

Drawing 1 provides details and notes for precast cut off walls for small culverts. These may be used as a guide to the designer to develop and RPEQ certify a precast cut off wall for a large size culvert, specific to the project

GENERAL ARRANGEMENT
Detail is similar in upstream and downstream sides

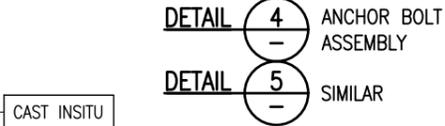
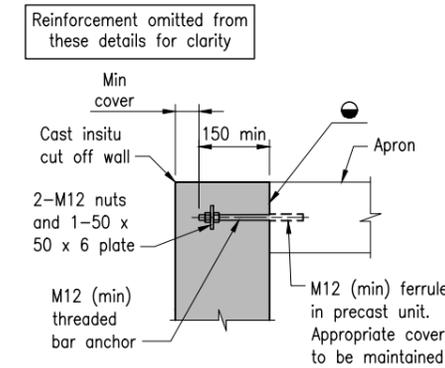
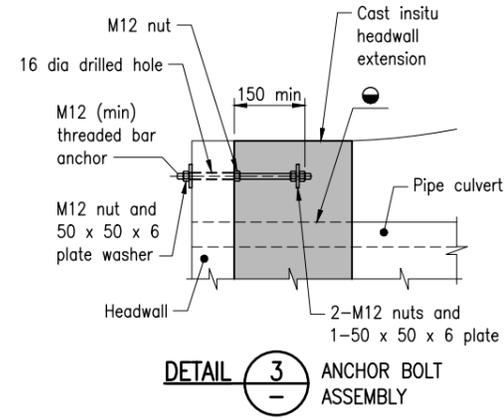
SCOPE OF PRECAST HEADWALL STANDARD DRAWING 1243

The scope of this standard drawing is to provide standard details for culvert headwall connections for pipe culverts. It is the responsibility of the precast headwall supplier and the project design engineer to provide project specific drawings, based on these standard details, to suit the project situation and to RPEQ certify the project specific drawings. This standard drawing is applicable for single cell and multi-cell headwalls

HEADWALL ANCHORS

Internal pipe diameter ID	Minimum No OFF # anchors
375	4
450	4
525	4
600	4
675	4
750	8
825	8
900	8
1050	8
1200	8
1350	8
1500	8
1650	12
1800	12
1950	12
2100	12
2250	12
2400	12
2550	12

This minimum No OFF anchors shall be provided at the top and bottom of the headwall, for each pipe. Before drilling precast units, the position of the reinforcements shall be identified and any drilling shall avoid cutting the reinforcement.



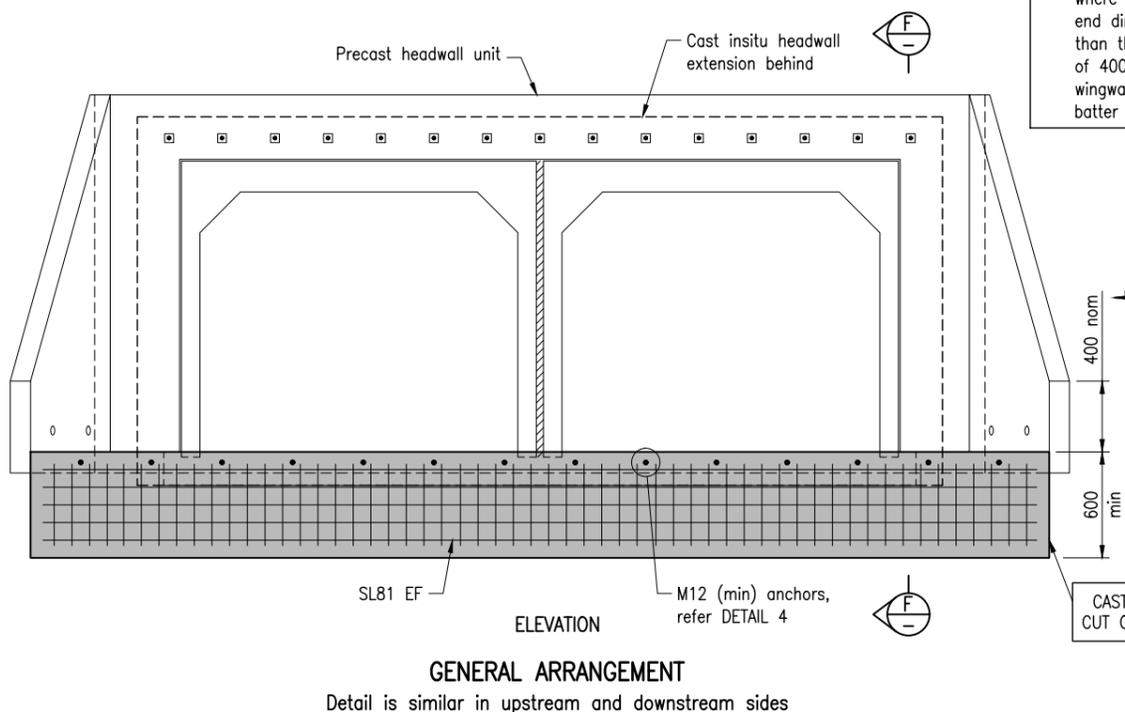
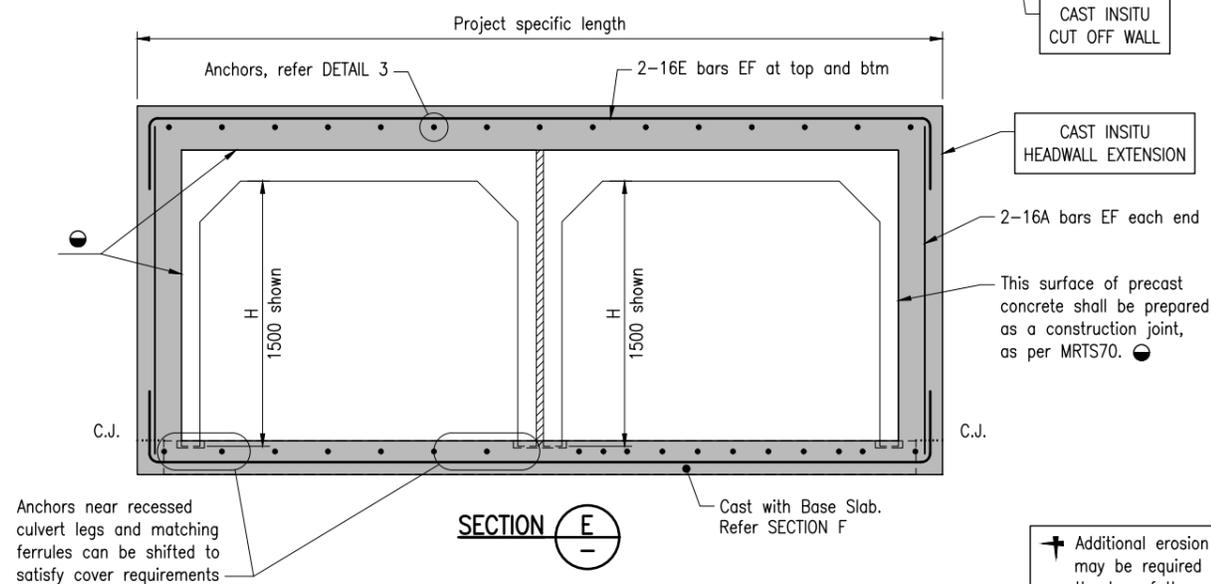
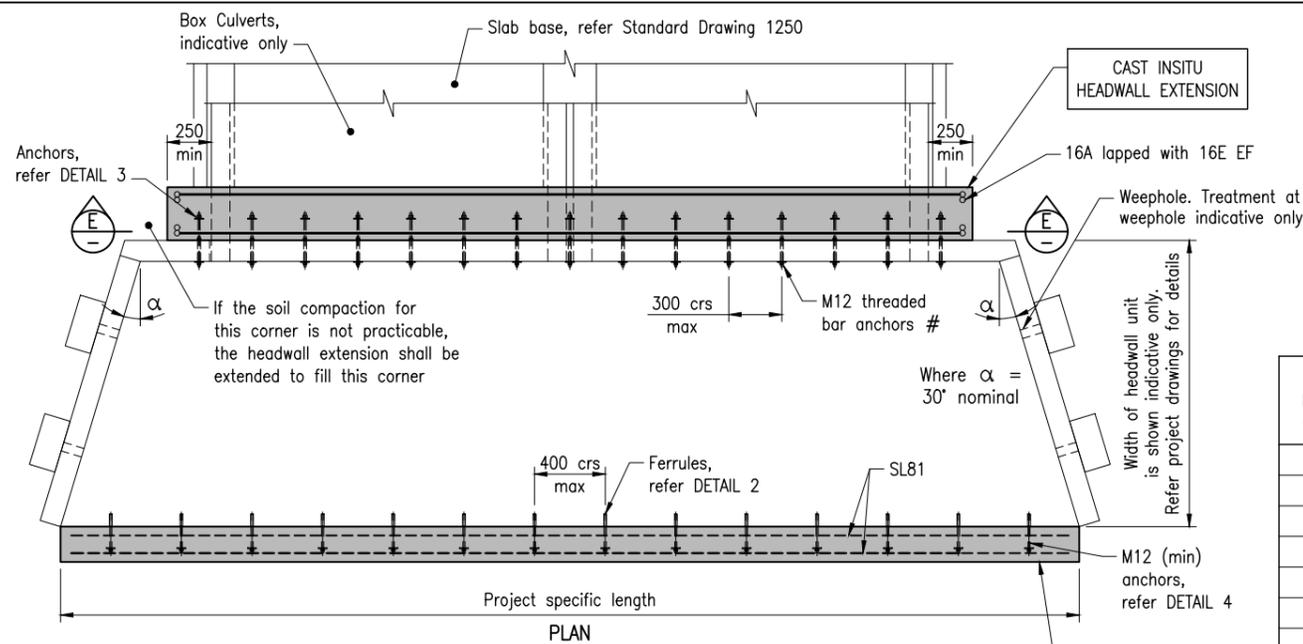
- NOTES for PIPE CULVERTS:**
- PIPE CULVERTS shall be in accordance with MRTS03. Precast headwall unit and cast insitu headwall extension shall be designed in accordance with Technical Note 27 (TN27). The standard details shown in this drawing are for exposure class B2 to AS 5100. Refer Note 8 for additional requirements for projects in exposure class C1 and C2.
 - FOR SMALLER CULVERTS diameter up to 450, including sloping headwalls, the use of the cast insitu headwall extension details shown in this drawing can be omitted dependent upon site conditions and risk of separation of headwall, as assessed by the Project Engineer. Factors such as low flow in small culverts, ease of maintenance in the event of headwall separation, can be considered in the assessment. Refer Drawing 3 for alternative bolted connection details for culverts diameter \leq 1200.
 - PRECAST HEADWALLS shall be manufactured in accordance with MRTS72.
 - CONCRETE shall be in accordance with MRTS70. Requirements for cast insitu concrete for headwall extensions and cut off walls are shown in the table below.

Item	Design requirements
Design life	100 years
Minimum exposure classification	B2 to AS 5100
Minimum concrete class	S40/20
Cover to reinforcement	60 cover to AS 5100

- STEELWORK shall be fabricated to MRTS78, for exposure class B2. Ferrules shall be TMR approved. Threaded bar, bolts and screws to Class 4.6 to AS 1111.1. Nuts class 5 to AS 1112.1. Washers class 5 to AS 1237.1. Steel plate Grade 250 minimum to AS/NZS 3678. All ferrules, anchors, bolts and nuts shall be hot dip galvanised to AS 1214. All other steelwork hot dip galvanised to AS/NZS 4680 unless shown otherwise.
- REINFORCING STEEL shall be in accordance with Standard Drawings 1043 and 1044, and compliant with MRTS71 and AS/NZS 4671. All reinforcing steel shall be ACRS certified. Reinforcing Steel welding shall be in accordance with Standard Drawing 1044. Deformed bars Grade D500N. Reinforcing mesh Grade D500L.
- PRECAST HEADWALL UNIT shall be designed and RPEQ certified by the precaster's designer according to the project specific requirements. Minimum details to be shown in the precast supplier provided project specific drawings are:
 - All dimensions of precast headwall unit including wingwall and apron lengths and reinforcement details.
 - Design loads and design standards including Technical Note 27.
 - Details of formed holes/ferrules for the threaded bar anchors for connection between precast headwall unit and cast insitu headwall extension/cut off wall.
 - Design minimum exposure classification.
 - Concrete notes including concrete class, aggregate size, cover to reinforcement.
- Additional requirements for exposure class C1 and C2: Minimum concrete strength and cover to reinforcement shall be to AS 5100. Anchor bolt assemblies shall be of stainless steel bolts, threaded bar, plate, and washers to Grade 316, and nuts to Grade 304, in accordance with MRTS78A, and its referred standards.
- PROJECT-SPECIFIC INFORMATION TO BE SHOWN ON THE PROJECT DRAWINGS:
 - Cast insitu headwall extension dimensions.
 - Cast insitu cut off wall dimensions.
 - Details of threaded bar anchors for cast insitu headwall extension and for cut off wall.
- DIMENSIONS are in millimetres unless shown otherwise.

- ASSOCIATED DEPARTMENTAL DOCUMENTS:
- NDRRA Design Guidelines; Road Drainage Manual
- REFERENCED DEPARTMENTAL DOCUMENTS:
- Standard Drawing 1043 Reinforcing Steel - Standard Bar Shapes
 - Standard Drawing 1044 Reinforcing Steel - Lap Lengths
 - MRTS03 Drainage, Retaining Structures and Protective Treatments
 - MRTS70 Concrete
 - MRTS71 Reinforcing Steel
 - MRTS72 Manufacture of Concrete Elements
 - MRTS78 Fabrication of Structural Steelwork
 - MRTS78A Fabrication of Structural Stainless Steelwork
 - TN27 Guidelines for Design of Precast Culvert and Pipe Headwalls

Department of Transport and Main Roads			
PRECAST CULVERT HEADWALLS			
HEADWALL CONNECTIONS		Standard Drawing No 1243 Date 7/2022	A3 Not to Scale
DRAWING 1 OF 3			
FOR PIPE CULVERTS - ALL SIZES			



SCOPE OF PRECAST HEADWALL STANDARD DRAWING 1243

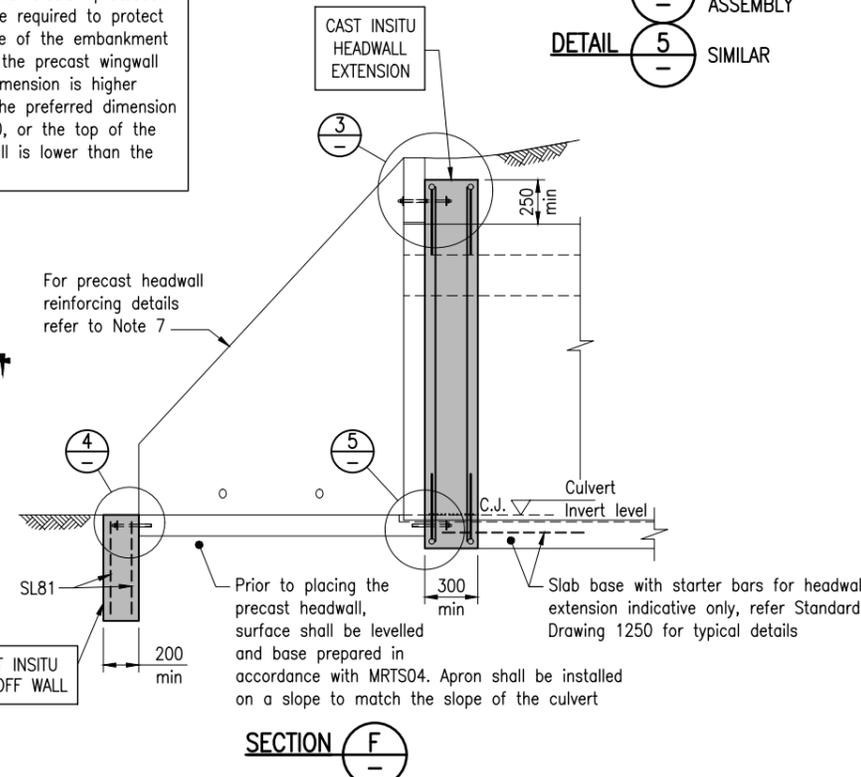
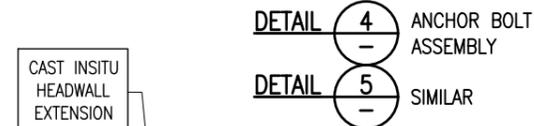
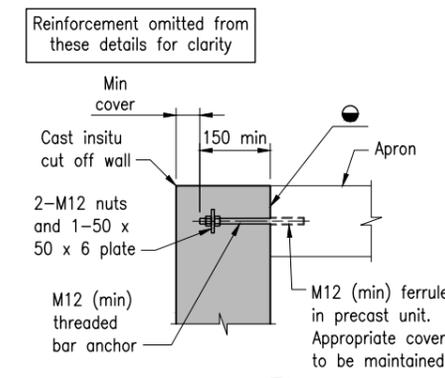
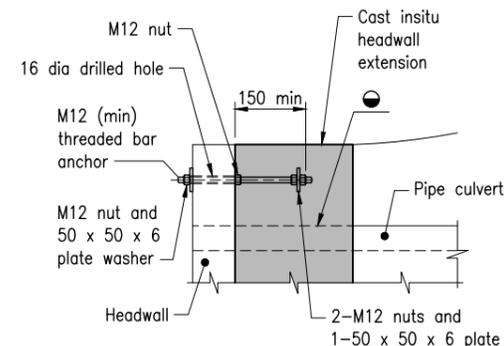
The scope of this standard drawing is to provide standard details for culvert headwall extensions for box culverts. It is the responsibility of the precast headwall supplier and the project design engineer to provide project specific drawings, based on these standard details, to suit the project situation and to RPEQ certify the project specific drawings. This standard drawing is applicable for single cell and multi-cell headwalls

HEADWALL ANCHORS

Internal height of culvert H	Minimum No OFF anchors
375	4
450	4
600	4
750	4
900	4
1200	6
1500	6
1800	8
2100	8
2400	12

This minimum No OFF anchors shall be provided at the top and bottom of the headwall, for each box. Before drilling precast units, the position of the reinforcements shall be identified and any drilling shall avoid cutting the reinforcement.

Additional erosion protection may be required to protect the toe of the embankment where the precast wingwall end dimension is higher than the preferred dimension of 400, or the top of the wingwall is lower than the batter



NOTES for BOX CULVERTS:

- BOX CULVERTS shall be in accordance with MRTS03. Precast headwall unit and cast in situ headwall extension shall be designed in accordance with Technical Note 27 (TN27). The standard details shown in this drawing are for exposure class B2 to AS 5100. Refer Note 8 for additional requirements for projects in exposure class C1 and C2.
- FOR SMALLER CULVERTS diameter up to 450, including sloping headwalls, the use of the cast in situ headwall extension details shown in this drawing can be omitted dependent upon site conditions and risk of separation of headwall, as assessed by the Project Engineer. Factors such as low flow in small culverts, ease of maintenance in the event of headwall separation, can be considered in the assessment. Refer Drawing 3 for alternative bolted connection details for culverts height ≤ 1200 .
- PRECAST HEADWALLS shall be manufactured in accordance with MRTS72.
- CONCRETE shall be in accordance with MRTS70. Requirements for cast in situ concrete for headwall extensions and cut off walls are shown in the table below.

Item	Design requirements
Design life	100 years
Minimum exposure classification	B2 to AS 5100
Minimum concrete class	S40/20
Cover to reinforcement	60 cover to AS 5100
- STEELWORK shall be fabricated to MRTS78, for exposure class B2. Ferrules shall be TMR approved. Threaded bar, bolts and screws to Class 4.6 to AS 1111.1. Nuts class 5 to AS 1112.1. Washers class 5 to AS 1237.1. Steel plate Grade 250 minimum to AS/NZS 3678. All ferrules, anchors, bolts and nuts shall be hot dip galvanised to AS 1214. All other steelwork hot dip galvanised to AS/NZS 4680 unless shown otherwise.
- REINFORCING STEEL shall be in accordance with Standard Drawings 1043 and 1044, and compliant with MRTS71 and AS/NZS 4671. All reinforcing steel shall be ACRS certified. Reinforcing Steel welding shall be in accordance with Standard Drawing 1044. Deformed bars Grade D500N. Reinforcing mesh Grade D500L.
- PRECAST HEADWALL UNIT shall be designed and RPEQ certified by the precaster's designer according to the project specific requirements. Minimum details to be shown in the precast supplier provided project specific drawings are:
 - All dimensions of precast headwall unit including wingwall and apron lengths and reinforcement details.
 - Design loads and design standards including Technical Note 27.
 - Details of formed holes/ferrules for the threaded bar anchors for connection between precast headwall unit and cast in situ headwall extension/cut off wall.
 - Design minimum exposure classification.
 - Concrete notes including concrete class, aggregate size, cover to reinforcement.
- Additional requirements for exposure class C1 and C2: Minimum concrete strength and cover to reinforcement shall be to AS 5100. Anchor bolt assemblies shall be of stainless steel bolts, threaded bar, plate, and washers to Grade 316, and nuts to Grade 304, in accordance with MRTS78A, and its referred standards.
- PROJECT-SPECIFIC INFORMATION TO BE SHOWN ON THE PROJECT DRAWINGS:
 - Cast in situ headwall extension dimensions.
 - Cast in situ cut off wall dimensions.
 - Details of threaded bar anchors for cast in situ headwall extension and for cut off wall.
- DIMENSIONS are in millimetres unless shown otherwise.

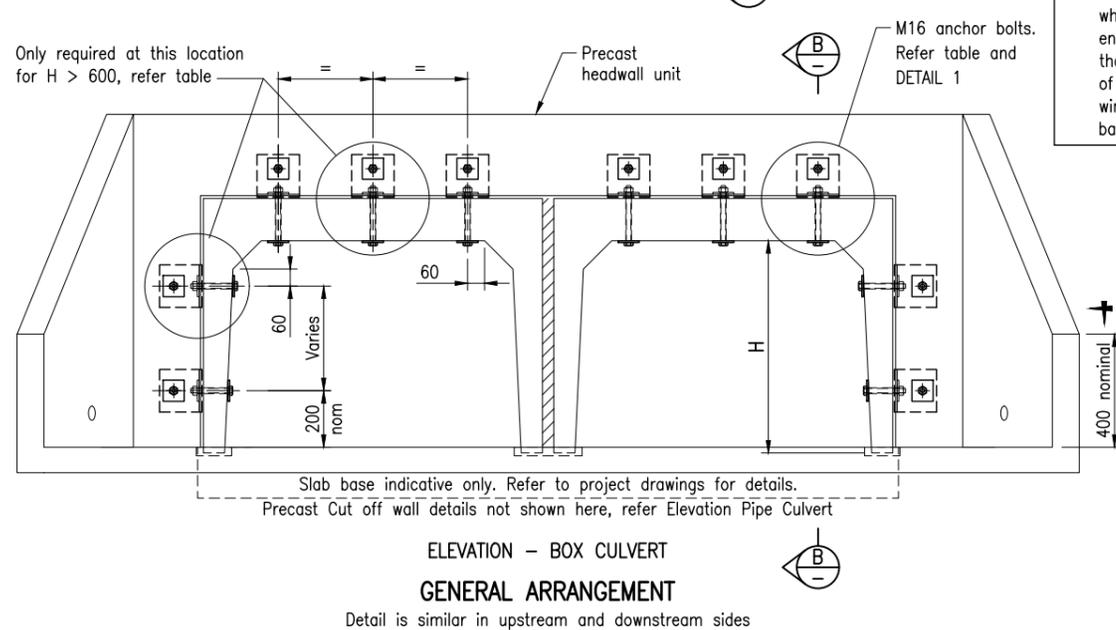
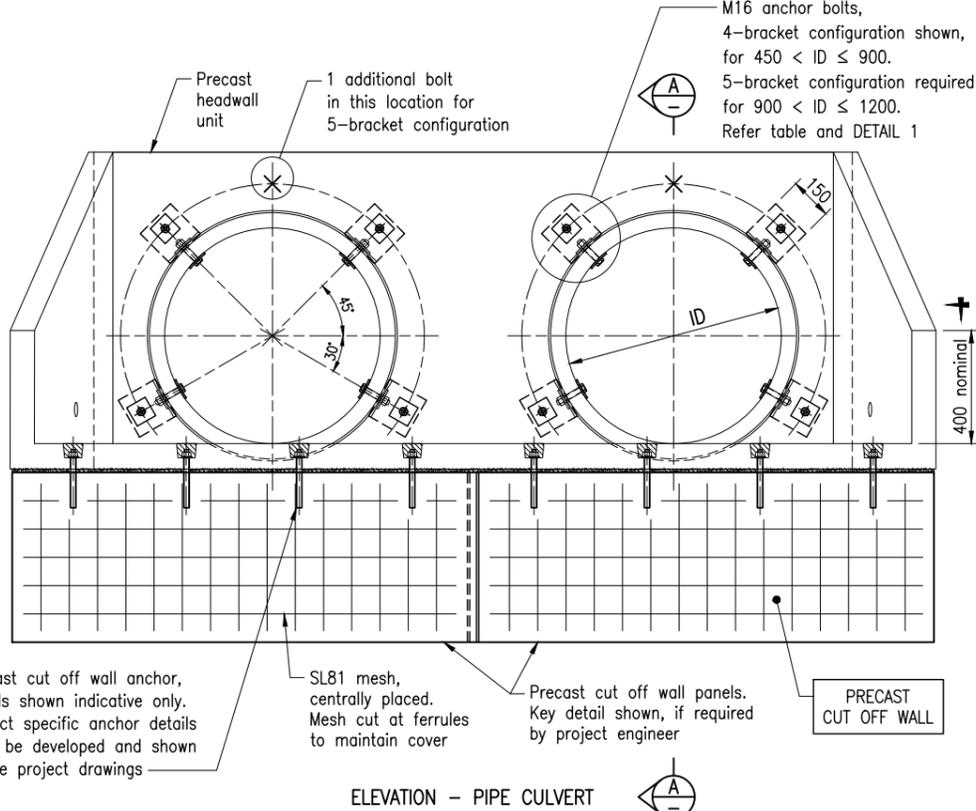
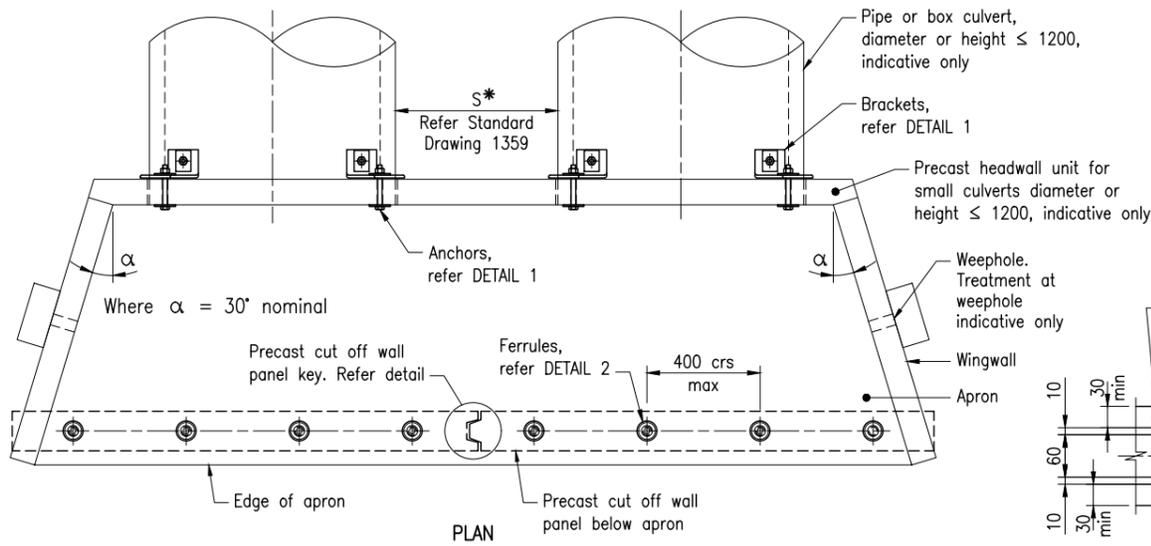
ASSOCIATED DEPARTMENTAL DOCUMENTS:

NDRRA Design Guidelines; Road Drainage Manual

REFERENCED DEPARTMENTAL DOCUMENTS:

- Standard Drawing 1043 Reinforcing Steel - Standard Bar Shapes
- Standard Drawing 1044 Reinforcing Steel - Lap Lengths
- MRTS03 Drainage, Retaining Structures and Protective Treatments
- MRTS70 Concrete
- MRTS71 Reinforcing Steel
- MRTS72 Manufacture of Concrete Elements
- MRTS78 Fabrication of Structural Steelwork
- MRTS78A Fabrication of Structural Stainless Steelwork
- TN27 Guidelines for Design of Precast Culvert and Pipe Headwalls

Department of Transport and Main Roads			
PRECAST CULVERT HEADWALLS			
HEADWALL CONNECTIONS		A3	Standard Drawing No
DRAWING 2 OF 3		Not to Scale	1243
FOR BOX CULVERTS - ALL SIZES			Date 7/2022
A	B	C	D



GENERAL ARRANGEMENT
Detail is similar in upstream and downstream sides

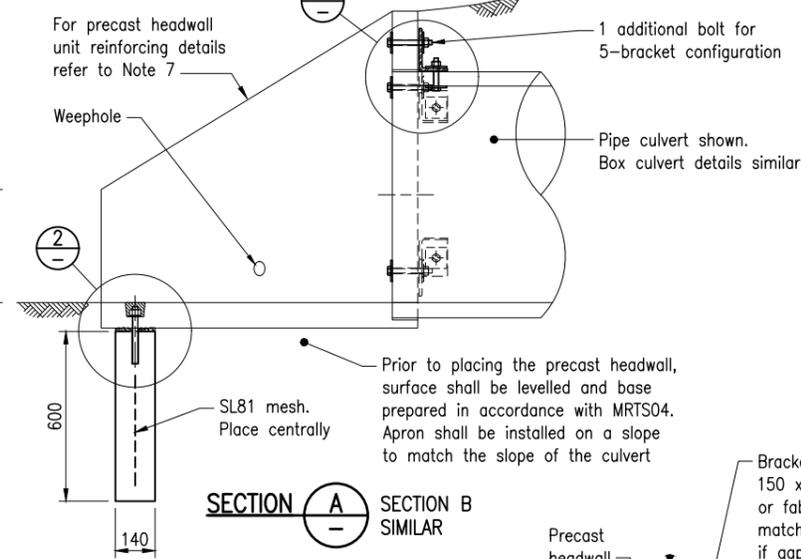
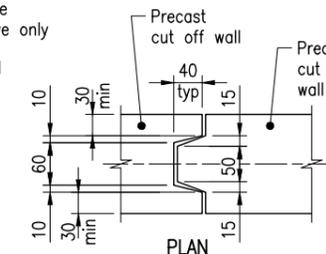
SCOPE OF PRECAST HEADWALL STANDARD DRAWING 1243
 The scope of this standard drawing is to provide standard details for precast headwall connection for pipe or box culverts.
 It is the responsibility of the project design engineer to provide project specific drawings for the use of precast headwall units supplied by registered precast supplier, to suit the project situation and to RPEQ certify the project specific drawings. The precast headwall unit dimensions shall be checked to ensure fit for purpose.
 This standard drawing is applicable for single cell and multi-cell headwalls.

ANCHOR BOLT DETAILS

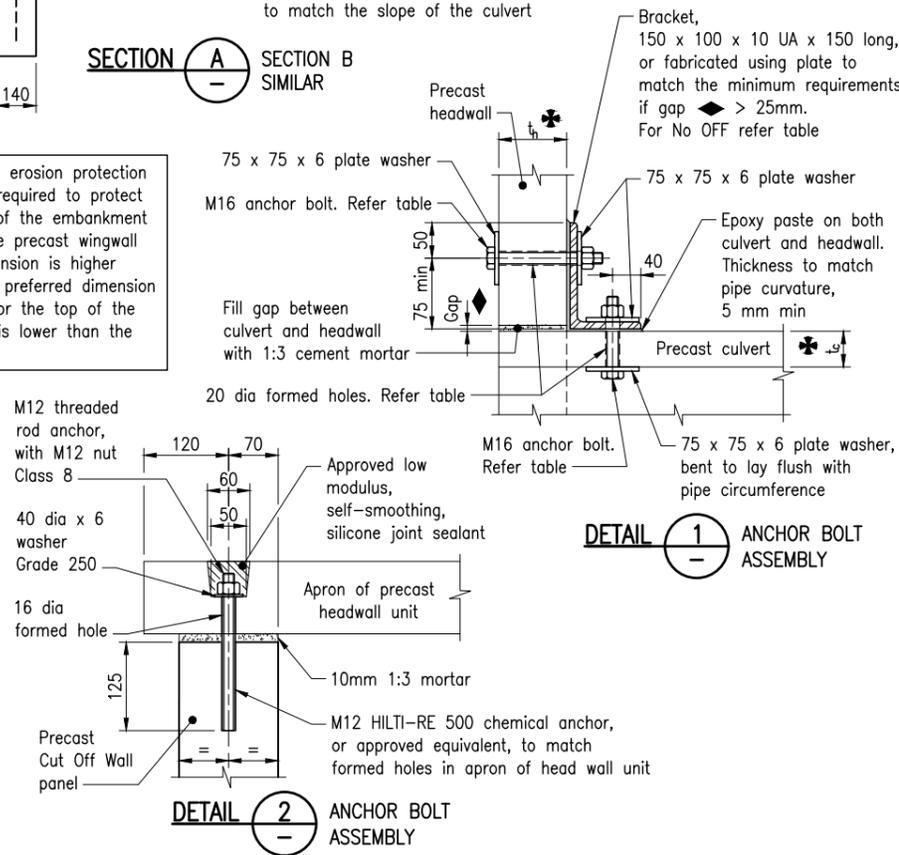
Culvert Size Pipe ID or H of Box	No OFF Brackets per culvert ✖		
	Pipe	375 < ID ≤ 900	4 per pipe
	900 < ID ≤ 1200	5 per pipe	
Box culvert	375 < H ≤ 600	Multicell culvert : Outer units = 3 Inner units = 2	Single cell = 4
	600 < H ≤ 900	Multicell culvert : Outer units = 5 Inner units = 3	Single cell = 7
	900 < H ≤ 1200		

✖ Each bracket requires 2 bolts, length as follows :
 1-Bolt for headwall = thickness of headwall t_h + 60
 1-Bolt for culvert = thickness of culvert t_c + 60

KEY DETAIL FOR PRECAST CUT OFF WALL PANEL



✚ Additional erosion protection may be required to protect the toe of the embankment where the precast wingwall end dimension is higher than the preferred dimension of 400, or the top of the wingwall is lower than the batter



NOTES for PIPE and BOX CULVERTS diameter ≤ 1200:

- PIPE and BOX CULVERTS shall be in accordance with MRTS03. Precast headwalls shall be manufactured in accordance with MRTS03 and MRTS72. Precast cut off wall panels shall be manufactured in accordance with MRTS72. Precast headwall unit and headwall connection to this standard drawing shall be designed in accordance with Technical Note 27 (TN27). The standard details shown in this drawing are for exposure class B2 to AS 5100. Refer Note 8 for additional requirements for projects in exposure class C1 and C2.
- PRECAST HEADWALL CONNECTIONS detailed on this standard drawing are applicable for pipe and box culvert of diameter or height ≤ 1200.
- FOR SMALLER CULVERTS diameter or height up to 450, including sloping headwalls, the use of the bolted connection details shown in this drawing can be omitted dependent upon site conditions and risk of separation of headwall, as assessed by the Project Engineer. Factors such as low flow in small culverts, ease of maintenance in the event of headwall separation, can be considered in the assessment.
- CONCRETE shall be in accordance with MRTS70. Design life 100 years. Minimum concrete strength shall be S50/20. Minimum exposure classification B2 to AS 5100. Minimum cover to reinforcement shall be 40 with rigid formwork and subjected to intense compaction. An approved super-workable concrete mix may be used in lieu of intense vibration. All exposed edges shall have 20 x 20 chamfers. Refer Note 8 for additional requirements for higher exposure classifications.
- STEELWORK shall be fabricated to MRTS78, for exposure class B2. Steel angle Grade 300 to AS/NZS 3679.1. Threaded bar, bolts and screws Class 4.6 to AS 1111.1. Nuts Class 5 to AS 1112.1. Washers Class 5 to AS 1237.1. Steel plate Grade 250 minimum to AS/NZS 3678. All anchors, bolts and nuts shall be hot dip galvanised to AS 1214. All other steelwork shall be hot dip galvanised to AS/NZS 4680.
- REINFORCING STEEL shall be in accordance with Standard Drawing 1044, and compliant with MRTS71 and AS/NZS 4671. Reinforcing mesh Grade D500L. All reinforcing steel to be ACRS certified. Reinforcing Steel welding shall be in accordance with Standard Drawing 1044.
- PRECAST HEADWALL UNIT AND CUT OFF WALL PANELS shall be designed and RPEQ certified by the precaster's designer according to the project specific requirements. Minimum details to be shown in the precast supplier provided project specific drawings are:
 - All dimensions of precast headwall unit including wingwall and apron lengths and reinforcement details;
 - Design loads and design standards including Technical Note 27;
 - Details of formed holes/ferrules for the threaded bar anchors for connection between precast headwall unit and precast cut off wall;
 - Design minimum exposure classification;
 - Concrete notes including concrete class, aggregate size, cover to reinforcement. These precast supplier provided project specific drawings shall be included in the project scheme drawings prepared by the project designer.
- Additional requirements for exposure class C1 and C2: Minimum concrete strength and cover to reinforcement shall be to AS 5100. Anchor bolt assemblies shall be of stainless steel bolts, threaded bar, angle, plate, and washers to Grade 316, and nuts to Grade 304, in accordance with MRTS78A, and its referred standards.
- PROJECT-SPECIFIC INFORMATION TO BE SHOWN ON THE PROJECT DRAWINGS:
 - Precast headwall connection details;
 - Precast cut off wall details;
 - Details of all anchors at culvert apron and cut off wall.
- Before drilling precast units, the position of the reinforcements shall be identified and any drilling shall avoid cutting the reinforcement.
- DIMENSIONS are in millimetres unless shown otherwise.

ASSOCIATED DEPARTMENTAL DOCUMENTS:
 NDRRA Design Guidelines; Road Drainage Manual

REFERENCED DEPARTMENTAL DOCUMENTS:
 Standard Drawing 1044 Reinforcing Steel - Lap Lengths
 MRTS03 Drainage, Retaining Structures and Protective Treatments
 MRTS70 Concrete
 MRTS72 Manufacture of Concrete Elements
 MRTS78 Fabrication of Structural Steelwork;
 MRTS78A Fabrication of Structural Stainless Steelwork
 TN27 Guidelines for Design of Precast Culvert and Pipe Headwalls

Department of Transport and Main Roads			
PRECAST CULVERT HEADWALLS			
HEADWALL CONNECTIONS DRAWING 3 OF 3		A3	Standard Drawing No
ALTERNATIVE FOR SMALL CULVERTS DIAMETER OR HEIGHT ≤ 1200		Not to Scale	1243 Date 7/2022
A	B	C	D