Drafting and Design Presentation Standards
Volume 3: Structural Drafting Standards

Chapter 18: Expansion Joints and Miscellaneous Details

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### Chapter 18 Amendments

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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figures and examples shown in this volume are for presentation purposes only, and may contain some details that are now superseded.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 In situ 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](image)

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](image)

**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 In-situ Kerbs without an Expansion Joint**

A Miscellaneous Details drawing is not required.

**Deck Unit Bridge with Cast In-situ 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 In-situ 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 C – Example Drain Drawings

Appendix C – Example Drain Drawings – Sheet 1
Appendix C – Example Drain Drawings – Sheet 3