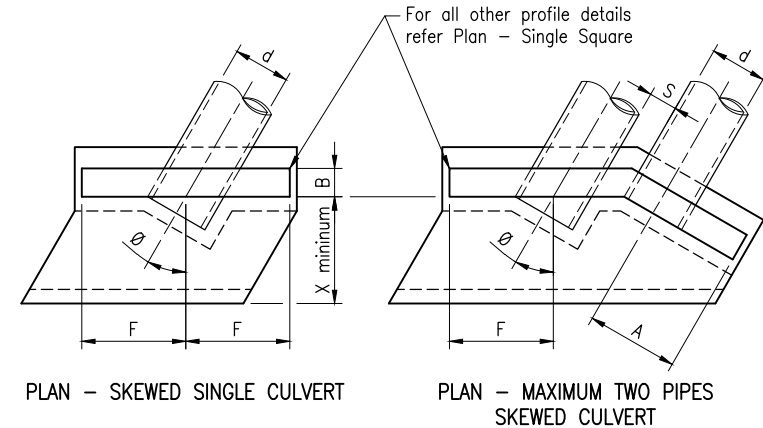


**TABLE OF DIMENSIONS**

Dim	Nominal internal diameter, d				
	375	450	525	600	675
A	600	725	850	975	1100
B	250	250	300	300	300
C	525	525	675	675	675
F	700	825	950	1100	1250
X	565	675	790	900	1015
S	Spacing for multiple pipes "S" is as specified on Standard Drawing 1359				

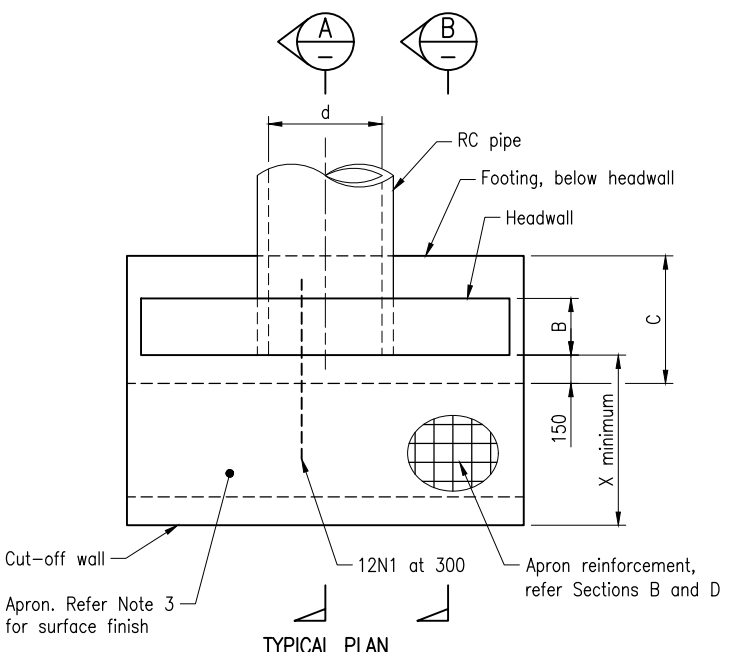
For culverts with more than two pipes, the typical headwall reinforcement shall be as per the details in the lower portion of this drawing



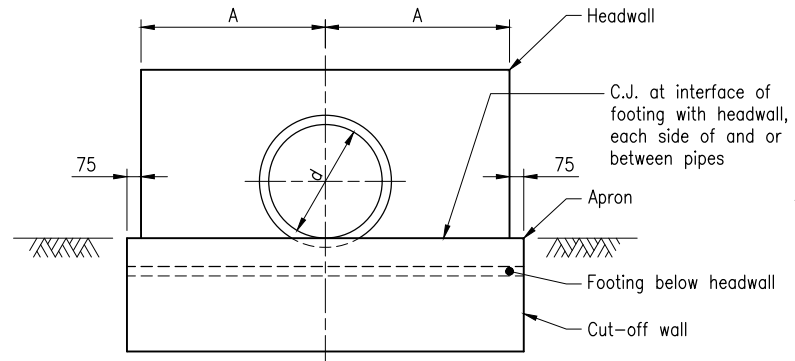
FOR MAXIMUM TWO PIPES

The purpose of this Standard Drawing is to provide typical standard details that shall be used within the limitations specified in the drawing and in accordance with the following:

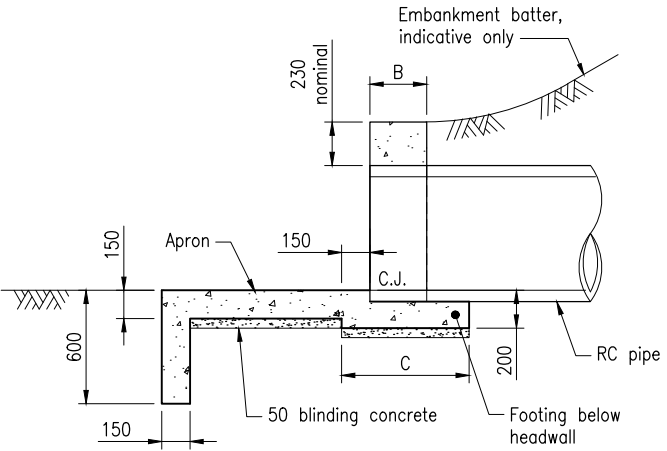
1. The adaptability of the standard details shall be assessed by the project designer in respect of specific project geometric, appropriate foundation and scour conditions.
2. If the insitu bearing capacity is inadequate, insitu ground improvement may be explored subject to review and acceptance by E&T Structures and Geotechnical sections.
3. When there is uncertainty regarding the application of the standard details on this drawing for a specific project, advice shall be sought from E&T Structures.
4. The details specific to the project shall be shown on the project specific drawings.



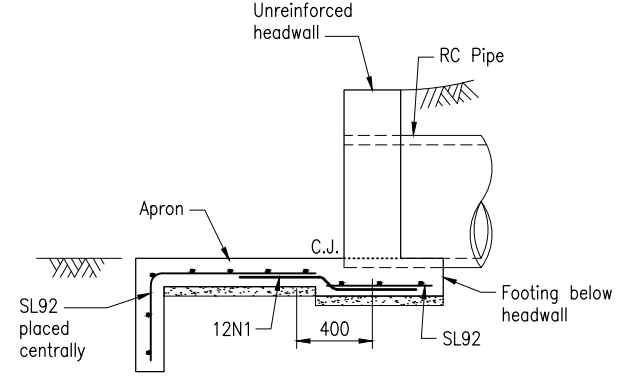
TYPICAL PLAN



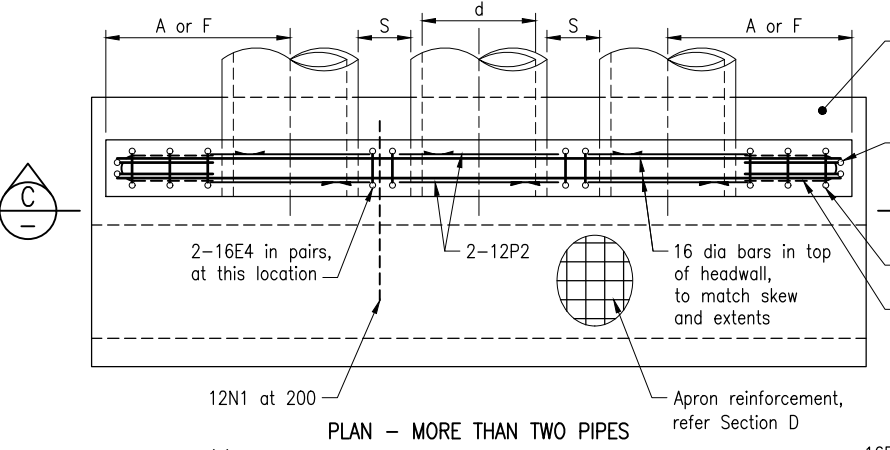
TYPICAL ELEVATION - SQUARE SINGLE SHOWN SKEWED AND MULTIPLE ARRANGEMENTS SIMILAR



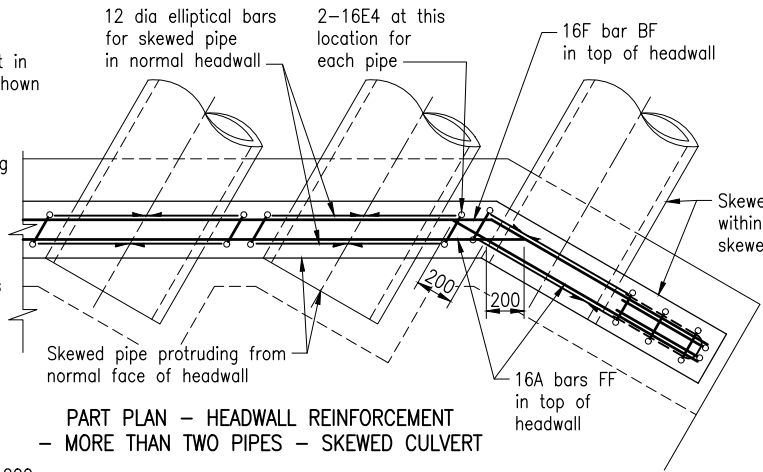
SECTION A TYPICAL DETAILS ALL ARRANGEMENTS



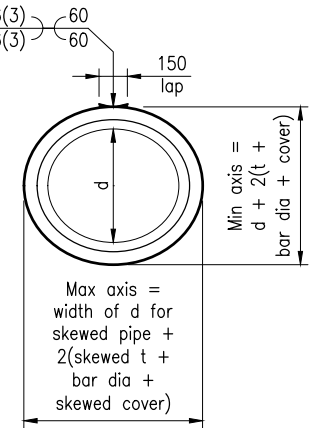
SECTION B FOR MAXIMUM TWO PIPES



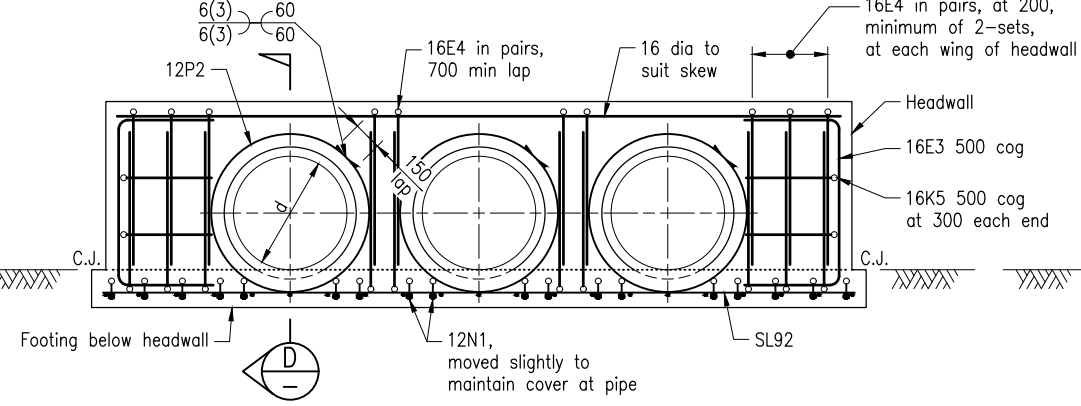
PLAN - MORE THAN TWO PIPES



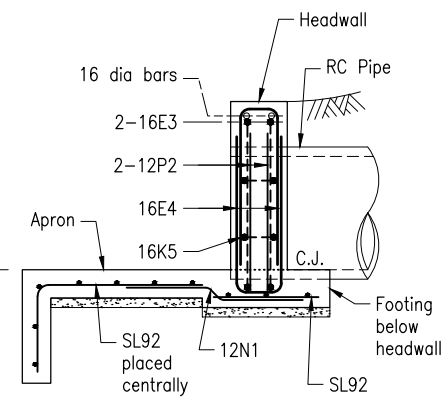
PART PLAN - HEADWALL REINFORCEMENT - MORE THAN TWO PIPES - SKEWED CULVERT



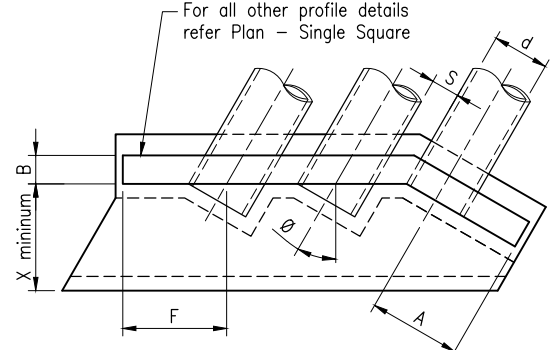
12 DIA ELLIPTICAL BAR DETAIL



SECTION C ELEVATION AT HEADWALL



SECTION D



PLAN - MORE THAN TWO PIPES SKEWED CULVERT

**NOTES:**

1. PIPE CULVERT END STRUCTURES shall be constructed in accordance with MRTS03. The purpose of this drawing is to provide typical details of headwalls and aprons for culverts with pipe diameter 375 to 675. Unreinforced headwall detail shall be used for maximum 2 pipe arrangement. For more than 2 pipe installation, reinforced headwall detail shall be used. Refer Standard Drawing 1304 for typical details of end structures for pipe culverts with diameter 750 to 2400. Refer Standard Drawing 1359 and MRTS03 for details of culvert installation and earthworks. This standard drawing does not provide details of fish passage requirements. Where project specific environmental assessment determines that waterway barrier works are required, additional details shall be developed and included in the project drawings.
2. Maximum design pressure ( $E_d$ ) under the culvert apron is 75 kPa.
3. CONCRETE shall be in accordance with MRTS70. Unreinforced concrete headwall shall be N20/20. Reinforced concrete headwall, apron and footing shall be S40/20. Minimum exposure classification B2 to AS 5100. Minimum cover to reinforcement shall be 60 or 70 against blinding concrete. Blinding concrete shall be N20/20. Surface roughening of the aprons shall be broom finish using a broom not less than 400 wide to achieve an average texture depth of 0.8. The direction of brushing shall be perpendicular to the direction of flow.
4. REINFORCING STEEL shall be read in conjunction with Standard Drawings 1043 and 1044, and shall be in accordance with MRTS71 and AS/NZS 4671. Deformed bars Grade D500N. Mesh Grade D500L.
5. TACK WELDING to reinforcement for location purposes to AS/NZS 1554.3. Welding consumables shall be controlled hydrogen type: G49X to AS/NZS ISO 14341-B or T49X to AS/NZS ISO 17632-B.
6. PROJECT-SPECIFIC INFORMATION TO BE SHOWN ON THE DRAWINGS: Culvert chainage; Skew angle  $\theta$ ; Apron setout and extents; Headwall extents; Steel schedule; Requirements for fish passage.
7. DIMENSIONS are in millimetres.

**ASSOCIATED DEPARTMENTAL DOCUMENTS:**

- Design Criteria for Bridges and Other Structures
- Road Drainage Manual (RDM)
- NDRRA Design Guidelines

**REFERENCED DOCUMENTS:**

- Departmental Standard Drawings:
  - 1044 Reinforcing Steel - Lap Lengths
  - 1304 Pipe Culverts - Wingwalls, Headwall and Apron for Pipe Diameter 750 to 2400
  - 1359 Culverts - Installation, Bedding and Filling/backfilling against/over Culverts
- Departmental Specifications:
  - MRTS03 Drainage, Retaining Structures and Protective Treatments
  - MRTS70 Concrete
  - MRTS71 Reinforcing Steel

Department of Transport and Main Roads			
PIPE CULVERTS			
HEADWALL AND APRON FOR PIPE DIAMETER 375 to 675		A3	Standard Drawing No
		Not to Scale	1305
			Date 7/2021