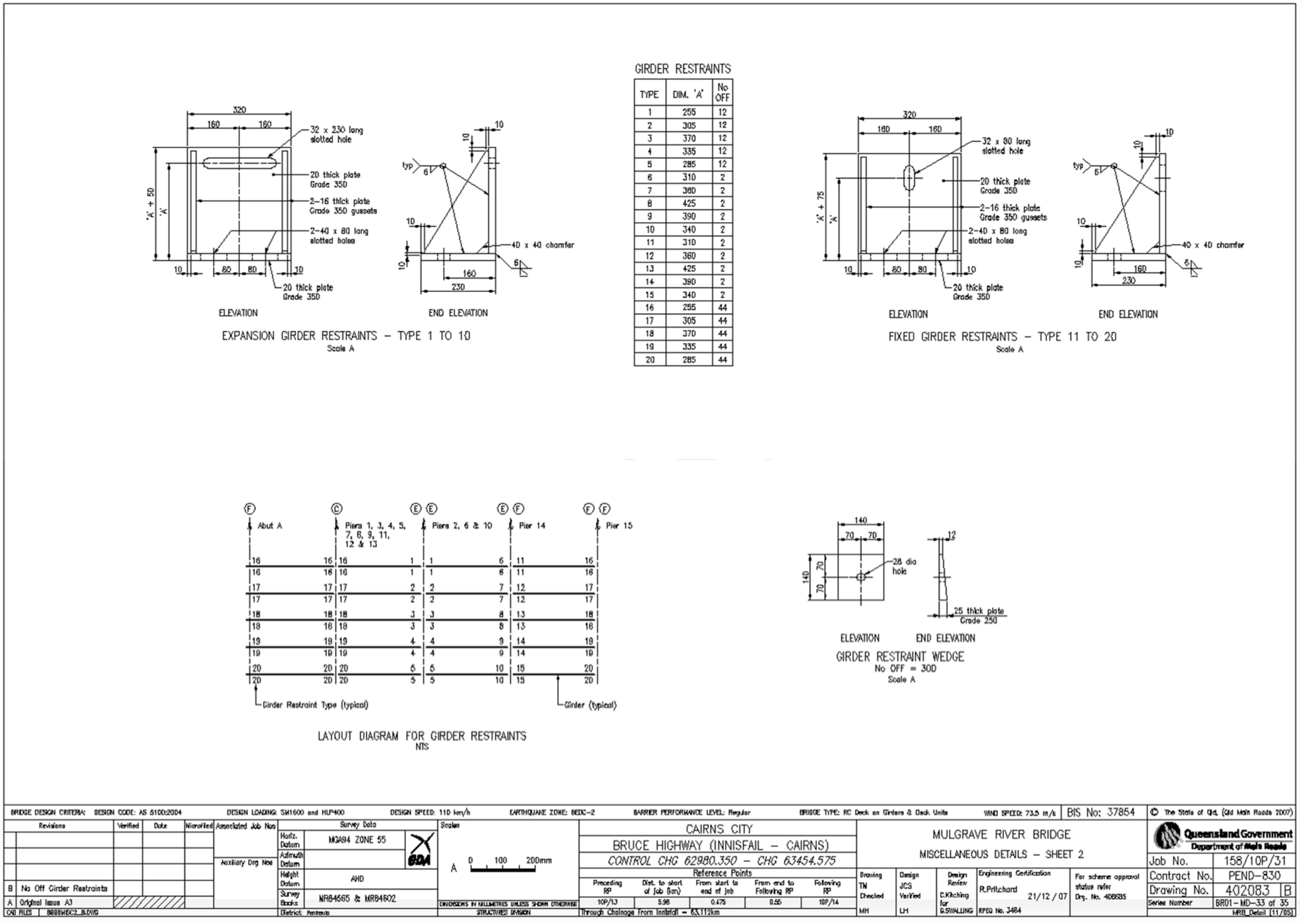
MULGRAVE RIVER BRIDGE
MISCELLANEOUS DETAILS – SHEET 1

Drawing	Design	Design Review	Engineering Certification	For scheme approval status refer Drg. No. 4086B5
TN	JGS		/ /	
Checked	Verified			
MH	LH	G.SWALLING	RPEQ No.	

Queensland Government Department of Main Roads

Job No.	158/10P/31
Contract No.	PEND–830
Drawing No.	402082 A
Series Number	BR01–WD–32 of 35
	MRB_Detail (11/95)

Appendix B – Example Miscellaneous Detail Drawings – Sheet 2



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Revisions	Verified	Date	Microfilmed
B No Off Girder Restraints			
A Original Issue A3			

CAD FILES | B888WESC2_BLOWG

Associated Job Nos

Auxiliary Drg Nos

Survey Data: Horiz. Datum: MGA94 ZONE 55; Azimuth Datum; Height Datum: AHD; Survey Books: MR84565 & MR84602; District: Pentvale

Scale: A 0 100 200mm

DIMENSIONS IN MILLIMETRES UNLESS SHOWN OTHERWISE

STRUCTURES DIVISION

CAIRNS CITY

BRUCE HIGHWAY (INNISFAIL – CAIRNS)

CONTROL CHG 62980.350 – CHG 63454.575

Reference Points

Preceding RP	Dist. to start of Job (km)	From start to end of Job	From end to Following RP	Following RP
10P/13	5.98	0.475	0.55	10P/14

Through Chainage from Innisfail = 63.112km

MULGRAVE RIVER BRIDGE

MISCELLANEOUS DETAILS – SHEET 2

Drawing	Design	Design Review	Engineering Certification	For scheme approval status refer
TN	JCS	C.Kitching for B.SWALLING	R.Pritchard 21/12/07	Drg. No. 408835
Checked	Verified			
MH	LH		RPEQ No. 3484	

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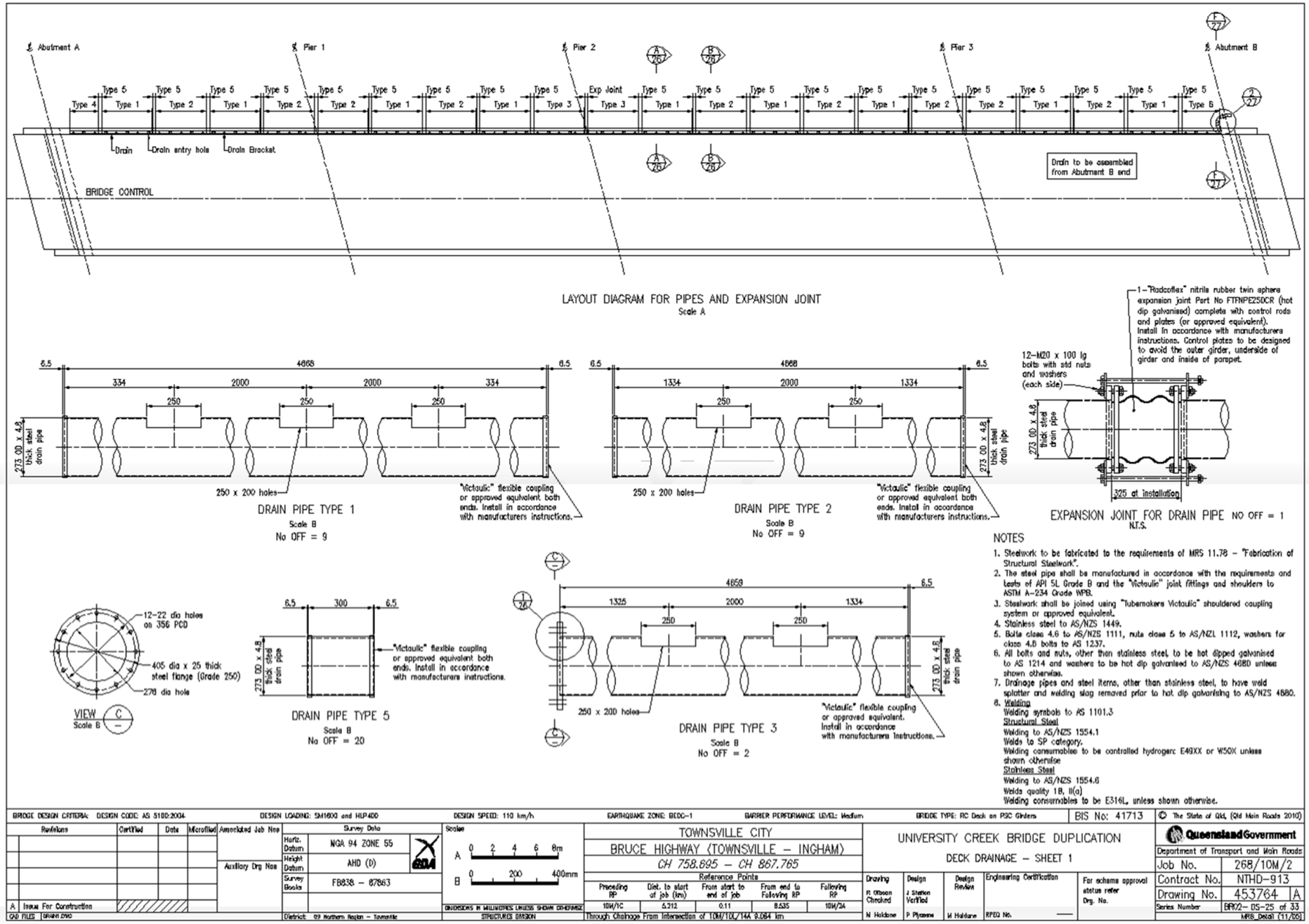
Queensland Government Department of Main Roads

Job No.	158/10P/31
Contract No.	PEND–830
Drawing No.	402083 B
Series Number	BR01–MD–33 of 35

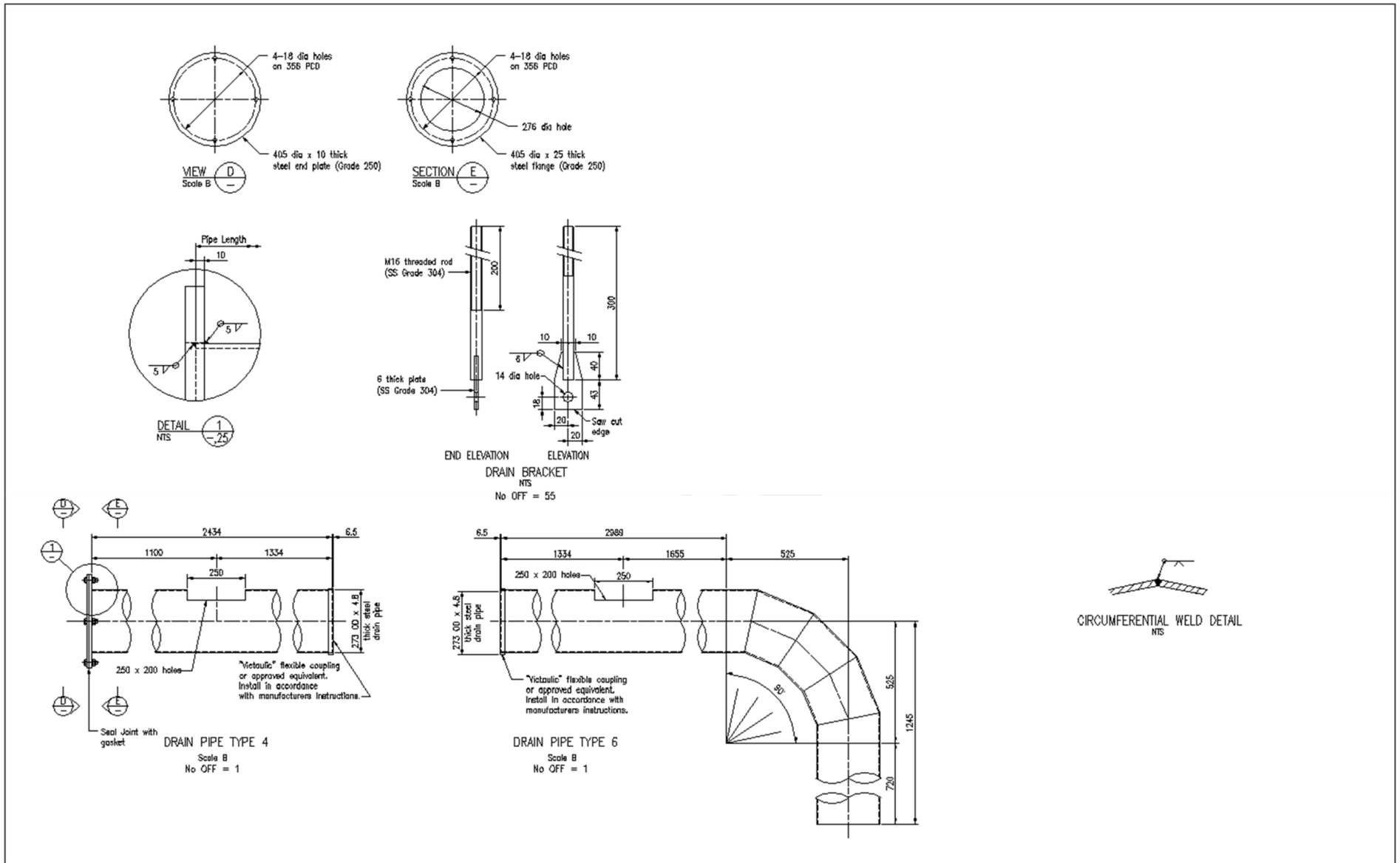
MRB_Detail [11/05]

Appendix C – Example Drain Drawings

Appendix C – Example Drain Drawings – Sheet 1



Appendix C – Example Drain Drawings – Sheet 2



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Revisions	Certified	Date	Microfilmed
A Issue For Construction			

Associated Job Nos | Auxiliary Drg Nos

Survey Data: Horiz. Datum: MGA 94 ZONE 55; Height Datum: AHD (D); Survey Books: FB838 – 87863; District: 08 Northern Region – Townsville

Scales: A 0 200 400mm; B 0 200 400mm

ALL DIMENSIONS IN MILLIMETRES UNLESS SHOWN OTHERWISE | STRUCTURES DIVISION

TOWNSVILLE CITY
BRUCE HIGHWAY (TOWNSVILLE – INGHAM)
CH 758.695 – CH 867.765

Reference Points

Preceding RP	Dist. to start of job (km)	From start to end of job	From end to Following RP	Following RP
10M/1C	5.212	0.11	8.535	10M/3A

Through Chainage from Intersection of 10M/10L/14A 0.084 km

UNIVERSITY CREEK BRIDGE DUPLICATION
DECK DRAINAGE – SHEET 2

Drawing Checked	Design Verified	Design Review	Engineering Certification	For scheme approval status refer Drg. No.
R Olbeon	J Shelton		K V Jacobs	
M Hoklane	P Plyaena	M Hoklane	RPEQ No. 9084 22/4/2010	

Queensland Government
Department of Transport and Main Roads

Job No.	268/10M/2
Contract No.	NTHD–913
Drawing No.	453765 B
Series Number	BR02– 05–26 of 33

NRB_Detail (11/05)

CAD FILES: DRAWG.DWG

Appendix C – Example Drain Drawings – Sheet 3