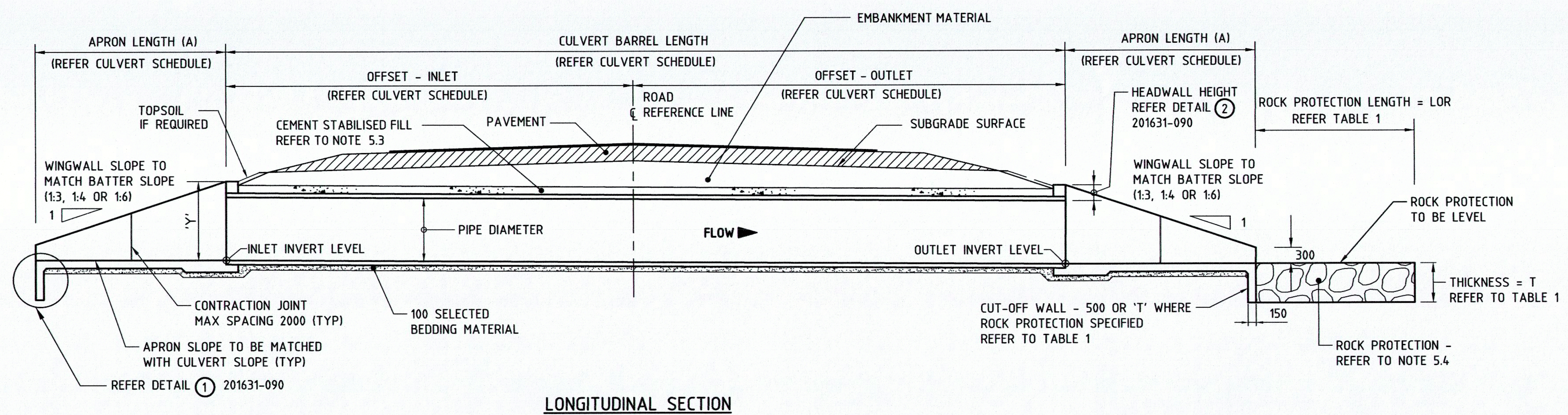
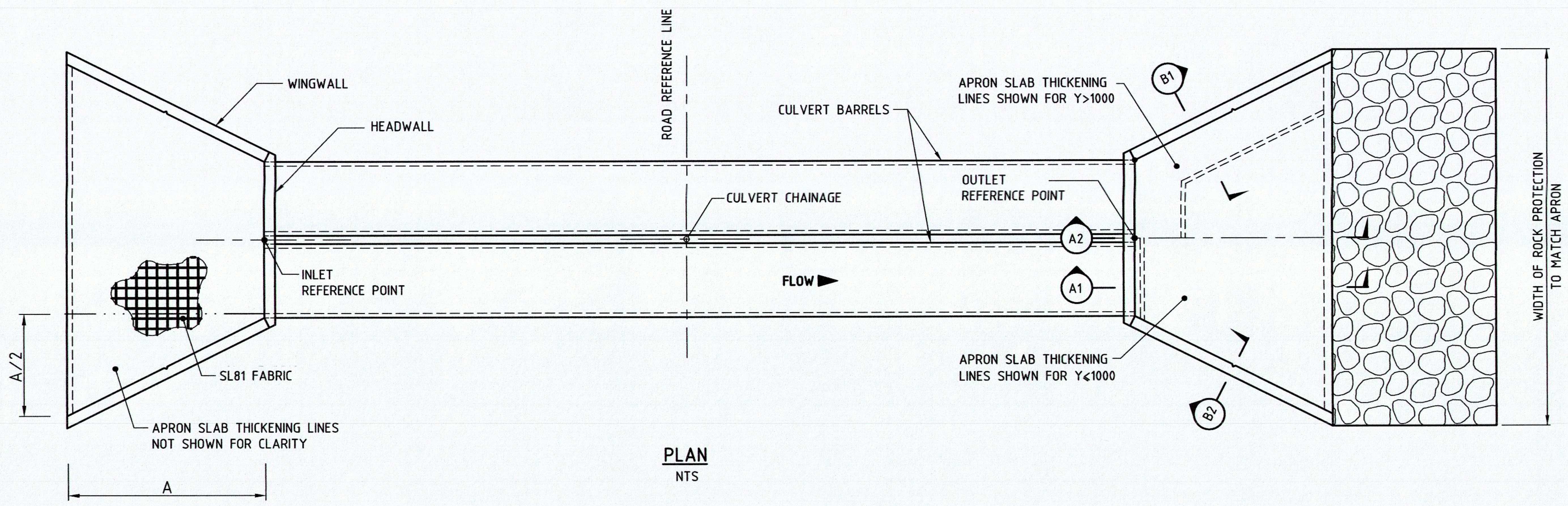


LONGITUDINAL SECTION
NTS



PLAN
NTS

NOTES

1. GENERAL

1.1 THIS DRAWING SHALL BE READ IN CONJUNCTION WITH MAIN ROADS STANDARD DRAWING 201631-0090 AND SPECIFICATION 404 CULVERTS.

1.2 THE PRECAST PIPE CULVERT UNITS SHALL BE SUPPLIED IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 404 CULVERTS.

1.3 THESE STANDARD DRAWINGS ARE APPLICABLE FOR CULVERTS AS DESCRIBED BY THE ATTACHED DESIGN CRITERIA. STRUCTURES THAT DO NOT MEET THESE CRITERIA SHALL BE DESIGNED OUTSIDE THIS STANDARD AND ARE SUBJECT TO APPROVAL BY MAIN ROADS.

2. CONCRETE

2.1 APRON SLABS, WINGWALLS AND HEADWALLS SHALL BE CLASS N40 CONCRETE MINIMUM UNLESS NOTED OTHERWISE (U.N.O) IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 404 CLAUSE 404.09 AND ANNEXURE 404A TABLE 404A3.

2.2 THE MINIMUM CLEAR COVER TO REINFORCEMENT SHALL BE :-
- a) ALL EXPOSED FACES 55
- b) BURIED FACES - HEDWALLS AND WINGWALLS 55
- c) FACES INCONTACT WITH GROUND - APRONS AND SLAB 65

IF MORE AGGRESSIVE SOIL CONDITIONS ARE PRESENT THEN SLABS AND WINGWALLS REQUIRE REDESIGNING AND SHALL BE SUBMITTED TO MAIN ROADS FOR REVIEW AND APPROVAL.

2.3 CONCRETE FINISHES SHALL CONFORM TO THE FOLLOWING :- 2 INDICATES A FORMED CONCRETE SURFACE FINISH AND SHALL BE IN ACCORDANCE WITH AS 3610.1

U2 INDICATES AN UNFORMED CONCRETE SURFACE (REFER TO SPECIFICATION 901)

2.4 ALL EXPOSED CONCRETE EDGES SHALL HAVE 20 X 20 CHAMFERS U.N.O .

3. REINFORCEMENT

3.1 REINFORCEMENT STEEL SHALL BE IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 822 STEEL REINFORCEMENT.

3.2 THE REINFORCEMENT SYMBOLS AND DENOTATIONS ARE AS FOLLOWS :-
- N - HOT ROLLED DEFORMED GRADE D500N BAR OF 500 MPa YIELD STRENGTH
- SL - GRADE D500L FABRIC OF 500 MPa YIELD STRENGTH

3.3 U.N.O, ALL BAR LAPS LENGTH SHALL BE A MINIMUM OF 45D AND A MAXIMUM OF 45D+150 FOR REINFORCING BARS. STOCK LENGTHS AND STAGGERED LAPS SHALL BE PROVIDED. U.N.O, ALL FABRIC OVERLAPS SHALL BE A MINIMUM OF TWO CROSS WIRES ON BOTH SHEETS.

3.4 REINFORCEMENT SHALL NOT BE WELDED OR HEAT TREATED.

3.5 CUTTING AND BENDING OF REINFORCEMENT SHALL BE IN ACCORDANCE WITH AS 3600.

3.6 REINFORCMENT PLACEMENT ABBREVIATIONS ARE :-
FF - FAR FACE NF - NEAR FACE EF - EACH FACE
T - TOP TS - TOP SECONDARY
B - BOTTOM BS - BOTTOM SECONDARY

3.7 FABRIC MAIN REINFORCING WIRES SHALL BE AT RIGHT ANGLES TO FLOW DIRECTION. APRON SLAB REINFORCEMENT SHALL BE PLACED SQUARE WITH THE CULVERT UNITS UNLESS OTHERWISE SHOWN.

4. ROAD SAFETY BARRIERS

4.1 ROAD SAFETY BARRIERS IF REQUIRED SHALL BE SHOWN ON THE PROJECT SPECIFIC DRAWINGS.

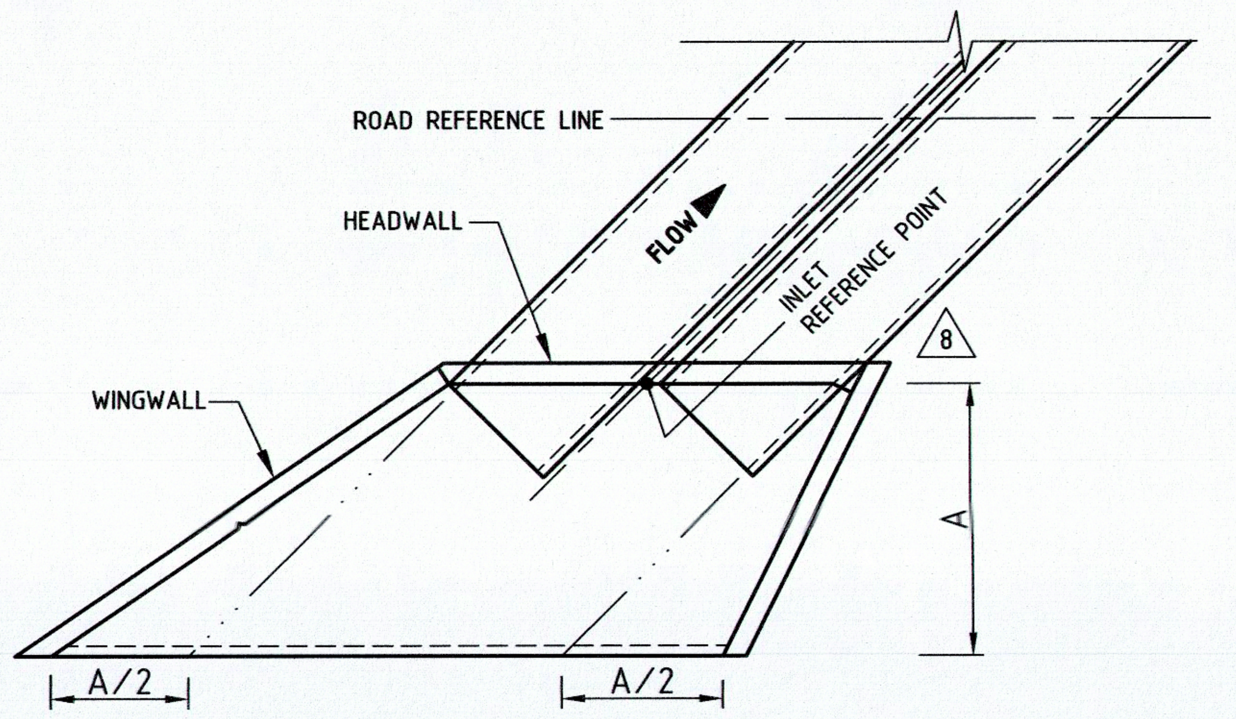
5. INSTALLATION

5.1 THE SERVICEABILITY LIMIT STATE BEARING CAPACITY SHALL BE NOT LESS THAN 250 kPa. A GEOTECHNICAL ENGINEER SHALL CONFIRM THAT THE BEARING PRESSURE IS ADEQUATE

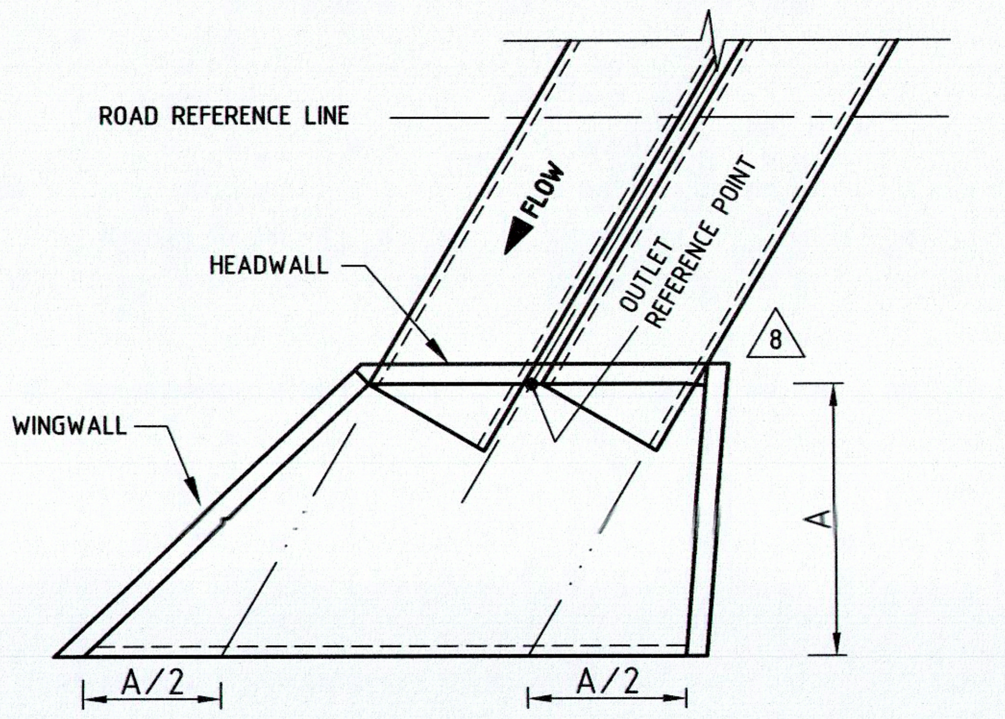
5.2 THE INSTALLATION AND BACKFILLING OF PIPE CULVERTS SHALL BE IN ACCORDANCE WITH MAIN ROADS SPECIFICATION 404.

5.3 BACKFILL MATERIAL IN ZONE OF SPECIAL COMPACTION AND CEMENT STABILISED BACKFILL SHALL COMPLY WITH MAIN ROADS SPECIFICATION 404.

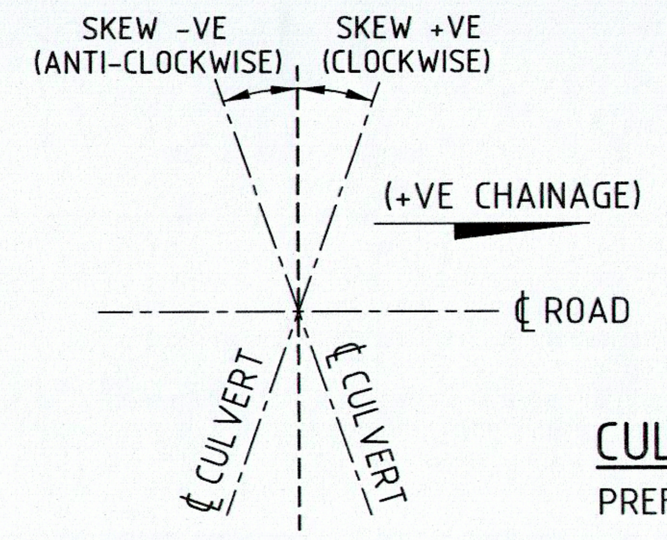
5.4 THE NEED FOR SCOUR PROTECTION SHALL BE DETERMINED BY THE PROJECT ENGINEER. THE DEPTH OF APRON SLAB DOWNSTANDS MAY BE VARIED TO SUIT THE ROCK PROTECTION. ROCK PROTECTION SHALL COMPLY WITH MAIN ROADS SPECIFICATION 406.



PLAN OF MULTI BARREL PIPE CULVERT ON 45° SKEW
NTS



PLAN OF MULTI BARREL PIPE CULVERT ON 30° SKEW
NTS



SKEW DIAGRAM
NOT TO SCALE

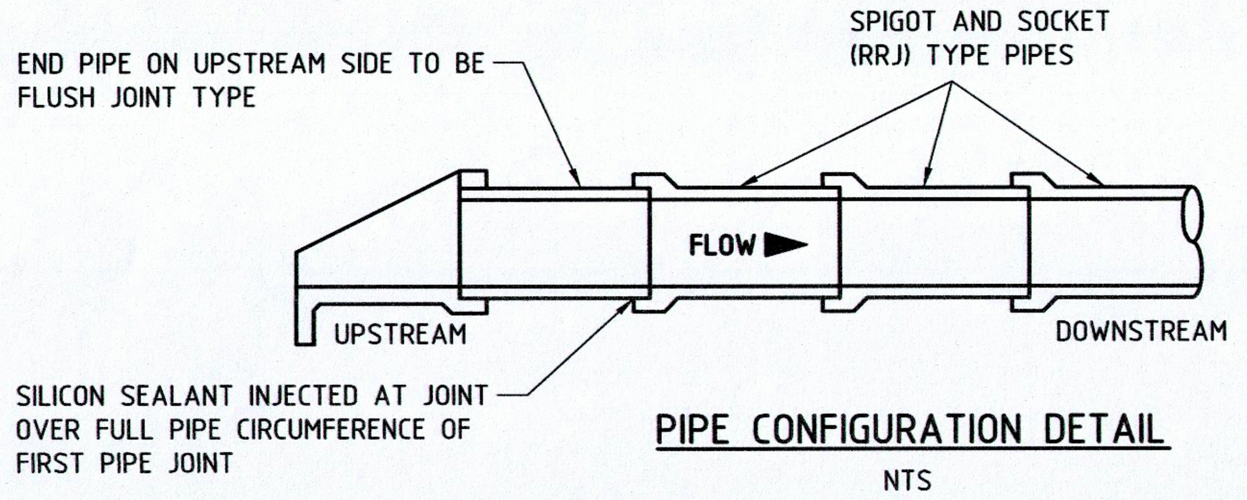
CULVERT SKEWS

PREFFERED CULVERT SKEWS ARE :-
0°, 15°, 30° & 45°
-15°, -30° & -45°

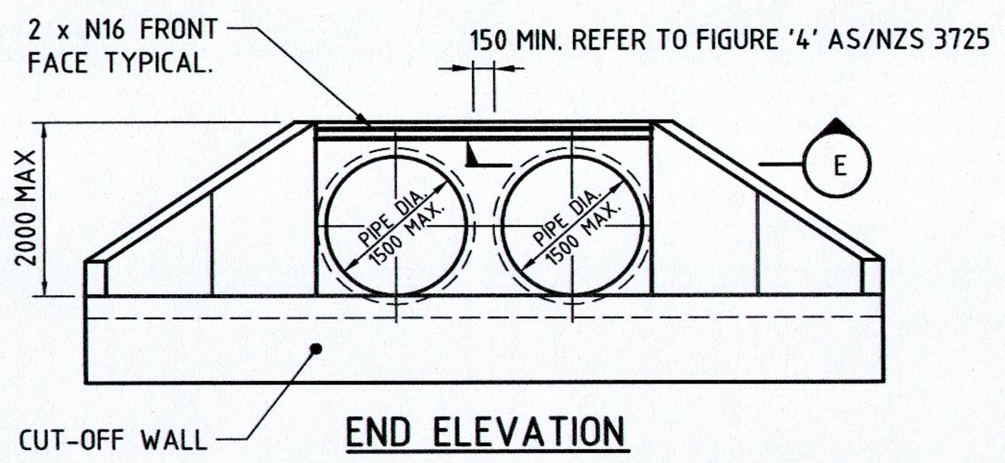
TABLE 1: ROCK PROTECTION DETAILS

CLASS ROCK	MIN THICKNESS (T)	MIN LENGTH (LOR)	ROCK SIZE (m)*	ROCK MASS (Kg)	% OF ROCK LARGER THAN
FACING	500	3000	0.40 0.30 0.15	100 35 2.5	0 50 90
LIGHT	750	3000	0.55 0.40 0.20	250 100 10	0 50 90
1/4 TONNE	1000	5000	0.75 0.55 0.30	500 250 35	0 50 90
1/2 TONNE	1250	5000	0.90 0.70 0.40	1000 450 100	0 50 90

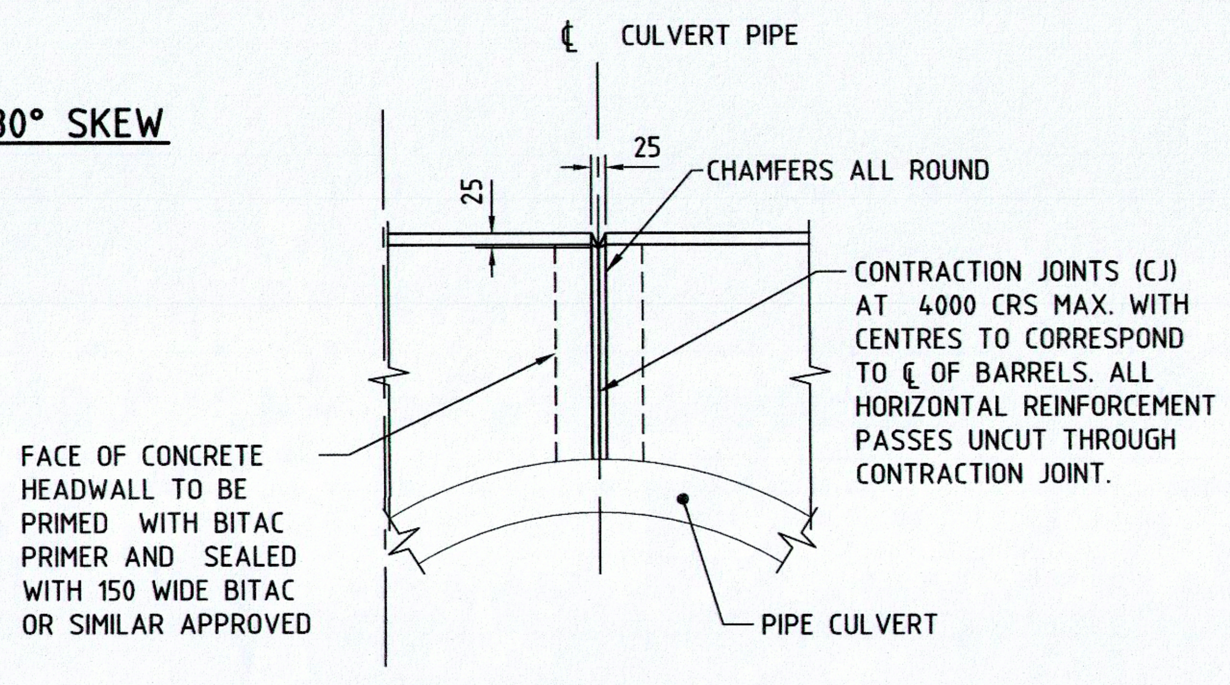
* ASSUMING A SPECIFIC GRAVITY OF 2.65 AND SPHERICAL SHAPE FOR ALL ROCK CLASSES.



PIPE CONFIGURATION DETAIL
NTS



END ELEVATION
NTS



CONTRACTION JOINT DETAIL
WHERE LENGTH OF HEADWALL > 4000
NTS

THESE DETAILS ARE NOT SUITABLE FOR HEADWALLS GREATER THAN 2000 HIGH.

NOT TO SCALE

SCALES A1

ALL UNITS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED.

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE
4	SECTION B2 AMENDED	T. FREEMAN 23/02/15
3	TABLE 1 UPDATED, WING WALL SLOPE CHANGED.	T. FREEMAN 08/04/14
2.	UPSTREAM END TREATMENT REMOVED FROM PIPE CONFIGURATION DETAIL.	R. GROVE 22/05/08
1.	DETAILS FOR MAX. PIPE DIA., HEADWALL HEIGHT ABOVE OBVERT AND DRAWING SUB-TITLE AMENDED.	R. GROVE 13/07/05

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE
6	· PLAN OF MULTI BARREL PIPE CULVERT ON SKEWS ADDED, · CULVERT SKEW DIAGRAMS ADDED.	Z. BATEN 22/05/18
5	· CUT OFF WALL ADDED AT INLET SIDE APRON SLOP. · ROCK PROTECTION TABLE AMENDED CEMENT STABILISED LAYER ADDED. · NOTE 13 & 14 ADDED, HEIGHT & WIDTH OF HEADWALL AMENDED. · TITLE BLOCK AMENDED.	T. FREEMAN 22/12/17

AMENDMENTS

No.	DESCRIPTION	APPROVED & DATE
8.	CLARIFIED PIPE ARRANGEMENT AND ADDED ADDITIONAL DRAWING REFERENCE IN THE NOTES.	[signature] 19/2/19
7.	APRON SLOPE IN LONGITUDINAL SECTION AND SKEW CULVERT DETAILS AMENDED.	Z. BATEN 07/03/19

THIS DRAWING SHALL BE READ IN CONJUNCTION WITH DRG. NO. 201631-090

THE GOVERNMENT OF WESTERN AUSTRALIA
mainroads WESTERN AUSTRALIA
PLANNING AND TECHNICAL SERVICES DIRECTORATE
ROAD AND TRAFFIC ENGINEERING BRANCH
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DESIGNED	G. DE SILVA
DRAWN	J. COOK/ K. KASIRI
VERIFIED	J. KARPINSKI 08.01.03
APPROVED	R. GROVE 11.01.03
FILE NUMBER	

STANDARD DRAWING
R.C.P. CULVERT
GENERAL ARRANGEMENT
(FOR MAXIMUM PIPE DIAMETER 1500)

LOCAL AUTHORITY
SHEET 1 OF 2

MRWA DRAWING NUMBER
200131-0061-8