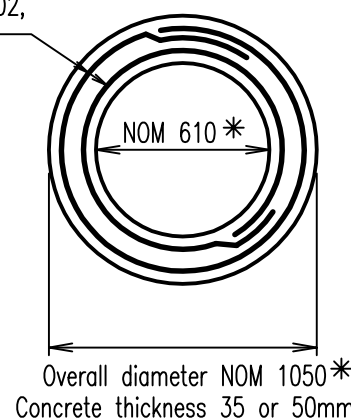


SECTION
ALTERNATIVE 1

INVERT GRADE DIMENSION 't' (MIN)

Access chamber DIA 'D'	FLOOR THICKNESS 't'		Wall thickness 'W'	Roof slab DIA
	INLET	OUTLET		
1050	175	150	150	1350
1200	250	225	225	1650
1350	250	225	225	1800
1500	250	225	225	1950
1800	250	225	250	2400
2100	275	250	275	2730

2-R6 bars Grade 400 to AS 1302, placed centrally in ring with 40 side cover. Lap 250.

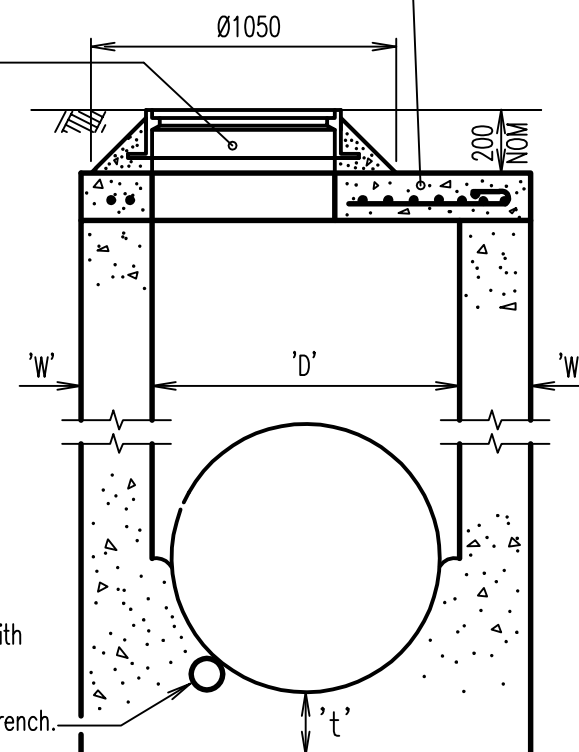


PLAN
ROOF RING

For use in raising covers and frames of existing access chambers
* Size to suit existing access chamber

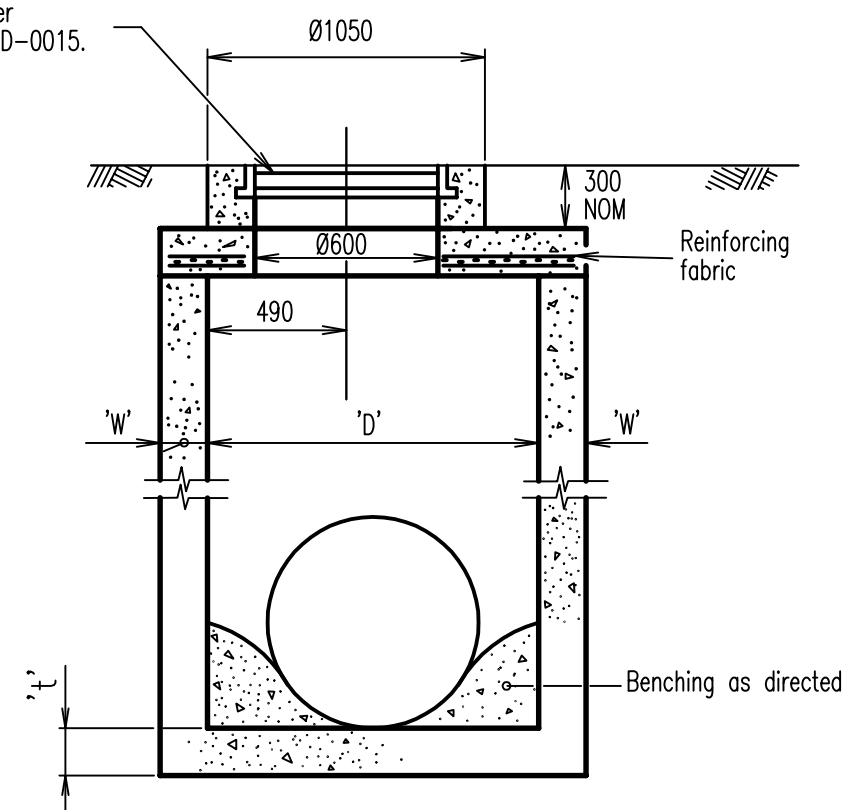
Special cast iron cover and frame, refer Service Authority.

Precast roof slabs refer Standard Drawing D-0011.



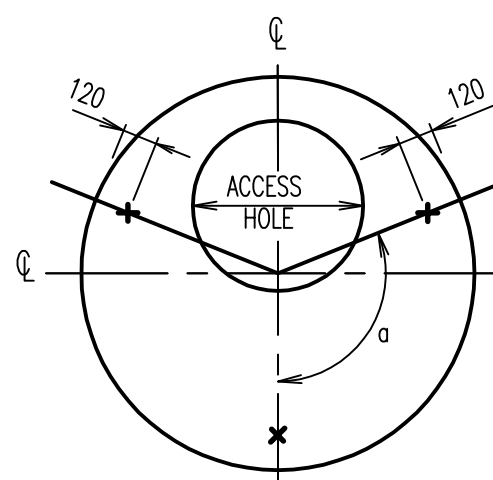
Ø100 uPVC slotted pipe stub, 1000 long with end cap, installed on the upstream side of access chamber (unless directed otherwise). The stub is required to dewater the pipe trench.

Cast iron cover and frame, refer Standard Drawing D-0014 and D-0015.



SECTION
ALTERNATIVE 2

TYPICAL SECTION ACCESS CHAMBER DETAILS



$a = 112^\circ$ For Ø1350
 $a = 120^\circ$ For Ø1650-2650

LIFTING ANCHOR LOCATIONS

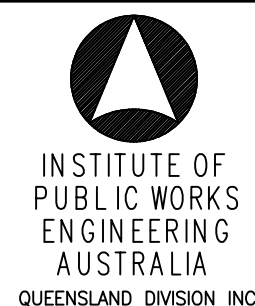
(Refer Note 5)

NOTES

- Structural concrete N25, benching N10 in accordance with AS 1379 and AS 3600.
- Refer Standard Drawing D-0011 and D-0012 for roof slab reinforcement details.
- Alternatives :-
for access hole location refer Service Authority.
for turent type refer Service Authority.
- Refer Project Drawings for size and level of culverts, and chamber cover level.
- Lifting anchors to be "swiftlift" or equivalent 1.8 tonne, galvanized to AS 1650 and fitted to manufacturer's specifications.
- Access ladders or step irons to AS1657 only to be used where approved by Local Authority.
- All dimensions in millimetres.

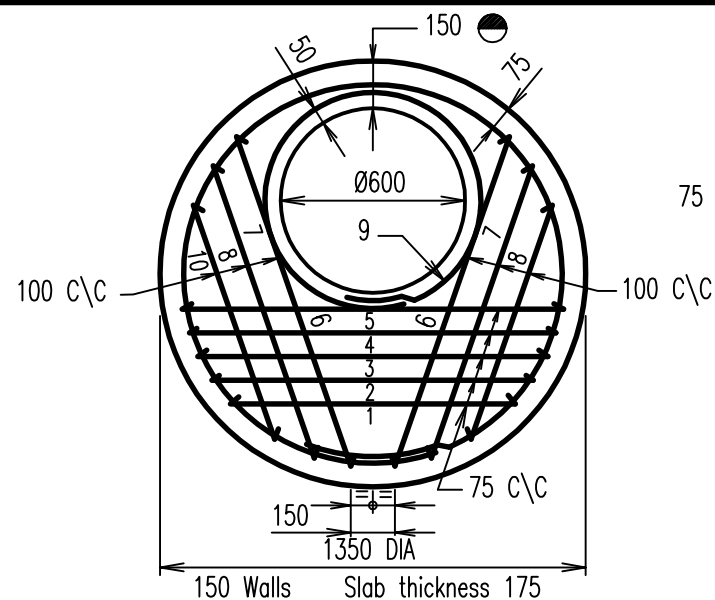
REVISIONS	DATE
C Step Irons removed, opening dia, wall thickness and Note 6 amended	3/4/00
B Ø1800 and Ø2100 chambers added	3/2/97
A ORIGINAL ISSUE	8/12/95

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. - 1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



STORMWATER ACCESS CHAMBER DETAILS DIA 1050 TO 2100

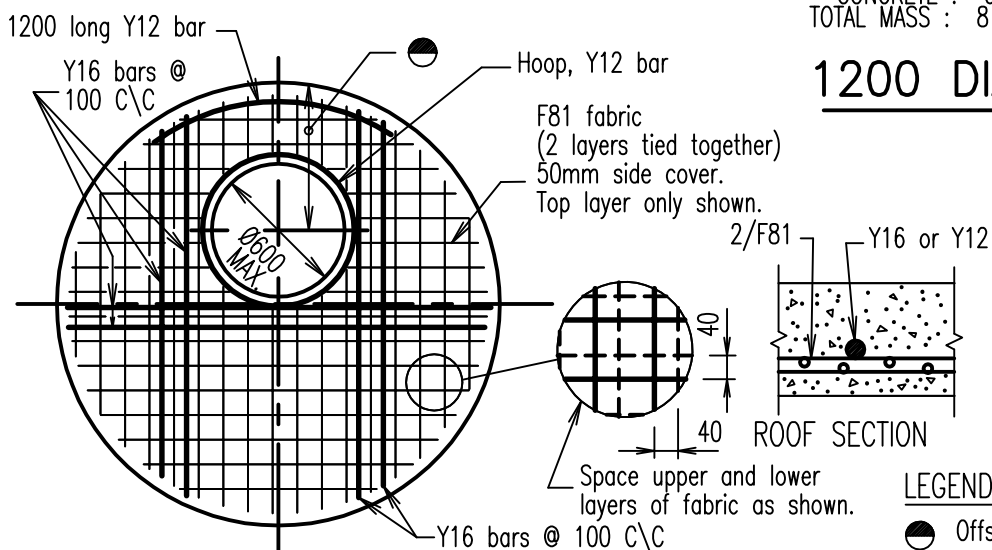
DRAINAGE
Standard
Drawing
D-0010



BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		937	1175	1	1175
2		1030	1255	1	1255
3		1125	1350	1	1350
4		1175	1400	1	1400
5		1225	1450	1	1450
6		1125	1350	2	2700
7		1000	1225	2	2450
8		812	1050	2	2100
9		700	2600	1	2600
10		1200	4200	1	4200
TOTAL					20680

STEEL MASS : 19kg
CONCRETE : 0.20m³
TOTAL MASS : 508kg

1050 DIA ACCESS CHAMBER



BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		1200	1425	1	1425
2		1400	1625	1	1625
3		1450	1675	1	1675
4		1500	1725	1	1725
5		1520	1745	1	1745
6		1537	1775	1	1775
7		1450	1675	2	3350
8		1375	1600	2	3200
9		1300	1525	2	3050
10		1050	1275	2	2550
11		700	2600	1	2600
12		1500	5150	1	5150
TOTAL					23250

STEEL MASS : 27kg
CONCRETE : 0.33m³
TOTAL MASS : 818kg

1200 DIA ACCESS CHAMBER

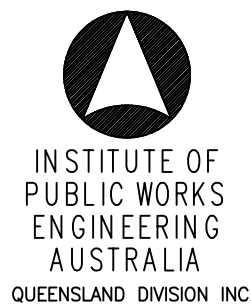
FABRIC REINFORCED SLAB

NOM CHAMBER DIA	ROOF THICKNESS
1050	175
1200	175
1350	200
1500	250
1800	250
2100	250

FABRIC REINFORCEMENT ALTERNATIVE AND Ø1800 AND Ø2100 CHAMBERS

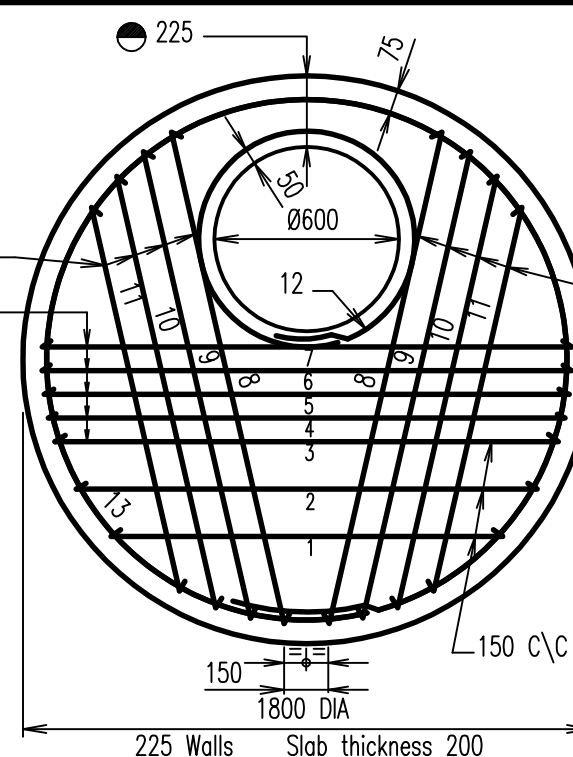
REVISIONS	DATE
C	Opening Diameter 600
B	Ø1800 and Ø2100 Chamber roofs added
A	ORIGINAL ISSUE

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. - 1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



ACCESS CHAMBER ROOF SLABS DIA 1050 - 2100

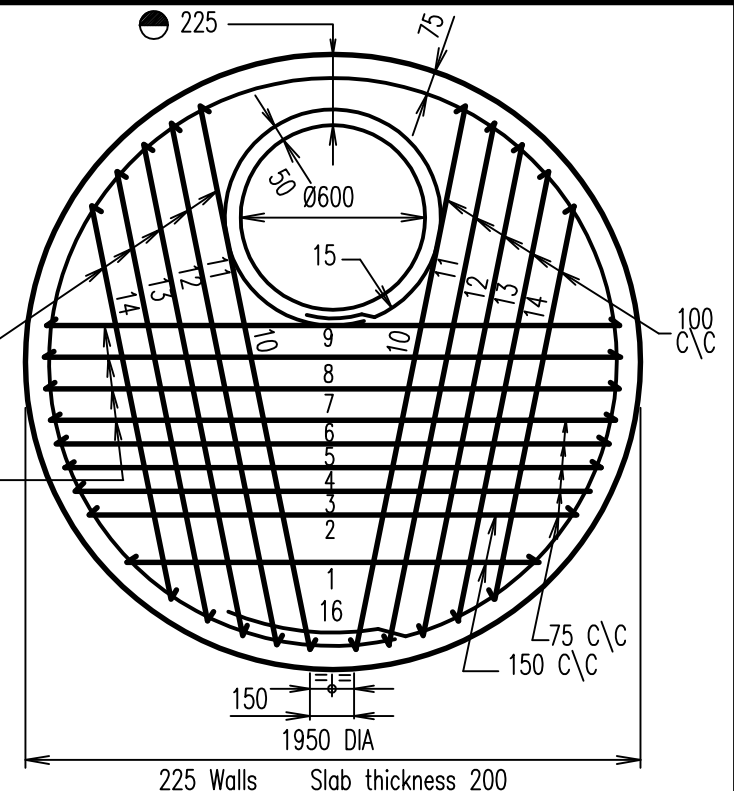
DRAINAGE Standard Drawing D-0011



BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		1275	1500	1	1500
2		1488	1725	1	1725
3		1612	1850	1	1850
4		1645	1870	1	1870
5		1675	1900	1	1900
6		1675	1900	1	1900
7		1675	1900	1	1900
8		1600	1825	2	3650
9		1525	1750	2	3500
10		1412	1650	2	3300
11		1262	1500	2	3000
12		700	2600	1	2600
13		1650	5625	1	5625
TOTAL					34320

STEEL MASS : 31kg
CONCRETE : 0.45m³
TOTAL MASS : 1138kg

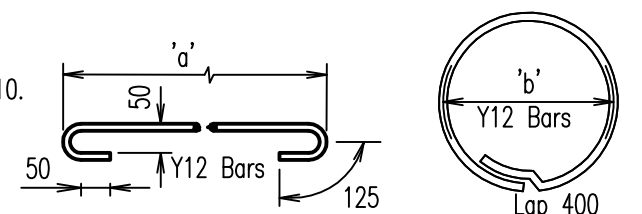
1350 DIA ACCESS CHAMBER



BAR No.	SHAPE	'a'/'b'	OVERALL LENGTH	No. OFF	TOTAL LENGTH
1		1337	1575	1	1575
2		1575	1800	1	1800
3		1645	1870	1	1870
4		1712	1950	1	1950
5		1756	1980	1	1980
6		1800	2025	1	2025
7		1825	2050	1	2050
8		1837	2075	1	2075
9		1825	2050	1	2050
10		1762	2000	2	4000
11		1700	1925	2	3850
12		1600	1825	2	3650
13		1462	1700	2	3400
14		1275	1500	2	3000
15		700	2600	1	2600
16		1800	6100	1	6100
TOTAL					43975

STEEL MASS : 39kg
CONCRETE : 0.55m³
TOTAL MASS : 1360kg

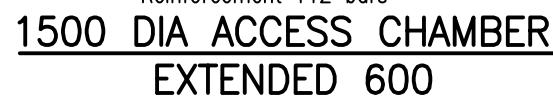
1500 DIA ACCESS CHAMBER



REINFORCEMENT DIMENSIONS

NOTES

- Concrete N40 in accordance with AS 1379 and AS 3600.
- Reinforcement cover 30 MIN (bottom cover)
- Reinforcement :- F81 Fabric to AS 1304
Bars Y12 and Y16, Grade 400 to AS 1302.
- For lifting anchor locations and details, refer Standard Drawing D-0010.
- Roof design based on Austroads bridge code, W7 wheel load, dynamic factor 0.4.
- All dimensions in millimetres.





















NOTES

1. Roof design based on Austroads Bridge code, W7 wheel load, dynamic factor 0.4.
2. Concrete N40 in accordance with AS 1379 and AS 3600.
3. Reinforcement cover 30 MIN (bottom face).
4. Reinforcement :- F81 Fabric to AS 1304
Bars Y12 and Y16, Grade 400 to AS 1302.
5. Refer Standard Drawing D-0011 for 'reinforcement dimensions'.
6. Lifting anchors to be "swiftlift" or equivalent. 1.8 tonne, galvanized to AS 1650 and fitted to manufacturer's specification at points shown 'X'.
7. Lifting capacity of mechanical devices to be no less than 4 tonnes.
8. All dimensions in millimetres.

LEGEND



















- Offset to access hole varies :-
 - a) Hole in line with chamber wall, or
 - b) Hole offset from wall 460mm
(refer Alternative 2 on Standard Drawing D-0010).

1500 DIA ACCESS CHAMBER
EXTENDED 600

BAR NO.	SHAPE	LENGTH	NO. OFF	TOTAL
1		835	1	835
2		1160	1	1160
3		1385	1	1385
4		1550	1	1550
5		1680	1	1680
6		1775	1	1775
7		1845	1	1845
8		1890	2	3780
9		1920	8	15360
10		1560	2	3120
11		1920	2	3840
12		2170	2	4340
13		2300	2	4600
14		2375	2	4750
15		2450	2	4900
16		2600	1	2600
17		7195	1	7195
18		1105	1	1105
Steel Mass		59 ka	TOTAL LENGTH	65820

Steel Mass	59 kg
Concrete Volume	0.90 m ³
Total Mass	2250 kg

1500 DIA ACCESS CHAMBER
EXTENDED 900

BAR NO.	SHAPE	LENGTH	NO. OFF	TOTAL
1		835	1	835
2		1160	1	1160
3		1385	1	1385
4		1550	1	1550
5		1680	1	1680
6		1775	1	1775
7		1845	1	1845
8		1890	2	3780
9		1920	11	21120
10		1800	2	3600
11		2200	2	4400
12		2470	2	4940
13		2650	2	5300
14		2700	2	5400
15		2750	2	5500
16		2600	1	2600
17		7795	1	7795
18		1105	1	1105
Steel Mass		67 kg	TOTAL LENGTH	75770

Steel Mass	67 kg
Concrete Volume	1.03 m ³
Total Mass	2575 kg

B	Opening Diameter 600	3/4/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

© INSTITUTE OF PUBLIC WORKS ENGINEERING
AUSTRALIA QUEENSLAND DIVISION INC. -1995
DISCLAIMER. The authors and sponsoring organisations shall have
no liability or responsibility to the user or any other person or entity with
respect to any liability, loss or damage caused or alleged to be caused,
directly or indirectly, by the adoption and use of these Standard Drawings
including, but not limited to, any interruption of service, loss of business
or anticipatory profits, or consequential damages resulting from the use
of these Standard Drawings. Persons must not rely on these Standard
Drawings as the equivalent of, or a substitute for, project-specific design
and assessment by an appropriately qualified professional.



INSTITUTE OF
PUBLIC WORKS
ENGINEERING
AUSTRALIA
QUEENSLAND DIVISION INC.

ACCESS CHAMBER
ROOF SLABS
DIA. 1500 EXTENDED 600 AND 900

DRAINAGE
Standard
Drawing
D-0012

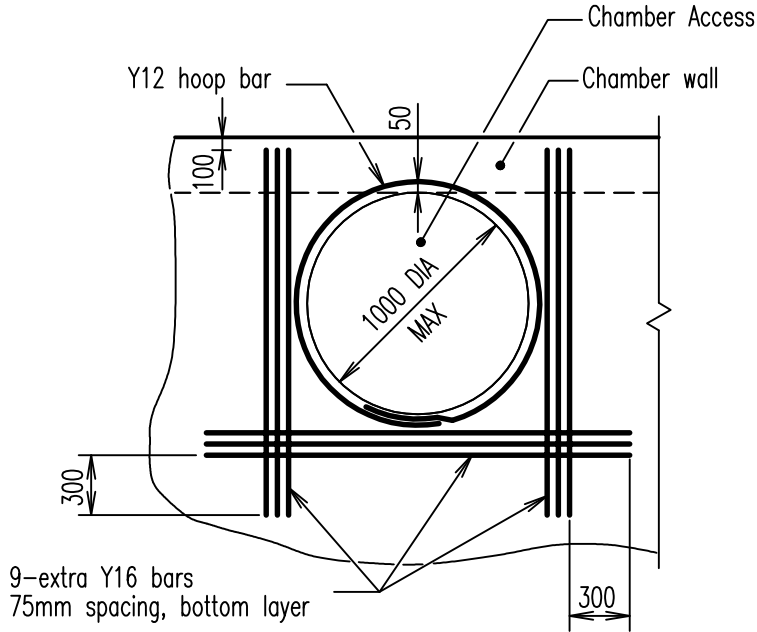
A	B			
---	---	--	--	--

		LONG SPAN										SLAB DEPTH
		1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	
SHORT SPAN	1200	Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	Y16 AT 175	Y16 AT 150	Y16 AT 150	Y16 AT 150	200
	1400		Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	Y16 AT 150	Y16 AT 150	Y16 AT 150	Y16 AT 150	200
	1600			Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 150	Y16 AT 150	Y16 AT 150	Y16 AT 150	200
	1800				Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	Y16 AT 175	225
	2000					Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	225
	2200						Y12 AT 150	Y16 AT 200	Y16 AT 200	Y16 AT 175	Y16 AT 175	225
	2400							Y16 AT 200	Y16 AT 200	Y16 AT 200	Y16 AT 175	225
	2600								Y16 AT 200	Y16 AT 200	Y16 AT 175	250
	2800									Y16 AT 200	Y16 AT 175	250
	3000										Y16 AT 175	250

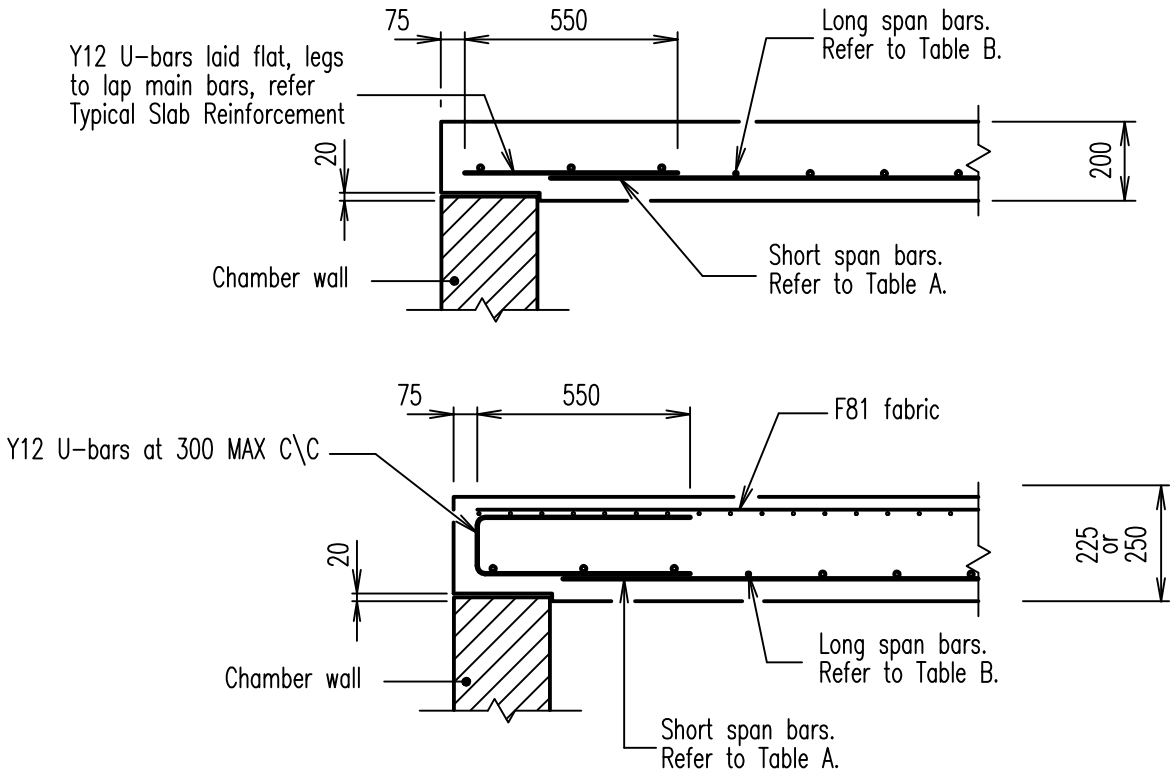
TABLE A : S BARS

		LONG SPAN										SLAB DEPTH
		1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	
SHORT SPAN	1200	Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	200
	1400		Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	200
	1600			Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	200
	1800				Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	225
	2000					Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	225
	2200						Y12 AT 150	Y12 AT 200	Y12 AT 200	Y12 AT 200	Y12 AT 200	225
	2400							Y16 AT 200	Y12 AT 150	Y12 AT 150	Y16 AT 150	225
	2600								Y16 AT 200	Y16 AT 200	Y16 AT 200	250
	2800									Y16 AT 200	Y16 AT 200	250
	3000										Y16 AT 175	250

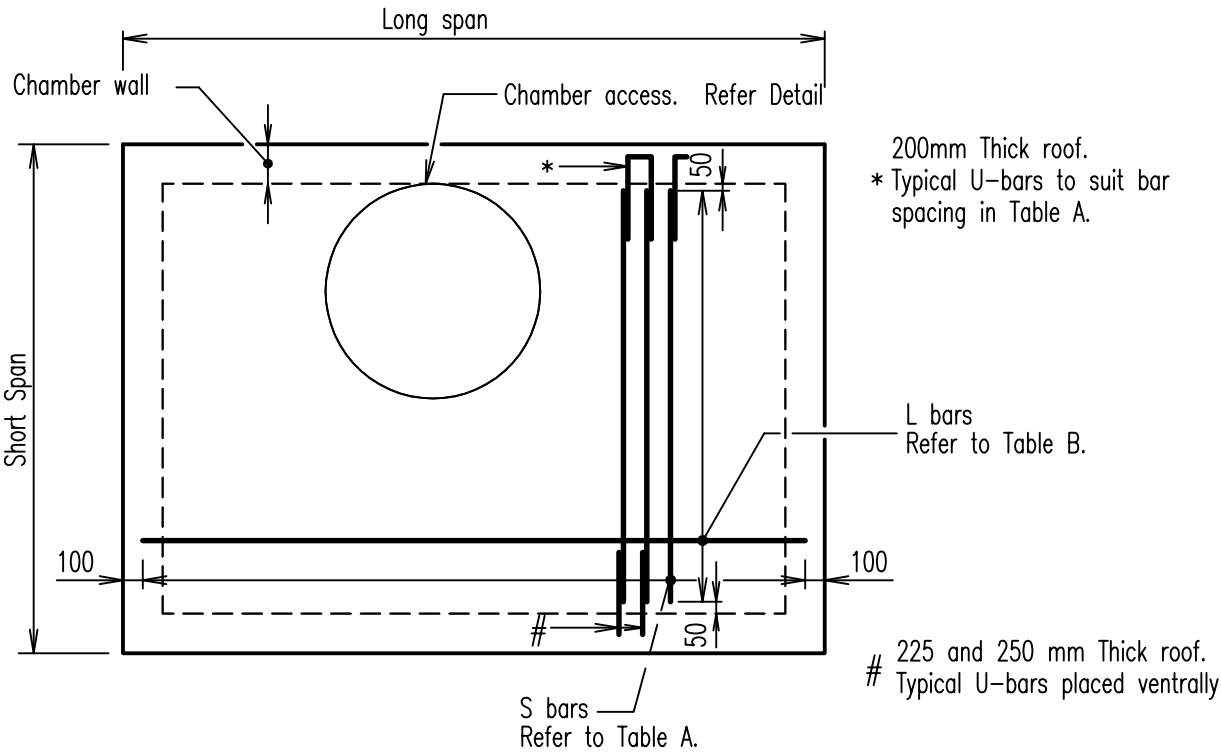
TABLE B : L BARS



SLAB REINFORCEMENT
AROUND CHAMBER ACCESS



TYPICAL SECTIONS

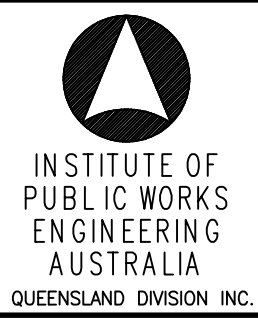


TYPICAL SLAB REINFORCEMENT

- NOTES
- Concrete N32/20 in accordance with AS 1379 and AS 3600.
 - Reinforcement :- F81 Fabric to AS 1304
Bars Y12 and Y16, Grade 400 to AS 1302.
 - All laps in reinforcement shall be :-
Y12 - 300, Y16 - 400
 - Formwork in accordance with AS 3610.
 - Designed to Austroads Bridge Code, W7 wheel load, dynamic factor 0.4.
 - Maximum fill over roof slab shall be 3000mm.
 - Reinforcement cover 45 MIN.
 - Refer Service Authority for access hole diameter to be adopted.
 - Refer project drawings for details of chamber walls and floors.
 - For sections at chamber access refer Standard Drawing D-0010.
 - All dimensions in millimetres.

B	TITLE ALTERED	16/1/97
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



ACCESS CHAMBER

ROOF SLAB – RECTANGULAR

STANDARD REINFORCEMENT

DRAINAGE

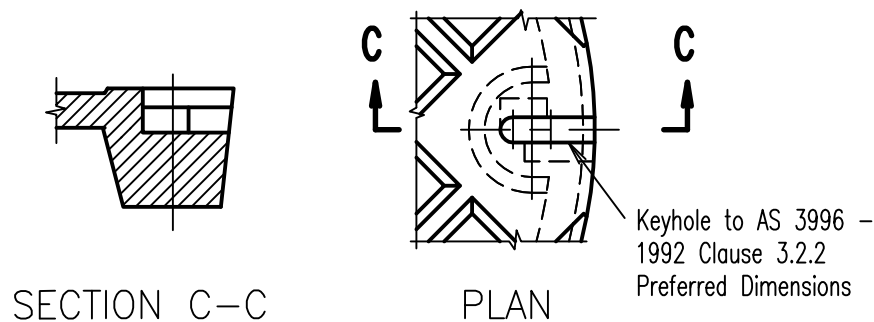
Standard

Drawing

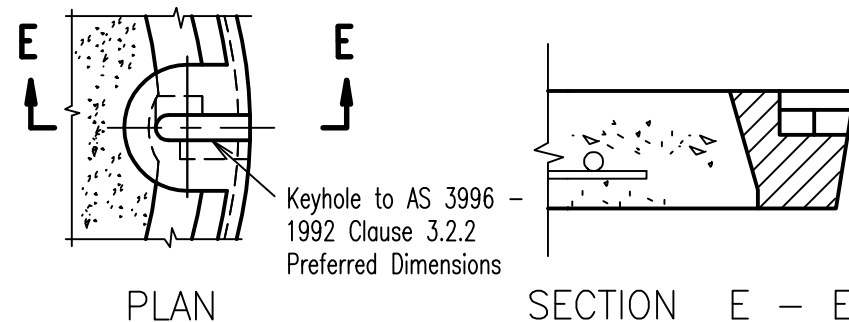
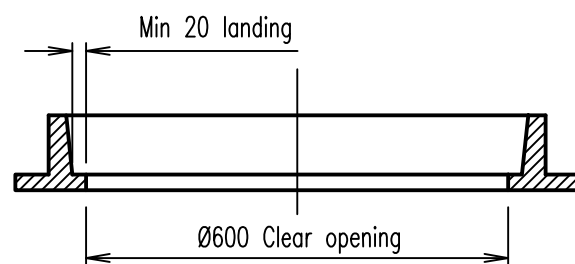
D-0013

A

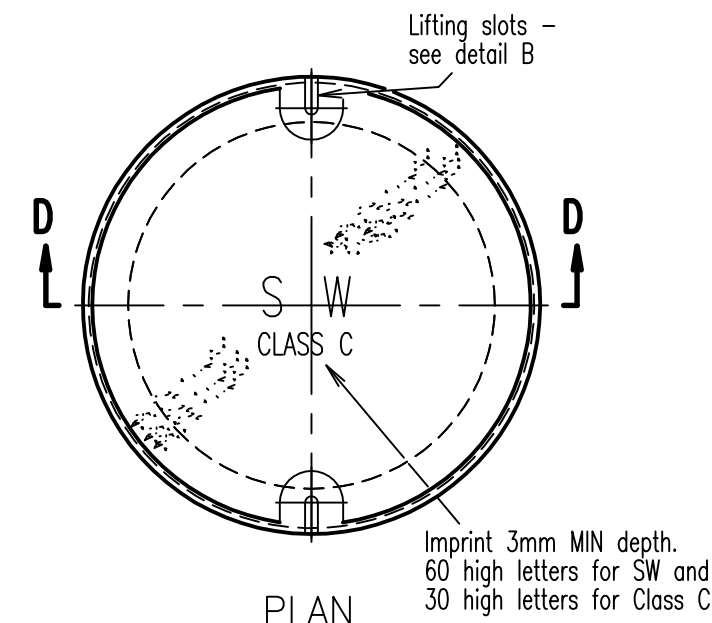
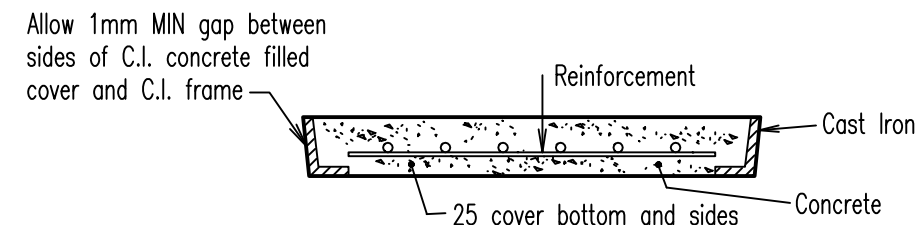
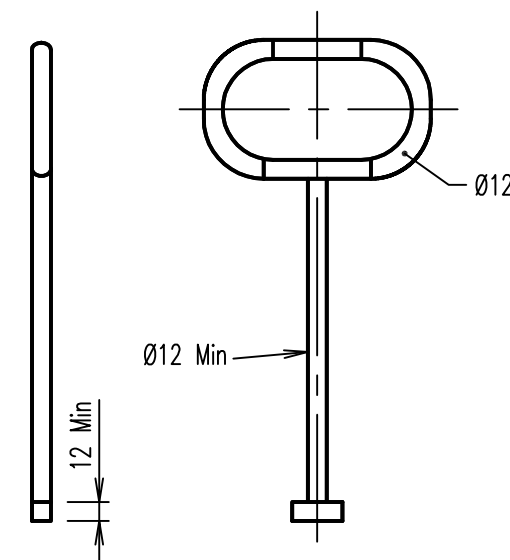
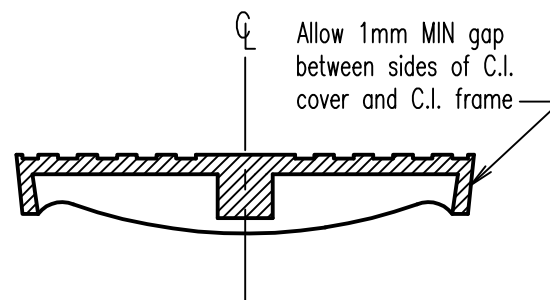
B



LIFTING SLOTS - DETAIL A



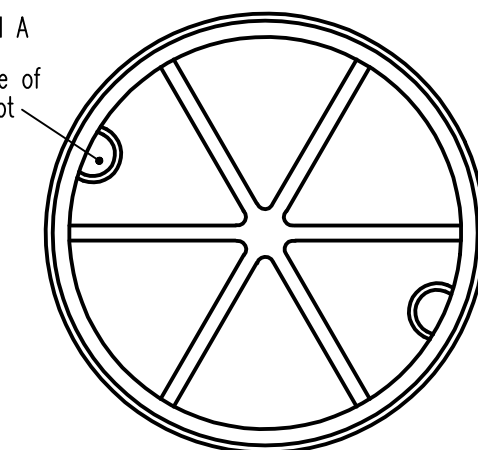
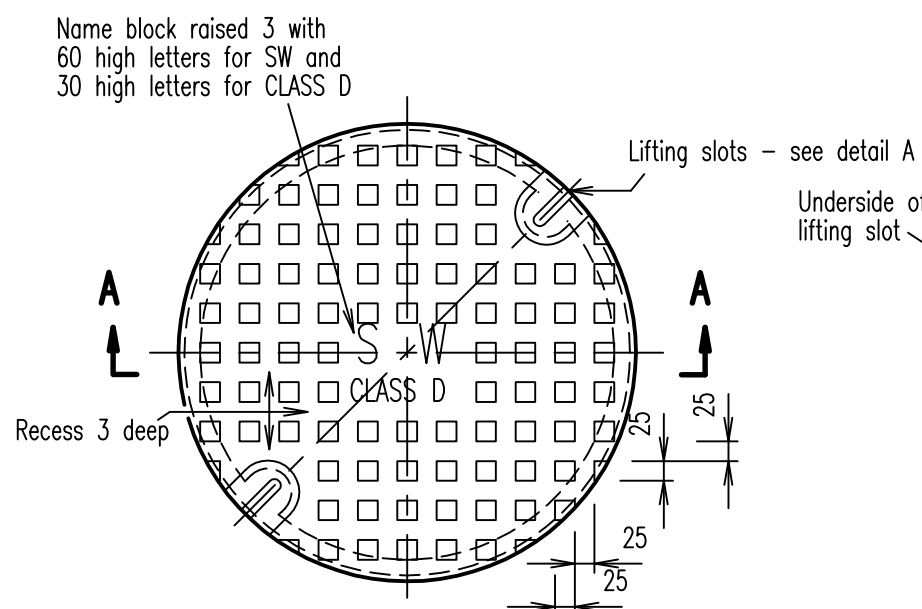
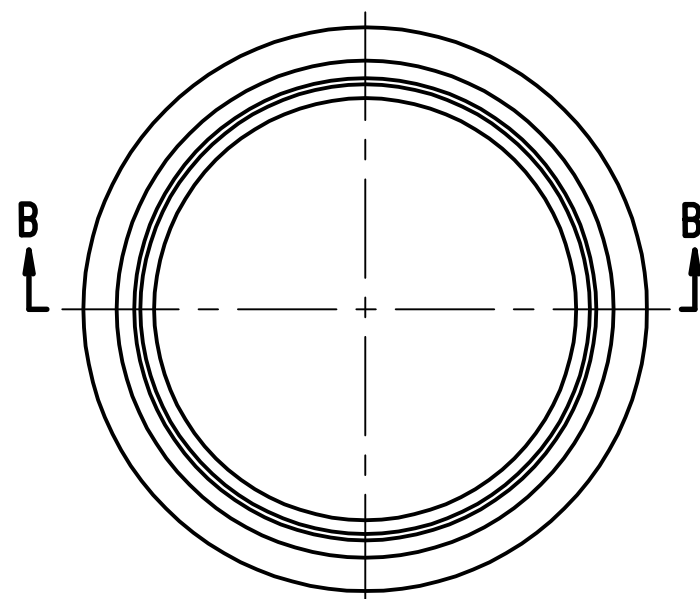
SLOTS - DETAIL B



PLAN - C.I. CONCRETE FILLED COVER

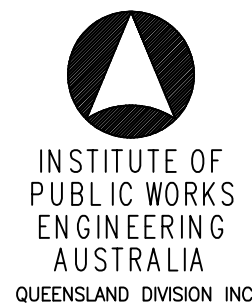
NOTES:

1. This drawing is intended to provide the performance specification only for the types of access chambers shown. The structures as shown are schematic as sizes and shapes may vary.
2. Access chambers which are proprietary items are required to be designed and certified to AS 3996-1992. Access covers subject to road traffic shall be of Class D design, where Minimum Ultimate Limit State Design Load = 210kN. Access covers subject to pedestrian traffic and occasional vehicle load shall be of Class C design, where Minimum Ultimate Limit State Design Load = 150kN. (Ref: AS 3996-1992 and Austroads Bridge Design Code 1992).
3. Cover and frame, grey cast iron, Grade \geq T220 to AS 1830.
4. All reinforcement to be Grade 400 to AS 1302. All other steel to be Min Grade 250 to AS 1442.
5. Concrete infill N32/10 in accordance with AS 1379 and AS 3600.
6. All welds to AS 1554.
7. Bitumen paint cover and frame to AS/NZS 3750.4.
8. All dimensions in millimetres.



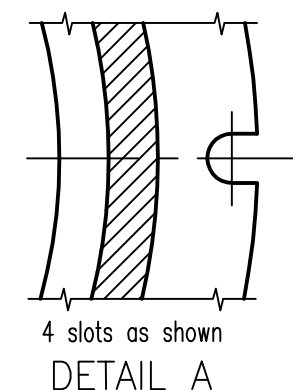
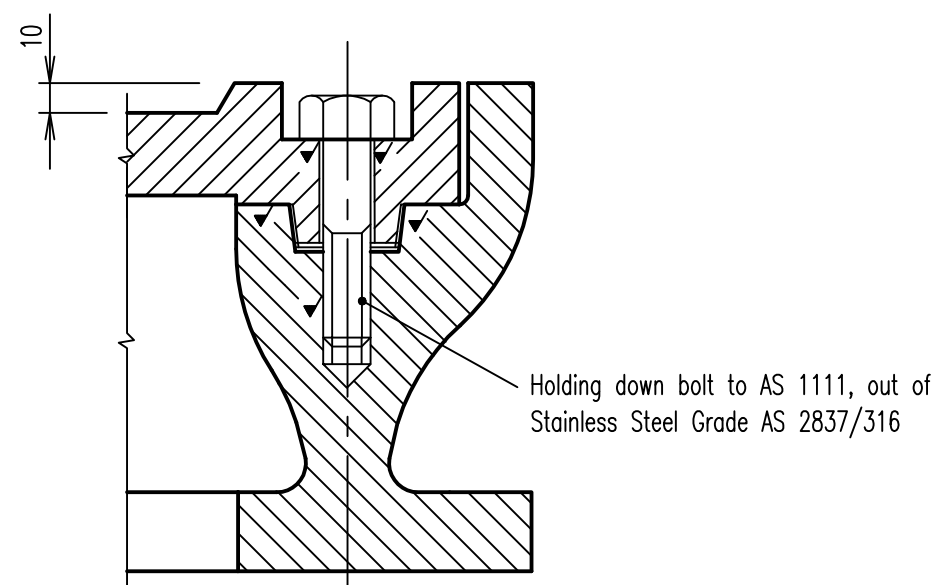
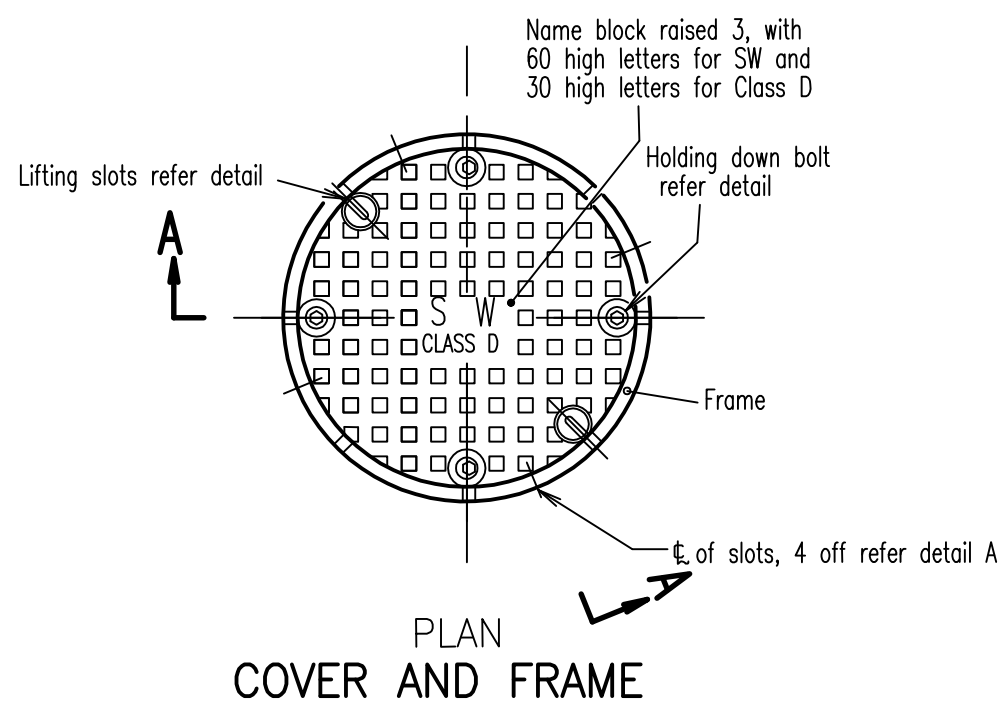
B	Dimensions Removed	3/4/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
 DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



**ACCESS CHAMBER
 CAST IRON COVER AND FRAME
 C.I. CONCRETE FILLED COVER**

**DRAINAGE
 Standard
 Drawing
 D-0014**



LEGEND

▼ Denotes machined surface.

NOTES:

1. This drawing is intended to provide the performance specification only for the type of access chamber shown. The structure as shown is schematic as sizes and shapes may vary.
2. Access chambers which are proprietary items are required to be designed and certified to AS 3996-1992.
3. Cover and frame, grey cast iron, Grade \geq T220 to AS 1830.
4. Cover design to be Class D to AS 3996 – 1992, where Minimum Ultimate Limite State Design Load = 210kN
5. All welds to AS 1554.
6. Bitumen paint cover and frame to AS/NZS 3750.4.
7. All dimensions in millimetres.

B	Dimensions Removed	3/4/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

© INSTITUTE OF PUBLIC WORKS ENGINEERING
AUSTRALIA QUEENSLAND DIVISION INC. - 1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.

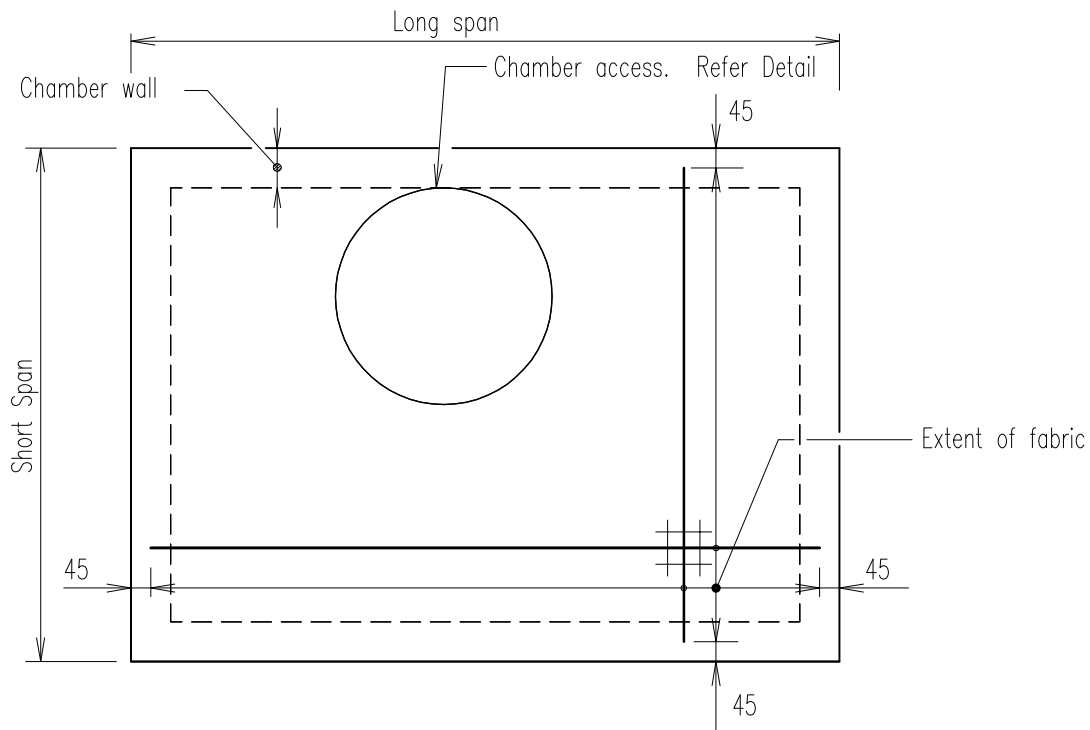


INSTITUTE OF
PUBLIC WORKS
ENGINEERING
AUSTRALIA
QUEENSLAND DIVISION INC.

ACCESS CHAMBER
CAST IRON COVER AND FRAME
BOLT DOWN

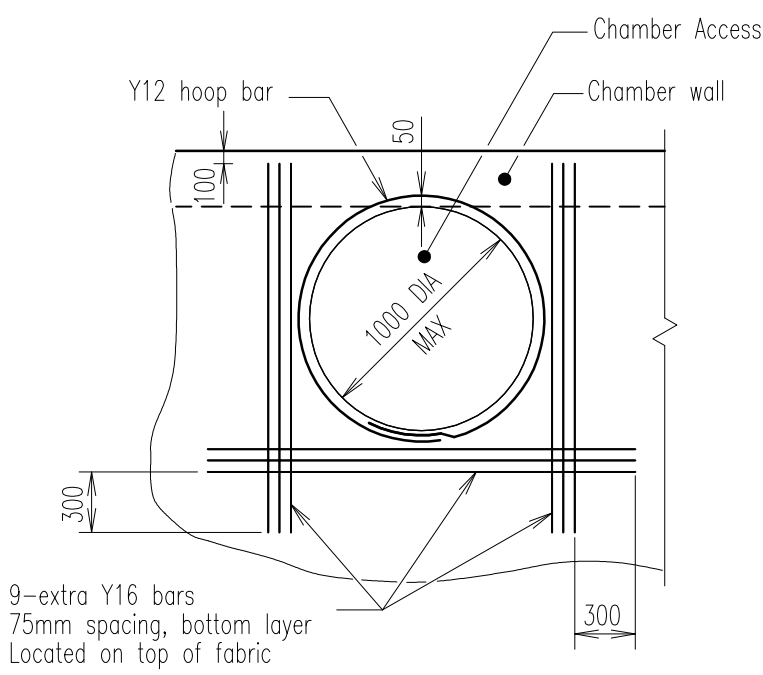
DRAINAGE
Standard
Drawing
D-0015

A	B			
---	---	--	--	--

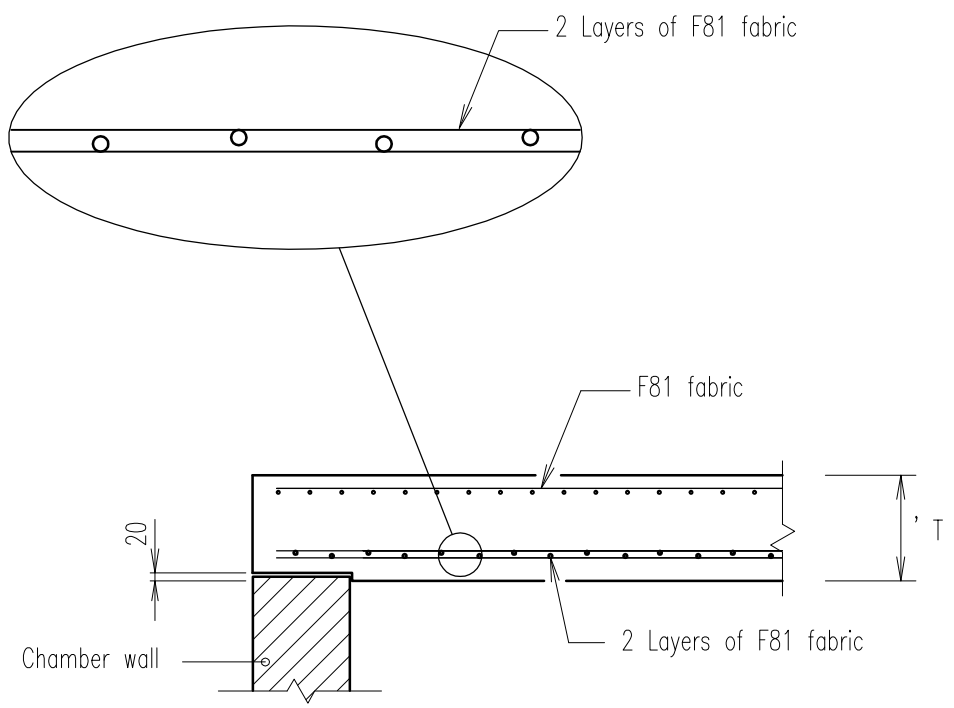


FABRIC REINFORCED SLAB	
SHORT SPAN	SLAB THICKNESS 'T'
1200 TO 1600	225
1800 TO 2400	250
2600 TO 3000	275

TYPICAL SLAB REINFORCEMENT




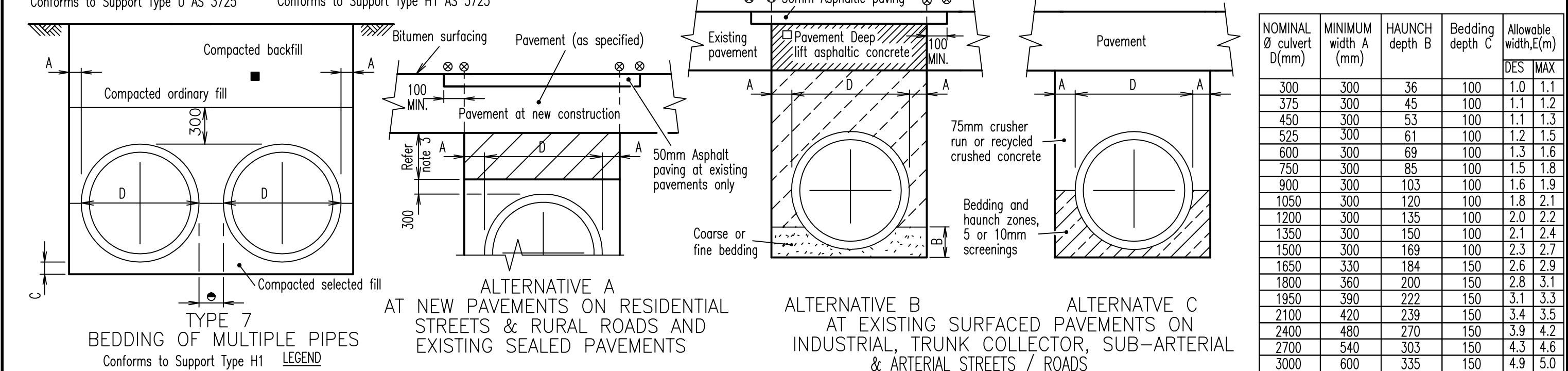
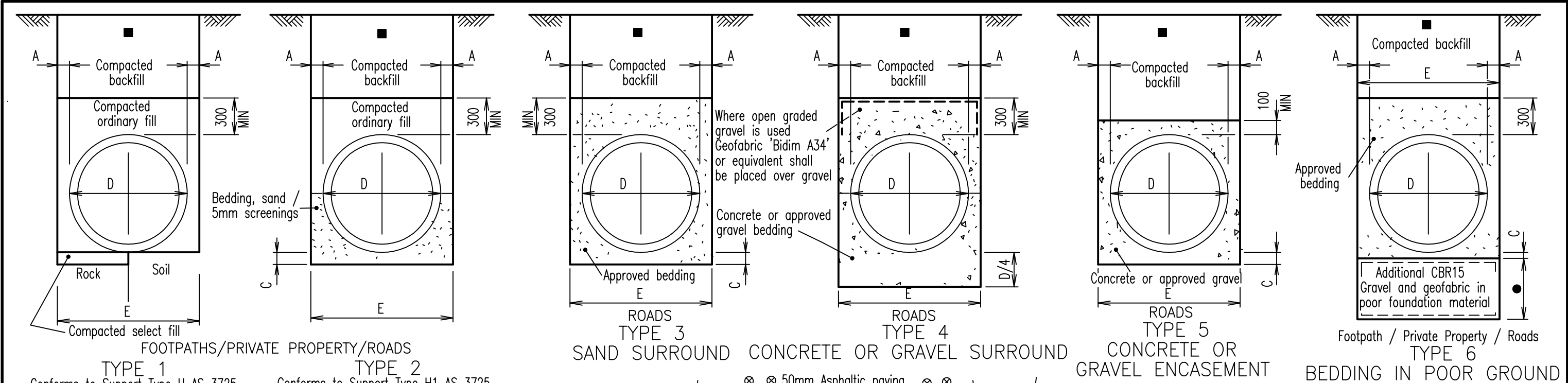
SLAB REINFORCEMENT
AROUND CHAMBER ACCESS



TYPICAL SECTION


- NOTES
- Concrete N32/20 in accordance with AS 1379 and AS 3600.
 - Reinforcement :- F81 Fabric to AS 1304
Bars Y16, Grade 400 to AS 1302.
 - All laps in reinforcement shall be :-
Y12 - 300, Y16 - 400, Fabric - 250
 - Formwork in accordance with AS 3610.
 - Designed to Austroads Bridge Code, W7 wheel load, dynamic factor 0.4.
 - Maximum fill over roof slab shall be 3000mm.
 - Reinforcement cover 45 MIN.
 - Refer Service Authority for access hole diameter to be adopted.
 - Refer project drawings for details of chamber walls and floors.
 - For sections at chamber access refer Standard Drawing D-0010.
 - All dimensions in millimetres.

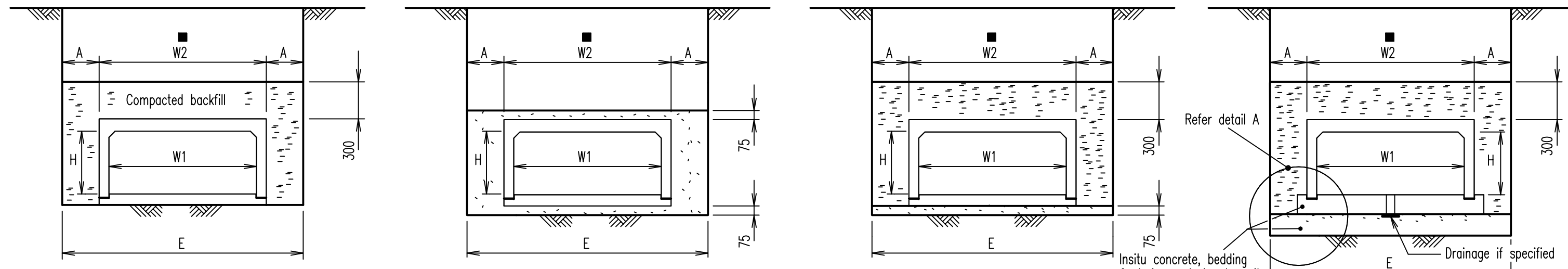
		© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995 DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.		 INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.	ACCESS CHAMBER ROOF SLAB – RECTANGULAR FABRIC REINFORCEMENT	DRAINAGE Standard Drawing D-0017
A	ORIGINAL ISSUE	25/2/97				
	REVISIONS	DATE				



NOMINAL Ø culvert D(mm)	MINIMUM width A (mm)	HAUNCH depth B	Bedding depth C	Allowable width,E(m)	
				DES	MAX
300	300	36	100	1.0	1.1
375	300	45	100	1.1	1.2
450	300	53	100	1.1	1.3
525	300	61	100	1.2	1.5
600	300	69	100	1.3	1.6
750	300	85	100	1.5	1.8
900	300	103	100	1.6	1.9
1050	300	120	100	1.8	2.1
1200	300	135	100	2.0	2.2
1350	300	150	100	2.1	2.4
1500	300	169	100	2.3	2.7
1650	330	184	150	2.6	2.9
1800	360	200	150	2.8	3.1
1950	390	222	150	3.1	3.3
2100	420	239	150	3.4	3.5
2400	480	270	150	3.9	4.2
2700	540	303	150	4.3	4.6
3000	600	335	150	4.9	5.0

- LEGEND**
- Pavement. Refer project documentation for detail
 - ⊗ Saw cut at existing pavement
 - Pipes : 300 when NOMINAL D < 600
600 when NOMINAL D 600 – 1800
900 when NOMINAL D > 1800
 - Refer Alternative A, B and C for backfill requirements at existing and new pavements.
 - Depth to be approved by the Superintendent
 - ▨ Gravel (MIN CBR15) backfill
 - ▩ No fines concrete backfill (8 parts 10mm NOM size aggregate to 1 part cement).
- NOTES:**
- Selected backfill in all cases shall be carried through to the wings and continued 300 thick for the length and height of wings.
 - Bedding compaction (Compacted selected fill / sand bedding)
Cohesive material – 95% standard compaction
Non-cohesive material – density index of 70 MIN, refer AS 1289.E5.1
Sand – compact by flooding and use of vibrators.
 - Backfill compaction
Compacted gravel (300mm) layer under road pavement 95% standard compaction.
Compacted ordinary fill / CBR15 Gravel 90% standard compaction – below 300mm zone.
Compacted backfill – at footpaths / private property 90% standard compaction.
MAX. densities determined by standard compaction tests to AS 1289.5.1.1.
 - Refer project drawings for types and/or alternatives to be adopted.
 - Type U & Type H1 to conform to AS 3725.
 - Dimension A can be reduced to 150 MIN for non mechanical compaction of backfill
 - Pipes are to be designed to their correct strength class under all construction loads, dead loads and in-service loads.
 - All dimensions in millimetres.

			<p>© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995</p> <p>DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.</p>	 <p>INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC.</p>	<p>EXCAVATION, BEDDING AND BACKFILLING OF STORMWATER DRAINAGE PIPES</p>	DRAINAGE			
						Standard			
						Drawing			
C	Note 7 added	6/1/00				D-0030			
B	Bedding modification Type 2, 4, 7 and Alternative B	16/1/97							
A	ORIGINAL ISSUE	8/12/95							
REVISIONS		DATE							

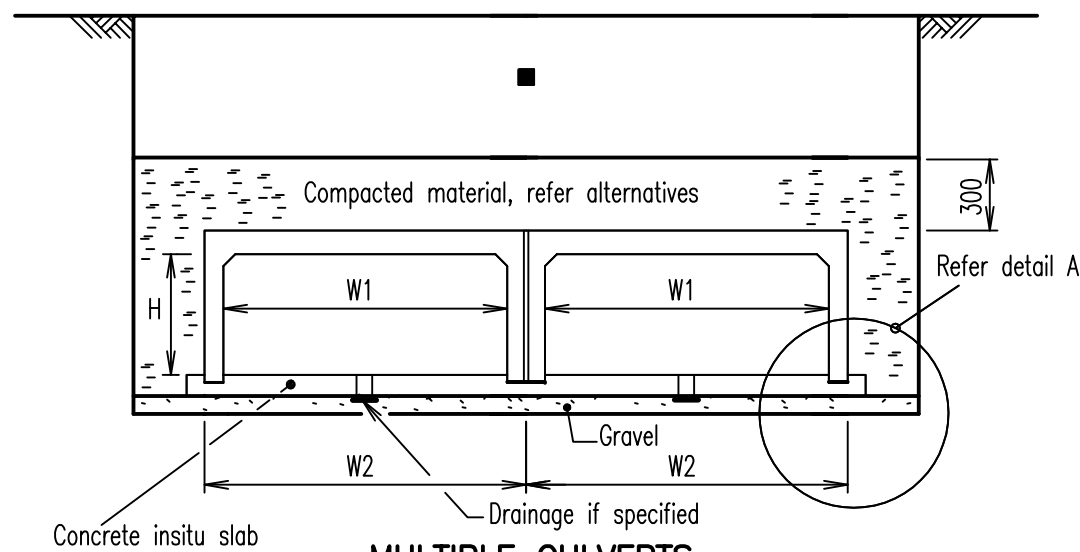


**TYPE 1
NATURAL BEDDING**

**TYPE 2
SAND SURROUND**

**TYPE 3
SAND BEDDING**

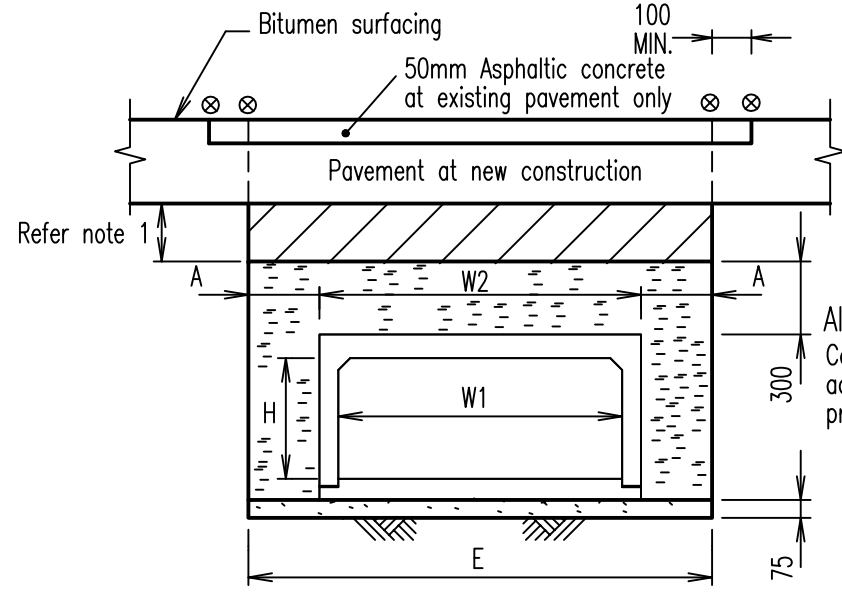
**TYPE 4
INSITU BASE SLAB**



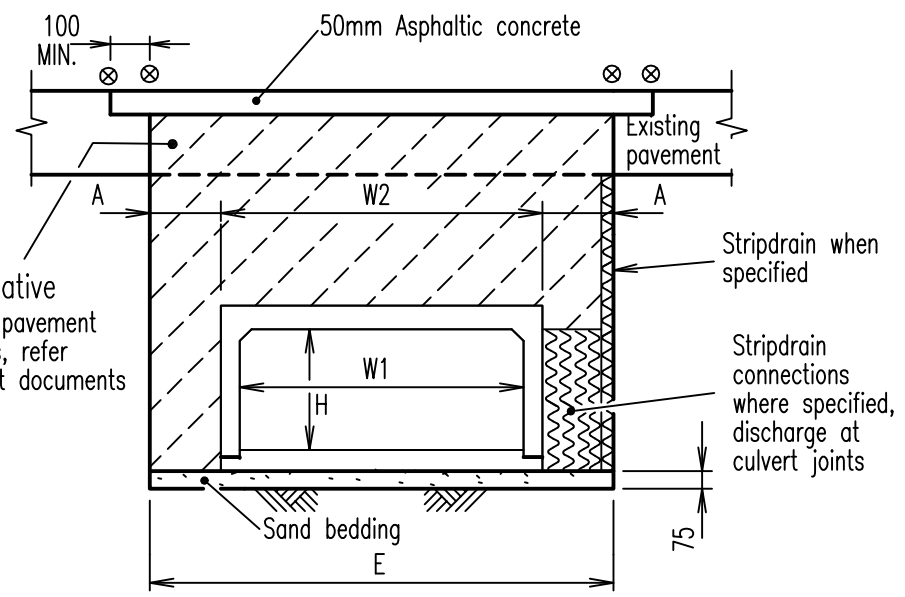
MULTIPLE CULVERTS

W1	W2	E NOM.
300	420	1000
375	500	1100
450	570	1200
600	730	1300
750	890	1500
900	1050	1700
1200	1360	2000
1520	1700	2300
1820	2010	2600
2130	2340	3000
2440	2670	3300

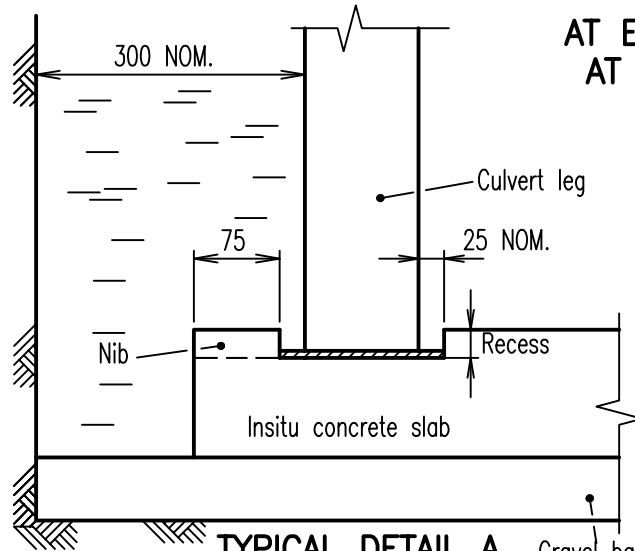
EXCAVATION WIDTH



**ALTERNATIVE A
AT EXISTING SURFACED PAVEMENTS OR
AT NEW PAVEMENTS ON RESIDENTIAL
STREETS & RURAL ROADS**



**ALTERNATIVE B
AT EXISTING SURFACED PAVEMENTS
ON INDUSTRIAL, TRUNK COLLECTOR,
SUB-ARTERIAL & ARTERIAL STREETS / ROADS**



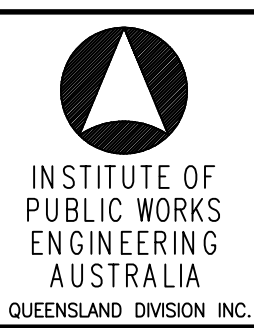
TYPICAL DETAIL A Gravel base, site specific design

- LEGEND**
- A 300mm NOMINAL
 - Refer Alternative A for backfill requirements at new pavement
 - ⊗ Saw cut at existing pavement
 - ▨ Gravel (MIN CBR15) or 75mm crusher run backfill
 - ▧ Lean mix concrete backfill (1:15 mix)
 - ▬ 10mm Cement mortar bed, 1:3 mix

- NOTES:**
- Backfill compaction
Approved fill / approved bedding / compacted backfill / CBR15 Gravel 90%
Compacted gravel (300mm layer) under road pavement 95%
Compacted fill – at footpaths / private property 90%
MAX. densities determined by Standard compaction tests to AS 1289.E5.1.
 - Refer to Main Roads Std Drg 1316 for installation of precast culverts.
 - Tape all joints with 75mm wide Denso (600) Tape or equivalent.
 - All dimensions in millimetres.

B	Note 2 added	6/1/00
A	ORIGINAL ISSUE	8/12/95
REVISIONS		DATE

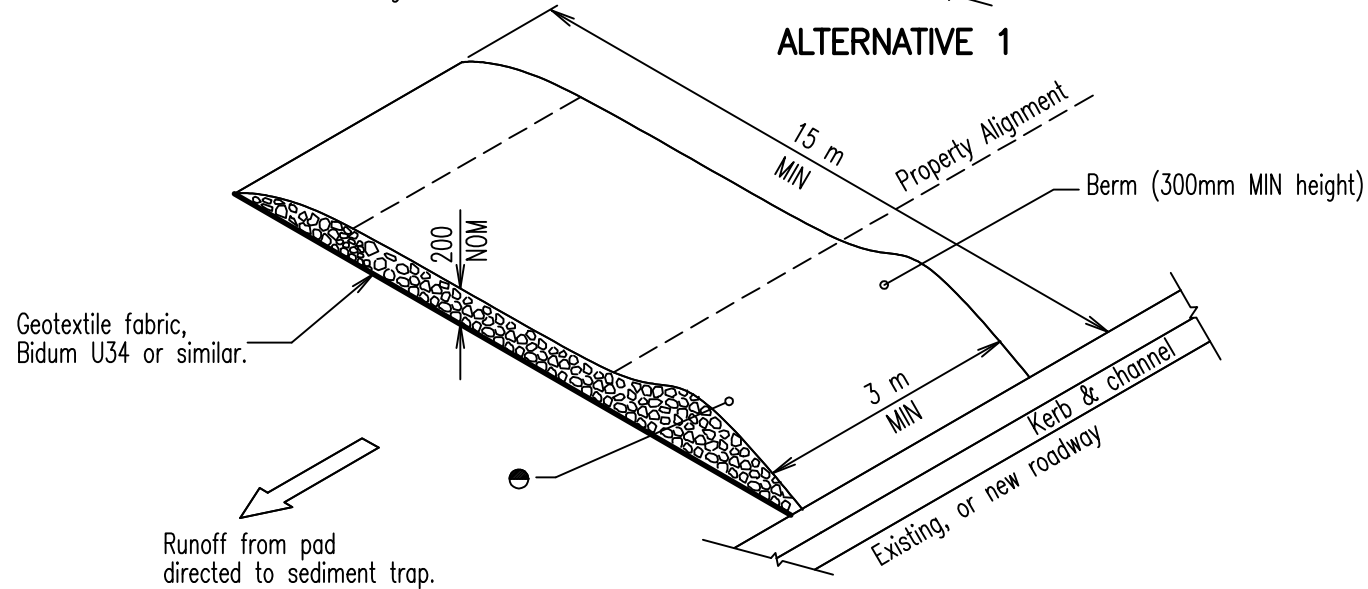
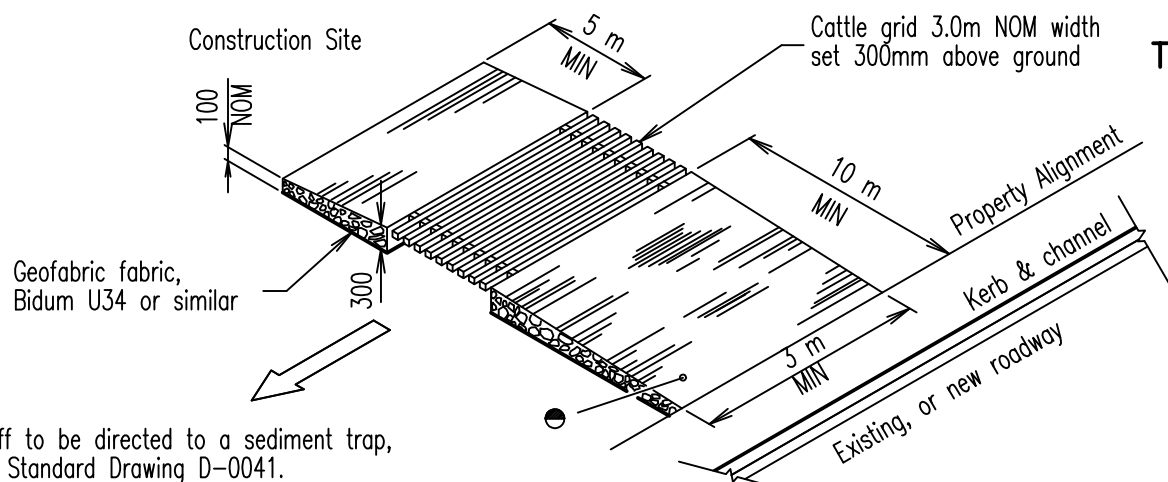
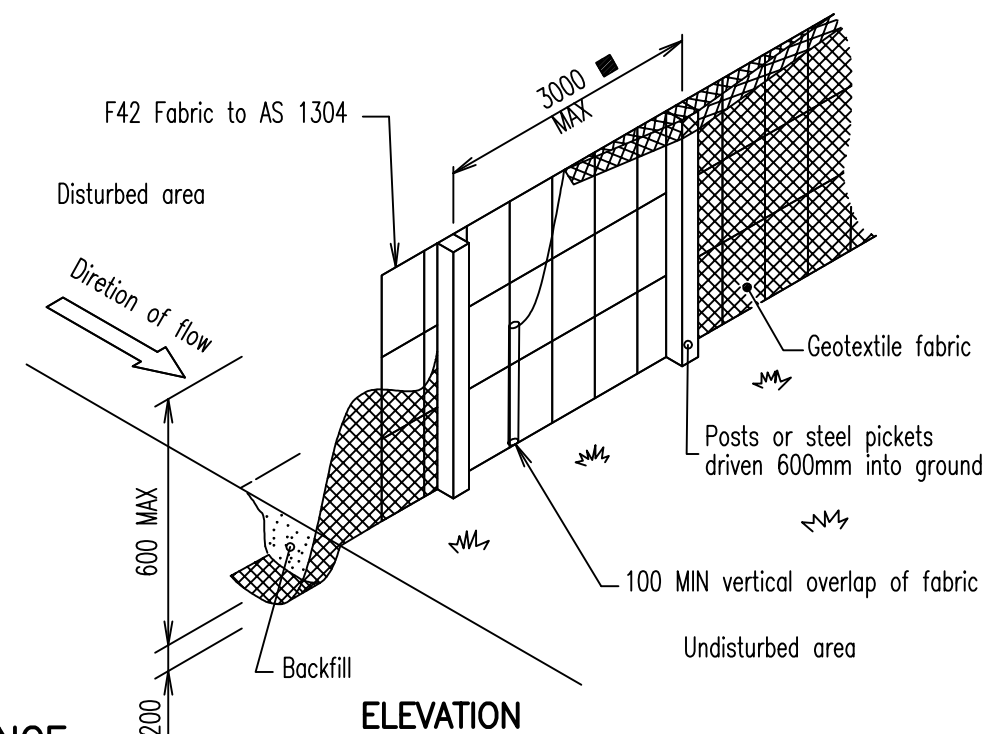
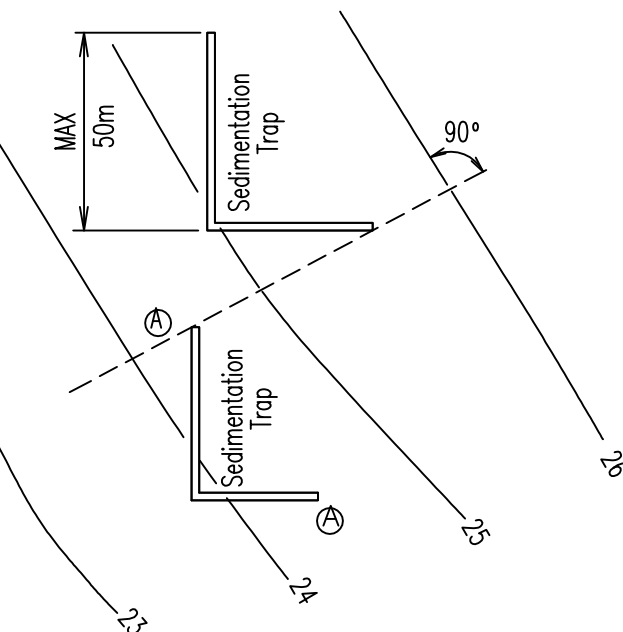
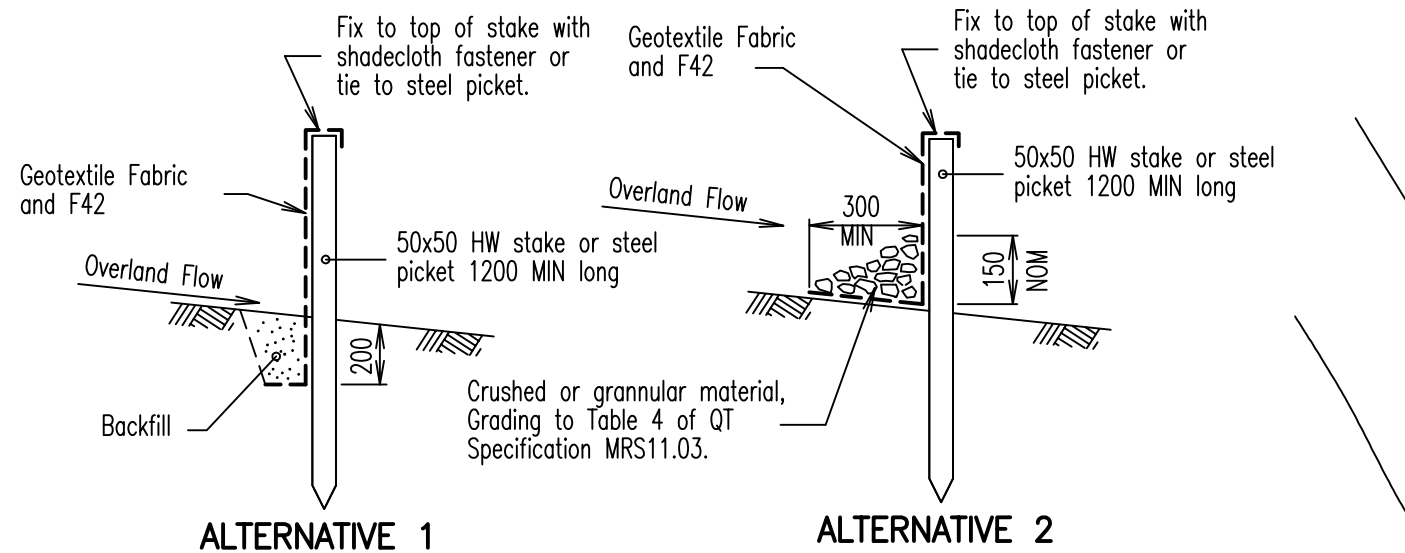
© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



EXCAVATION, BEDDING AND BACKFILLING OF PRECAST BOX CULVERTS

**DRAINAGE
Standard
Drawing
D-0031**

A



TEMPORARY CONSTRUCTION ENTRY / EXIT SEDIMENT TRAP

SEDIMENT FENCE

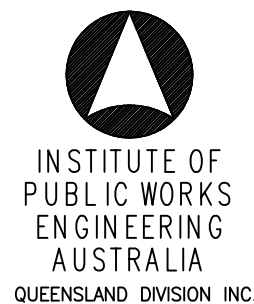
LEGEND

- Unbound pavement material (gravel) to Grading B, Table 9 of QT Specification MRS11.05, exclude material finer than AS sieve 2.36mm.
- Without F42 fabric, 2000 MAX C\C

NOTES

1. General
 - (a) Temporary drainage control. Flow should be diverted around the work site where possible.
 - (b) All drainage, erosion and sediment controls to be installed and be operational before commencing up-slope earthworks.
 - (c) All control measures to be inspected at least weekly and after significant runoff producing storms.
 - (d) Control measures may be removed when on-site erosion is controlled and 70% permanent soil coverage is obtained over all upstream disturbed land.
 - (e) In areas where runoff turbidity is to be controlled, exposed surfaces to be either mulched, covered with erosion control blankets or turfed if earthworks are expected to be delayed for more than 14 days.
 - (f) Straw bale sediment traps are a secondary option which generally should not be used if other options are available.
2. Sediment Fence
 - (a) Not to be located in areas of concentrated flow.
 - (b) Normally located along the contour with a maximum catchment area 0.6 ha per 100m length of fence.
 - (c) Woven fabrics are preferred, non-woven fabrics may be used on small work sites, i.e. operational period less than 6 months or on sites where significant sediment runoff is not expected.
 - (d) Where fences need to be located across the contour the layout shall conform to 'Typical Layout Across Grade'.
 - (e) Fences are required 2m MIN from toe of cut or fill batters, where not practical one fence can be at the toe with a second fence 1m MIN away. Fence should not be located parallel with toe if concentration of flow will occur behind the fence.
3. Temp Construction Entry/Exit Sediment Trap.
 - (a) Adjacent stormwater runoff to be diverted away from entry/exit.
 - (b) Wheel - wash or spray unit may be required during wet weather.
4. Safety issues must be considered at all times, incorporate traffic control devices to the satisfaction of the Superintendent.
5. All dimensions in millimetres unless indicated otherwise.

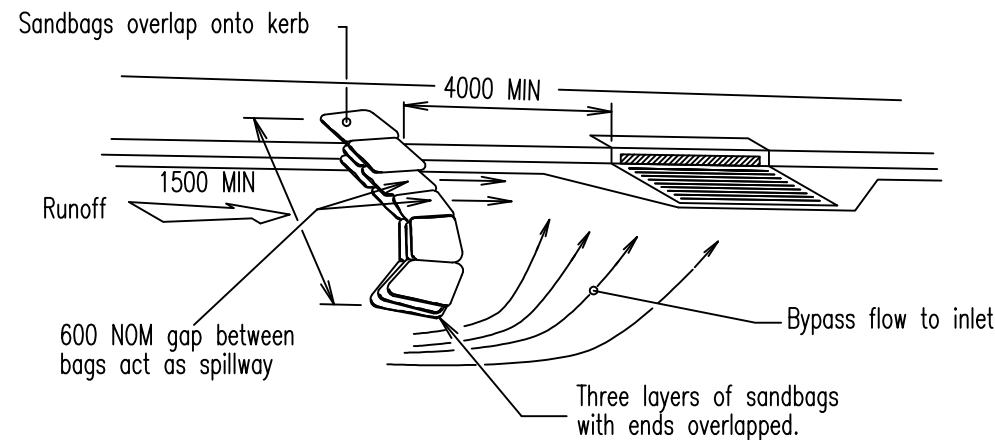
© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
 DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



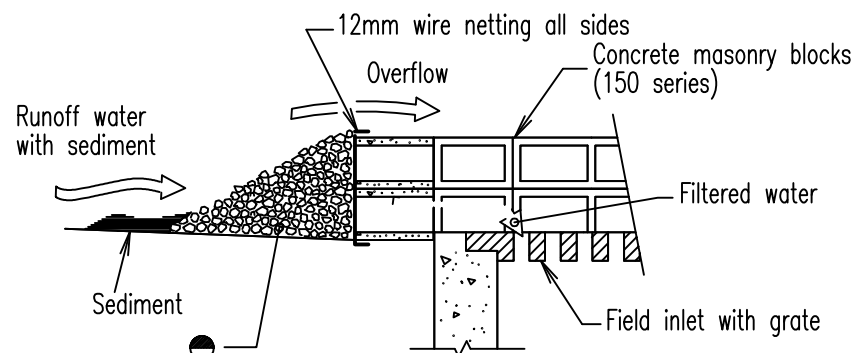
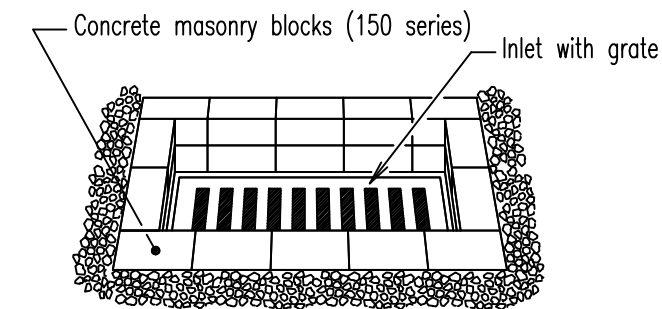
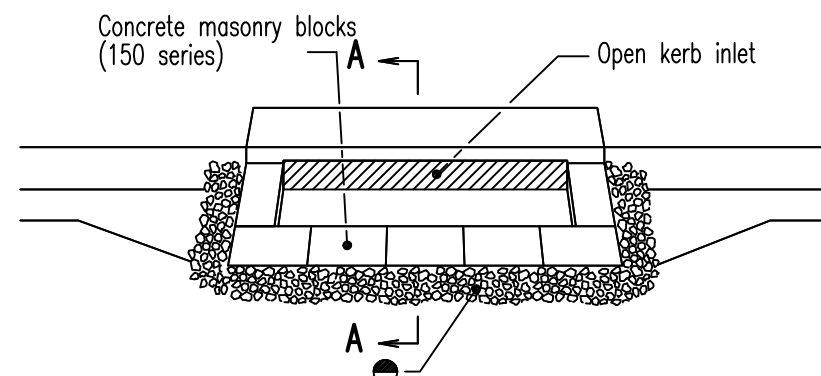
SEDIMENT CONTROL DEVICES SEDIMENT FENCE ENTRY/EXIT SEDIMENT TRAP

DRAINAGE
Standard
Drawing
D-0040

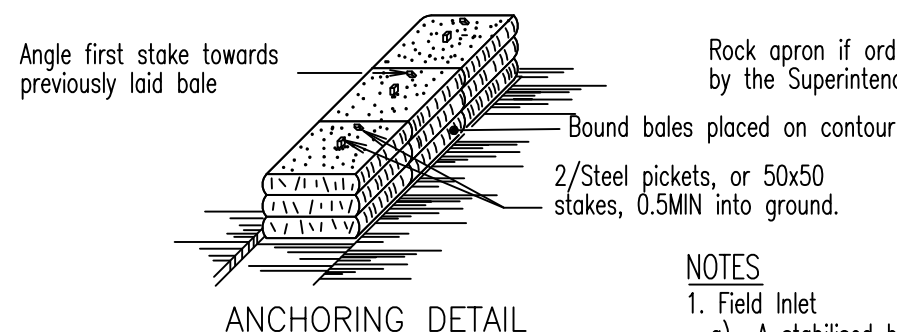
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE



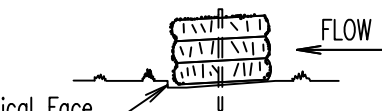
ON GRADE KERB INLET SEDIMENT TRAP



FIELD INLET SEDIMENT TRAP



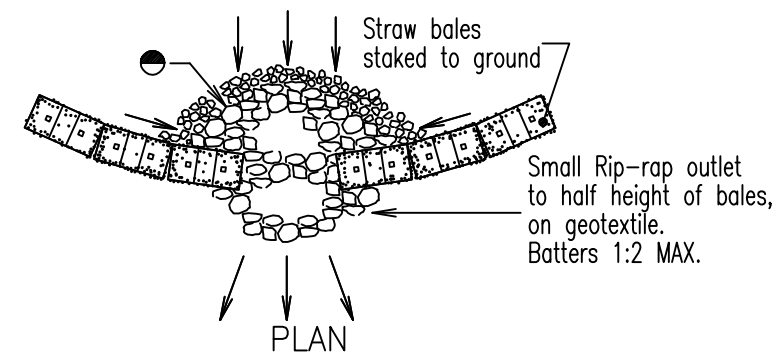
ANCHORING DETAIL



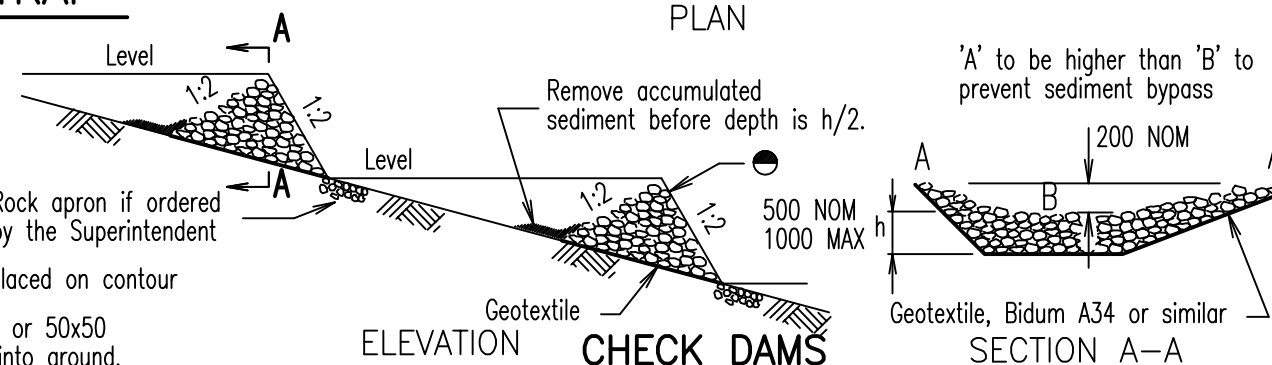
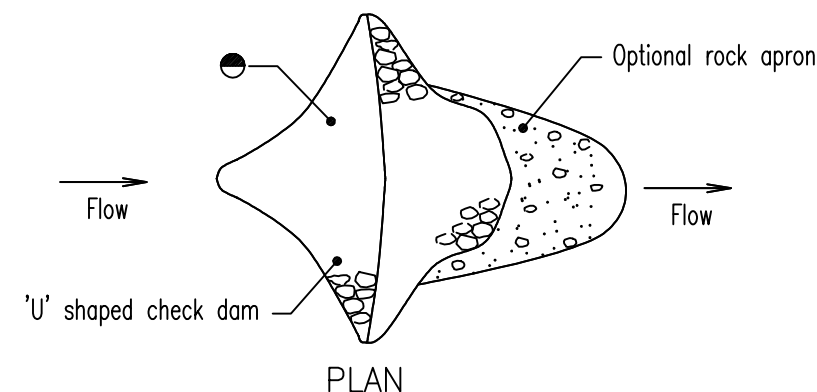
BEDDING DETAIL STRAW BALE BANK SEDIMENT CONTROL

LEGEND

- Gravel filter, refer Grading B, Table 9 of QT Specification MRS11.05, exclude material finer than AS sieve 2.36mm.



STRAW BALE AND STONE TRAP SEDIMENT CONTROL – CONCENTRATED FLOW



CHECK DAMS FLOW CONTROL

NOTES

- Field Inlet
 - A stabilised bypass overland flow path should exist adjacent to the field inlet.
 - Water level control perimeter banks may be required.
 - Blocks to be restrained by a horizontal timber rail at block joint height fixed to timber stakes at corners.
- Check Dams
 - Catchment area limited to 4 ha.
 - Use in minor open drains only, (velocity control), sediment collection is a secondary purpose.
- Straw Bale Banks
 - Bales shall be placed at the toe of a slope or on the contour, in a row with ends tightly abutting the adjacent bales.
 - Each bale shall be embedded in the soil a minimum of 100mm on the downstream side and placed so the bindings are horizontal.
 - Bales shall be securely anchored in place with either two stakes or steel pickets driven through the bale. The first stake in each bale shall be driven toward the previously laid bale at an angle to force the bales together.
 - Inspections shall be frequent and repair or replacement shall be made promptly as needed. Replace at least 3 monthly.
- Safety issues must be considered at all times, incorporate traffic control devices to the satisfaction of the Superintendent.
- All dimensions in millimetres.

SAG INLET SEDIMENT TRAP

A stabilised bypass 'overland flow path' should exist adjacent to inlet in genuine sags.

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
 DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



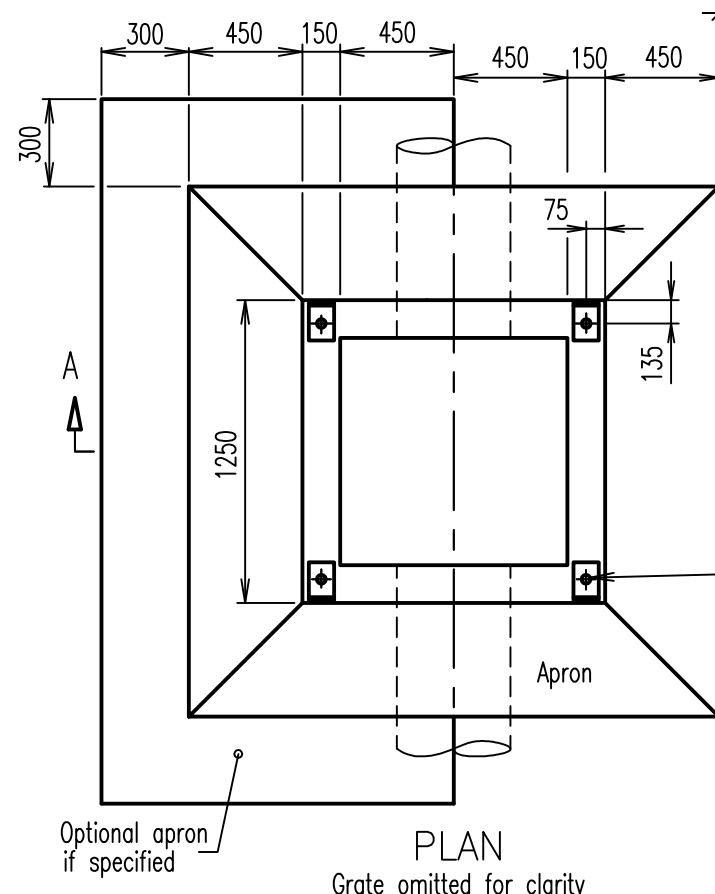
INSTITUTE OF
PUBLIC WORKS
ENGINEERING
AUSTRALIA
QUEENSLAND DIVISION INC.

SEDIMENT CONTROL DEVICES KERB AND FIELD INLETS, CHECK DAMS & STRAW BALE BANK

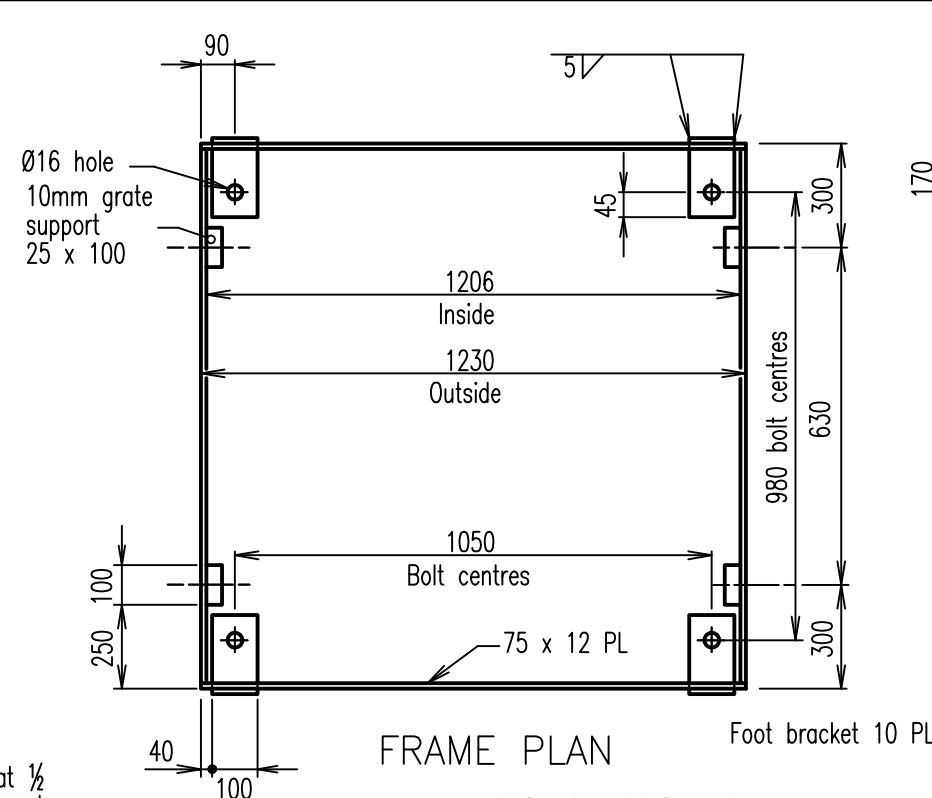
DRAINAGE
Standard
Drawing
D-0041

A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

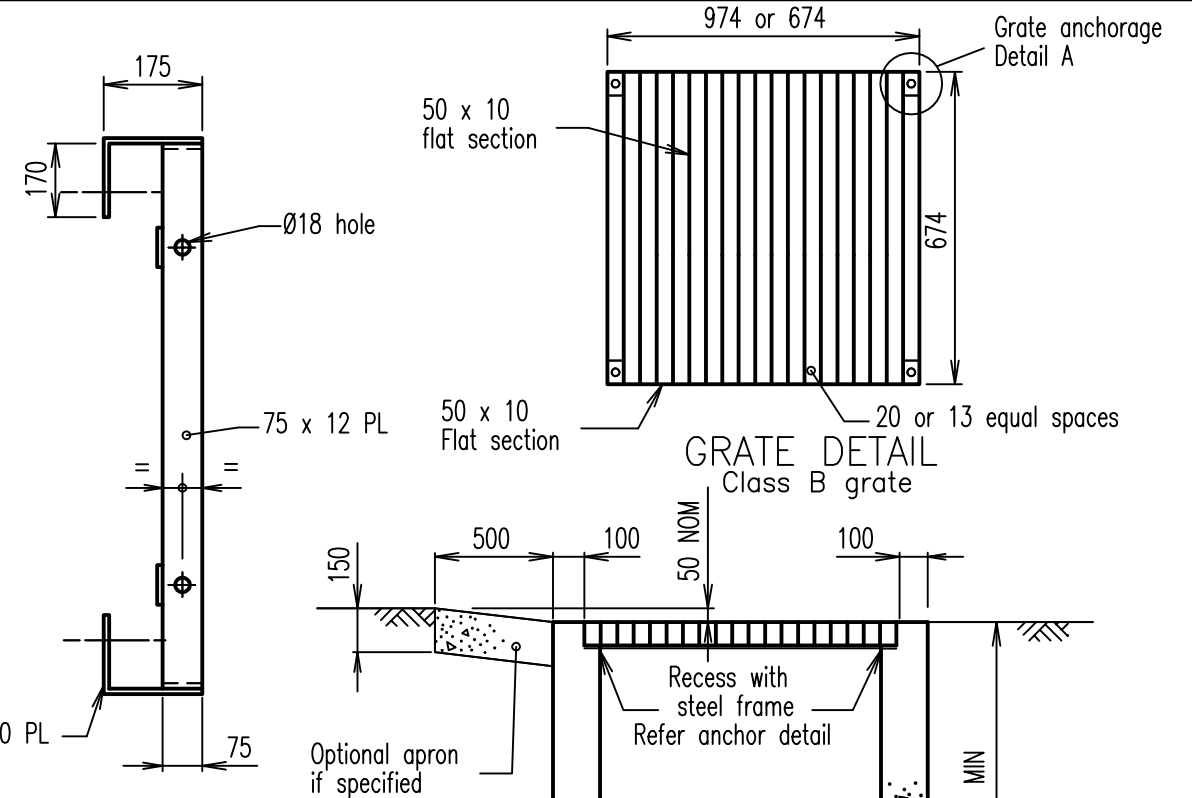
GRATE PLAN



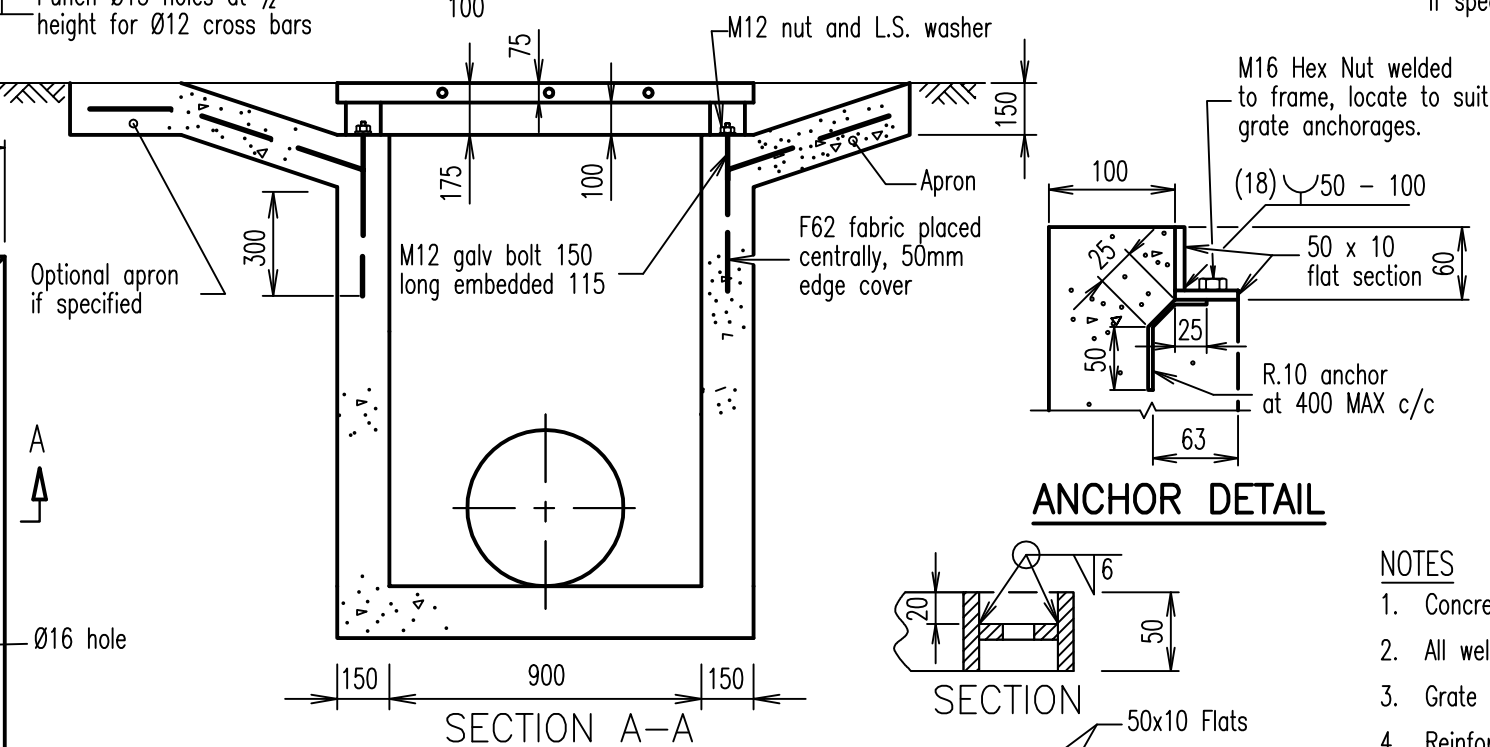
PLAN
Grate omitted for clarity



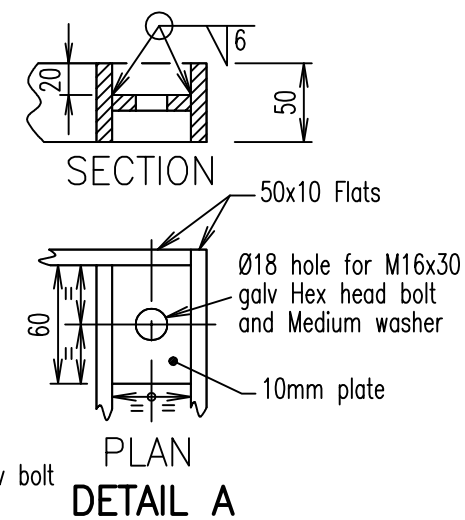
FRAME PLAN



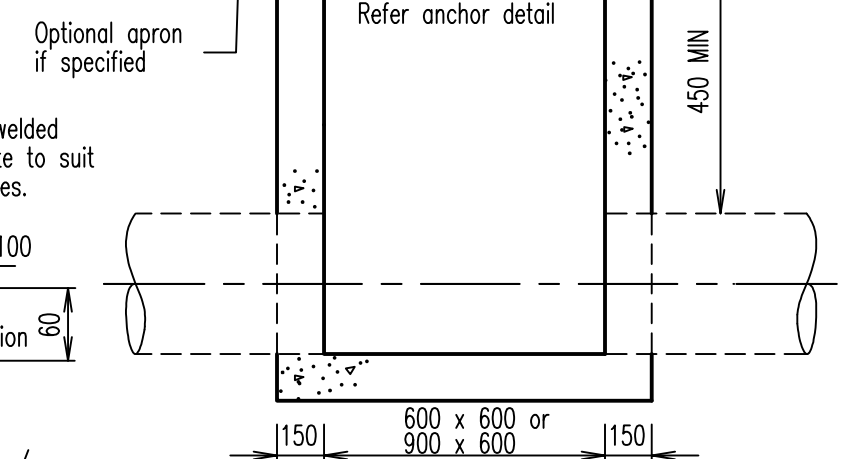
GRATE DETAIL
Class B grate



ANCHOR DETAIL



PLAN
DETAIL A



SECTION OF FIELD INLET TYPE 2

NOTES

1. Concrete N25 in accordance with AS 1379 and AS 3600.
2. All welds to AS 1554. All welding symbols to AS 1101.3.
3. Grate and frame to be hot dip galvanized after fabrication to AS 1650 .
4. Reinforcing bars Grade 250 to AS 1302.
5. All flats Grade 250 to AS 3678.
6. All angles Grade 250 to AS 3679.
7. Hexagonal head bolts to AS 1111.
Nuts to AS 1112.
Washers to AS 1237.
Galvanizing to AS 1214.
8. Class B grate to AS 3996 – grate in direction nominated, refer Project Drawings.
9. All dimensions in millimetres.

A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

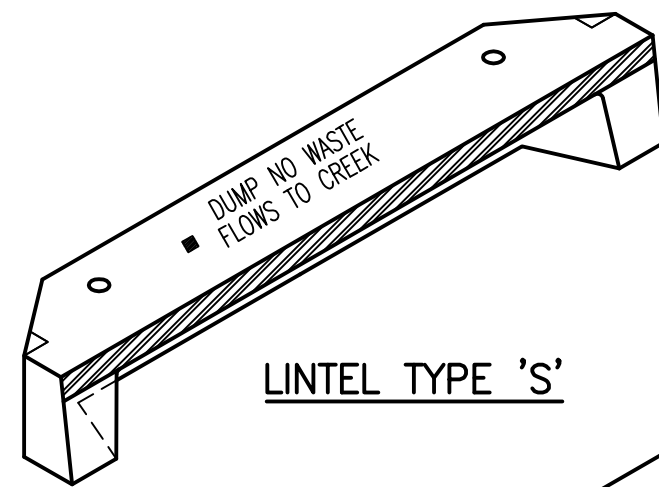
© INSTITUTE OF PUBLIC WORKS ENGINEERING
AUSTRALIA QUEENSLAND DIVISION INC. - 1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



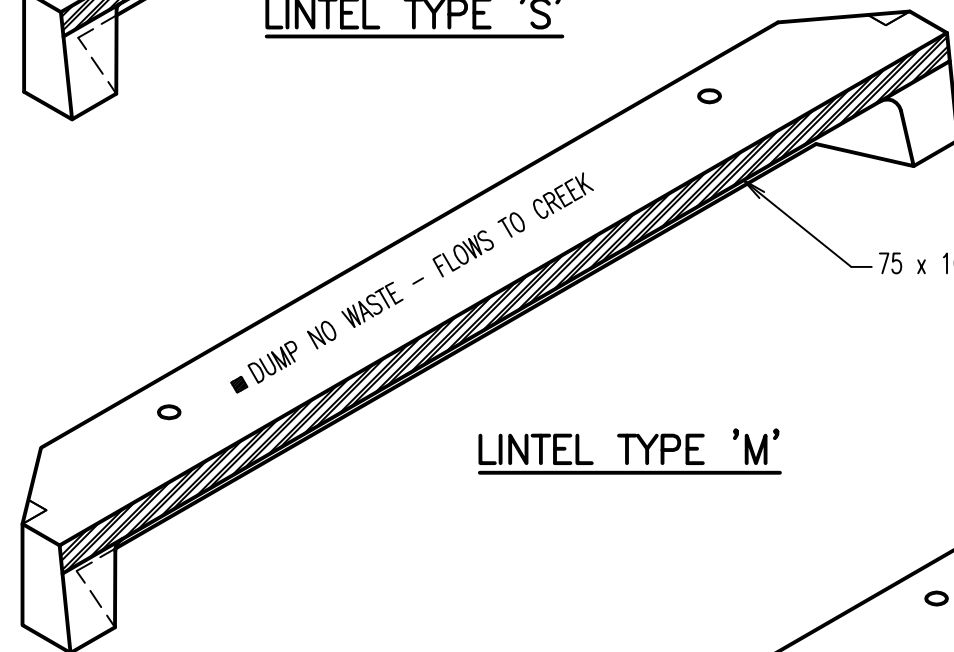
INSTITUTE OF
PUBLIC WORKS
ENGINEERING
AUSTRALIA
QUEENSLAND DIVISION INC.

FIELD INLET AND OVERFLOW GULLY TYPE 1 AND TYPE 2

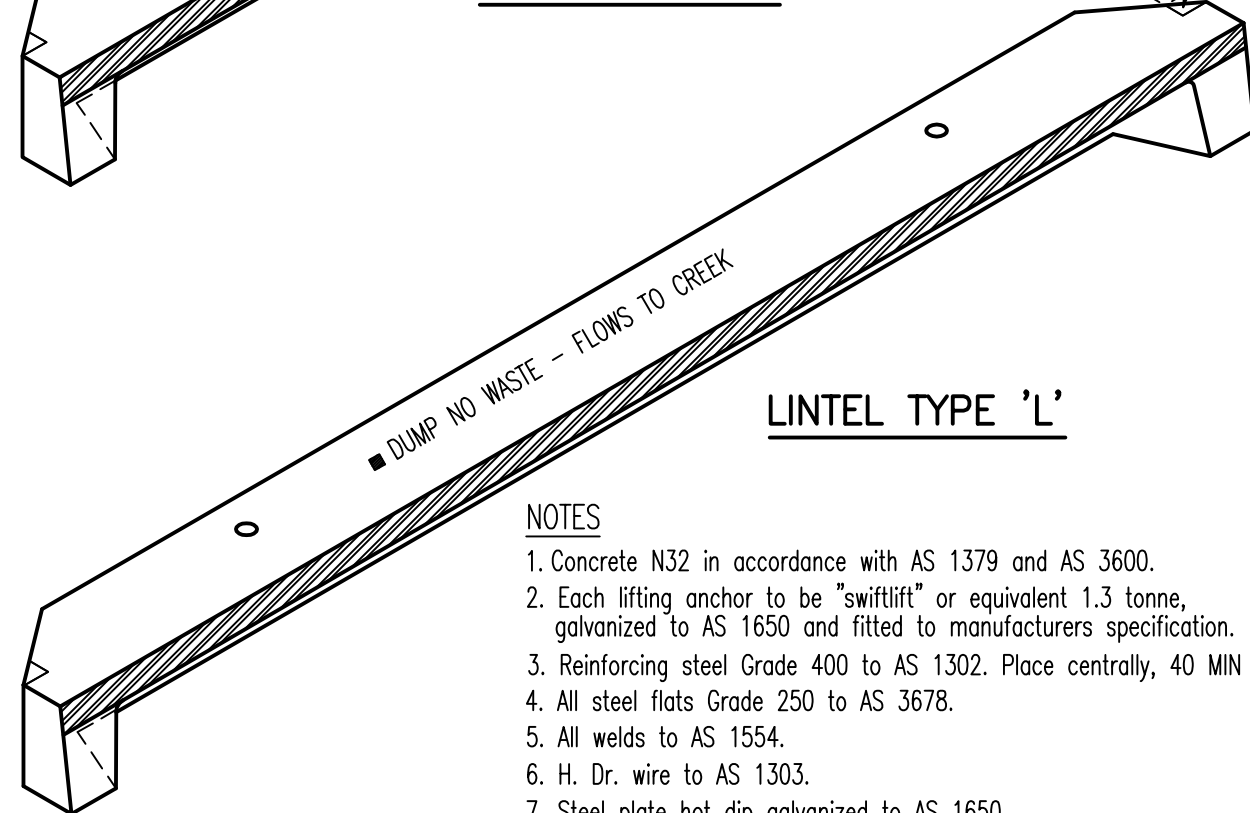
DRAINAGE
Standard
Drawing
D-0050



LINTEL TYPE 'S'



LINTEL TYPE 'M'



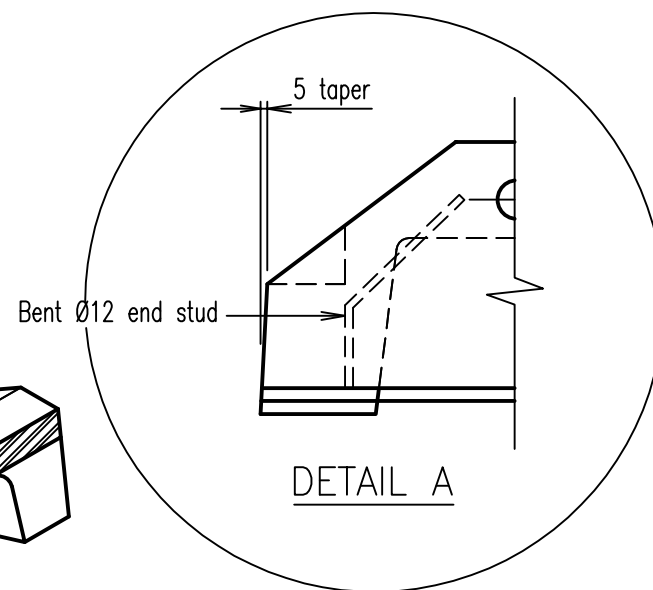
LINTEL TYPE 'L'

NOTES

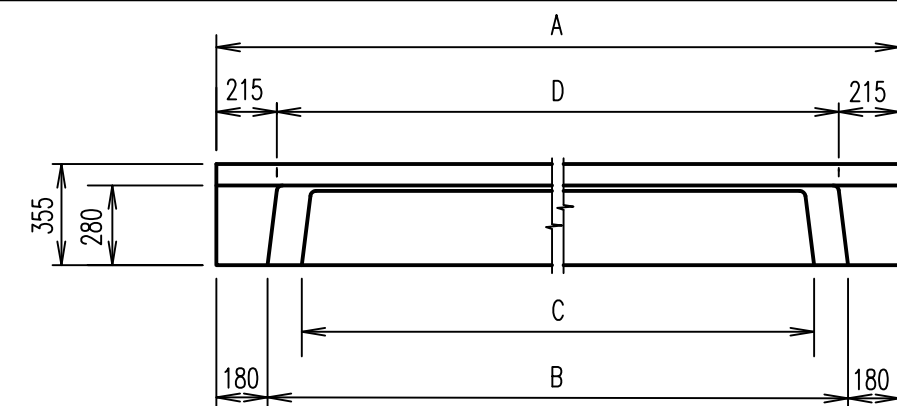
1. Concrete N32 in accordance with AS 1379 and AS 3600.
2. Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1650 and fitted to manufacturers specification.
3. Reinforcing steel Grade 400 to AS 1302. Place centrally, 40 MIN end cover.
4. All steel flats Grade 250 to AS 3678.
5. All welds to AS 1554.
6. H. Dr. wire to AS 1303.
7. Steel plate hot dip galvanized to AS 1650.
8. All dimensions in millimeters.

LEGEND

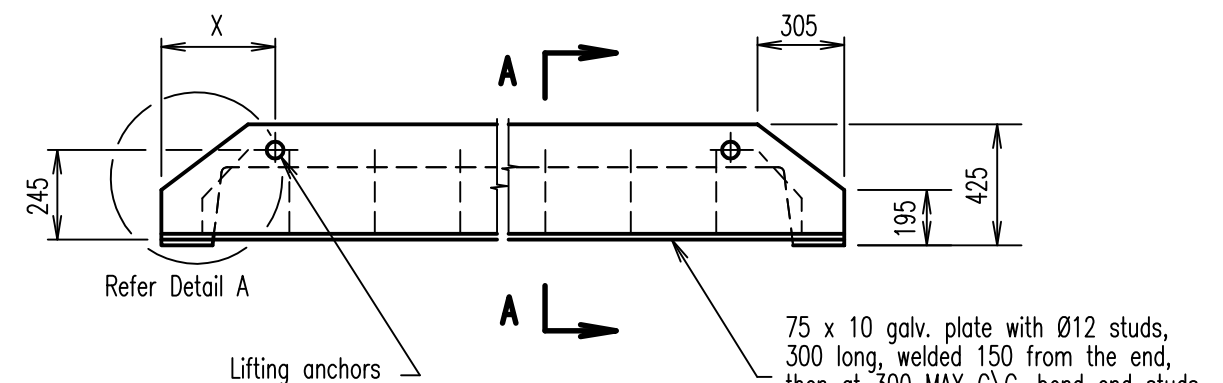
- Text 40mm high letters imprinted 5mm into concrete.



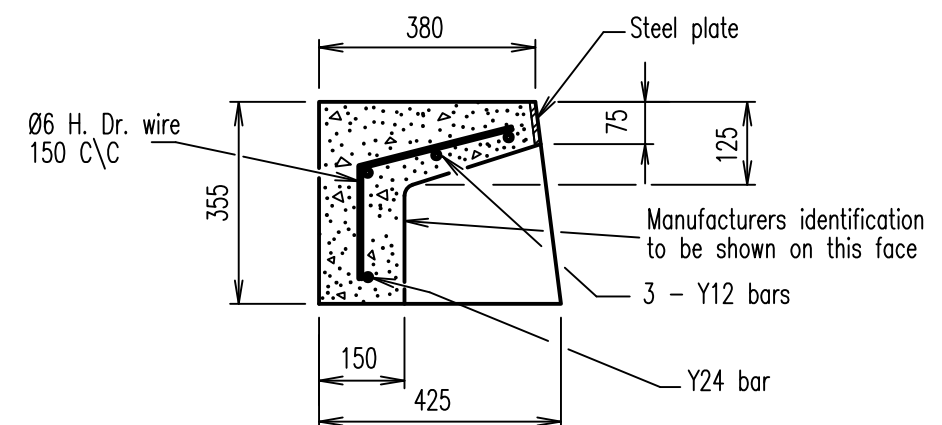
DETAIL A



ELEVATION



PLAN

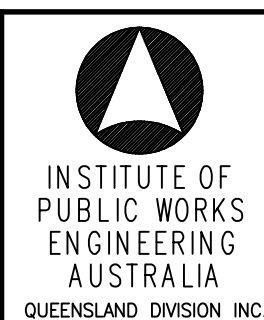


SECTION A-A

LINTEL	A	B	C	D	X	MASS (kg)
S	2400	2040	1800	1970	400	445
M	3600	3240	3000	3170	690	550
L	4800	4440	4200	4370	1000	725

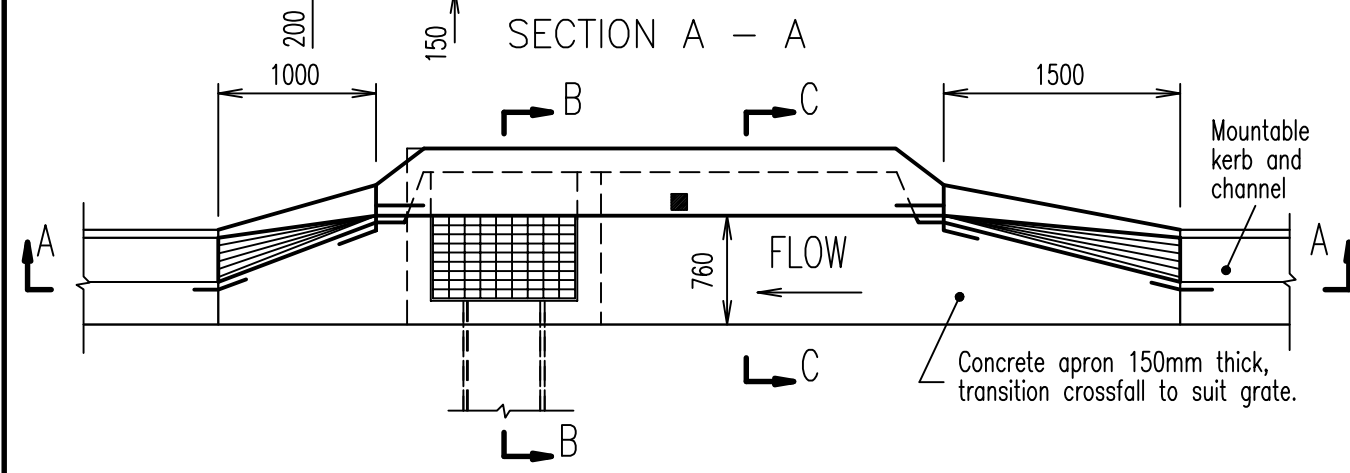
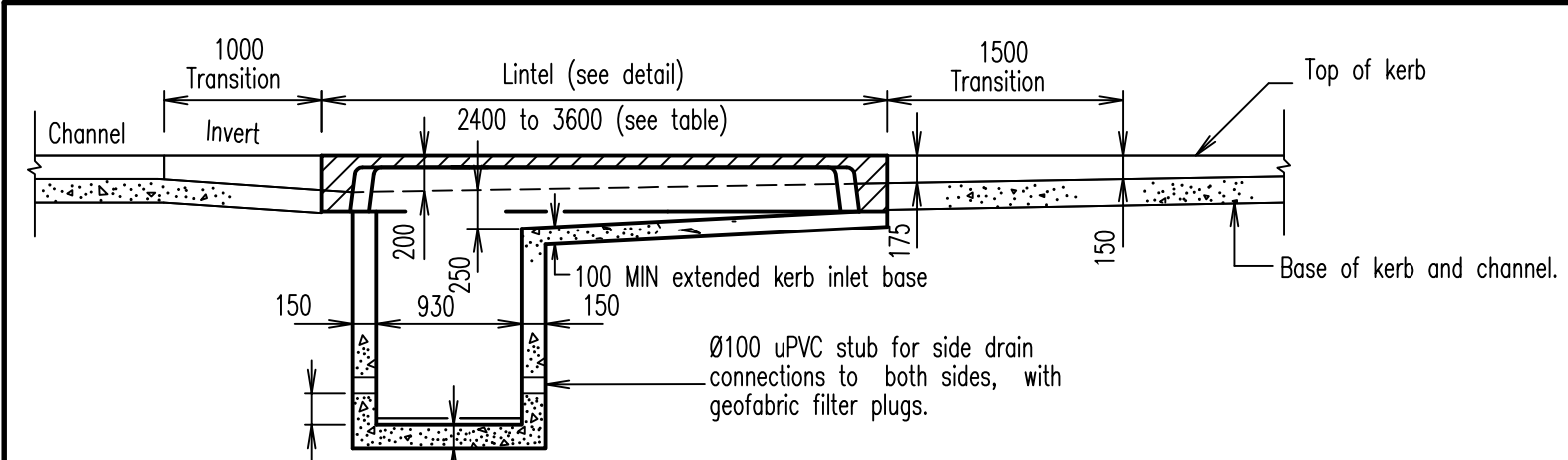
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.

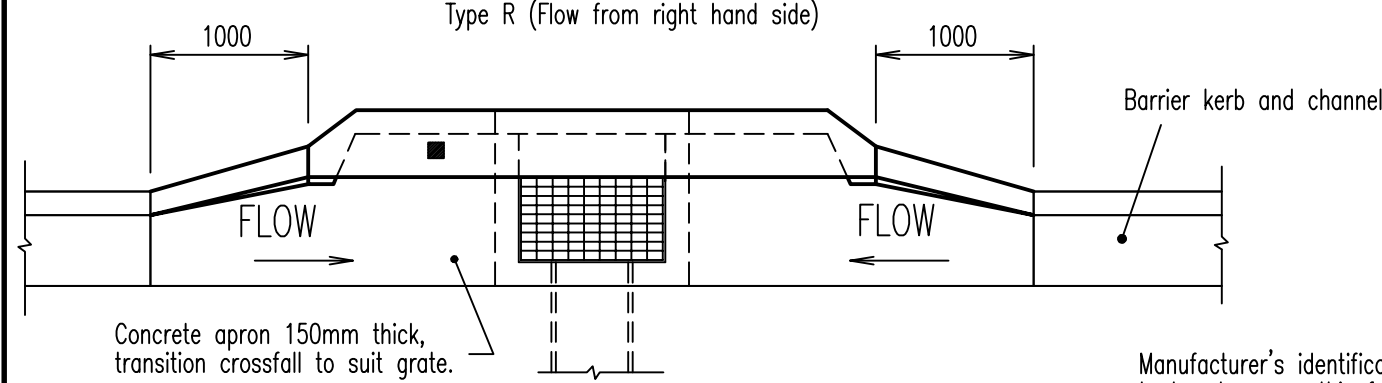


**GULLY – ROADWAY TYPE
 PRECAST LINTEL DETAILS
 KERB IN LINE**

**DRAINAGE
 Standard
 Drawing
 D-0061**



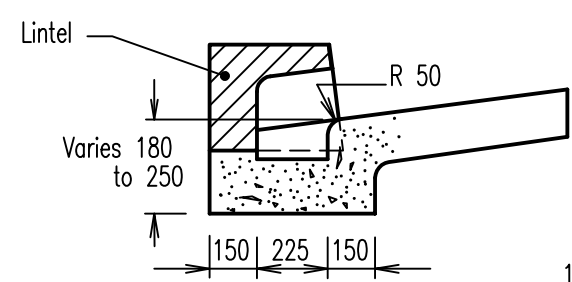
TYPICAL INLET ON GRADE
Type R (Flow from right hand side)



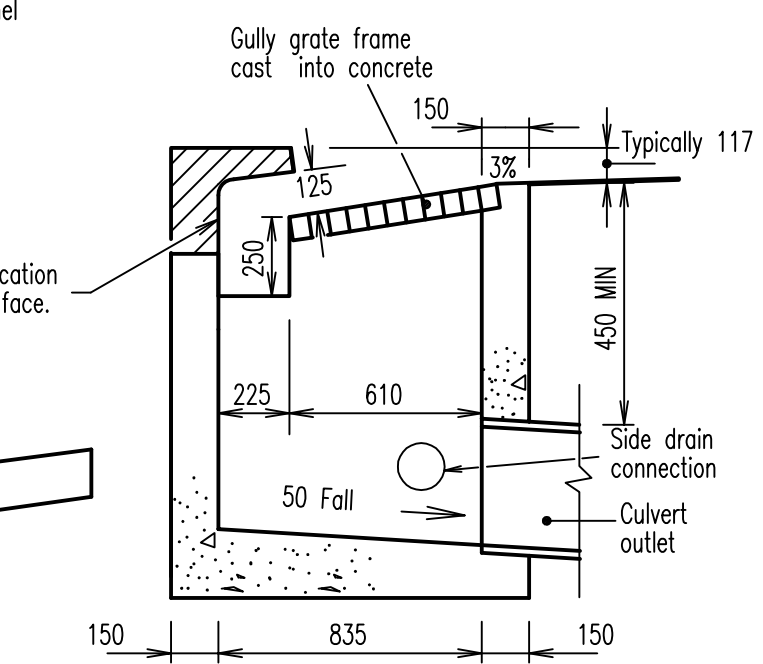
TYPICAL INLET IN SAG

LEGEND

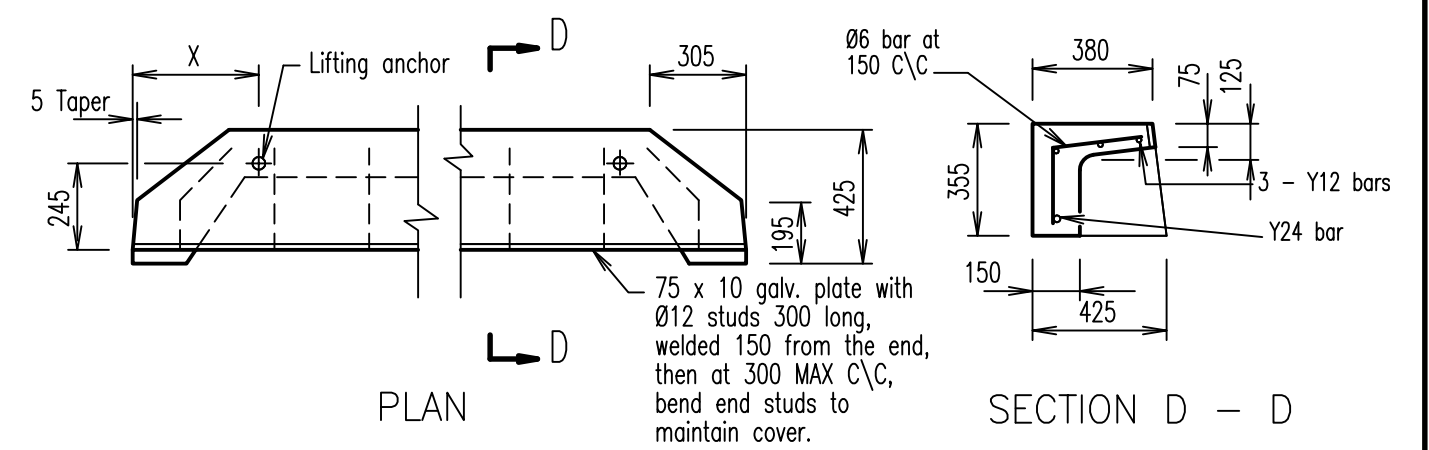
■ Text 'DUMP NO WASTE - FLOWS TO CREEK'
(40 high letters, imprinted 5 mm into concrete)



SECTION C - C



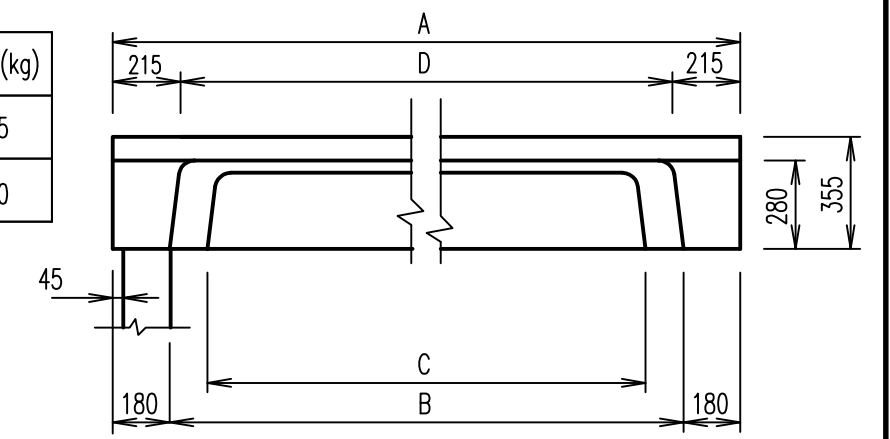
SECTION B - B



PLAN

SECTION D - D

TYPE	A	B	C	D	X	MASS(kg)
S	2400	2040	1800	1970	400	445
M	3600	3240	3000	3170	690	550



ELEVATION

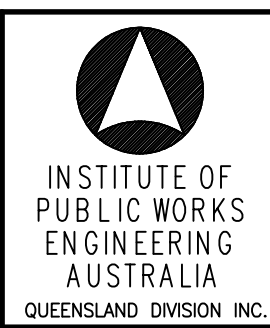
LINTEL

NOTES

1. The catchpit may be cast-in-situ or precast. This drawing indicates a cast-in-situ catchpit with a precast lintel.
2. Precast concrete N32 in accordance with AS 1379 and AS 3600.
3. Cast in-situ concrete N25 in accordance with AS 1379 and AS 3600.
4. Each lifting anchor to be "Swiftlift" or equivalent 1.3 tonne, galvanised to AS 1650 and fitted to manufacturer's specification.
5. Reinforcing bars Grade 400 to AS 1302, place centrally, 40 MIN end cover.
6. Refer Standard Drawing D-0062 for grate and frame details.
7. Grate and frame Class D to AS 3996. A locking device should be provided in accordance with clause 3.2.1.4 of AS 3996
8. Steel plate hot dip galvanized to AS 1650.
9. All dimensions in millimetres.

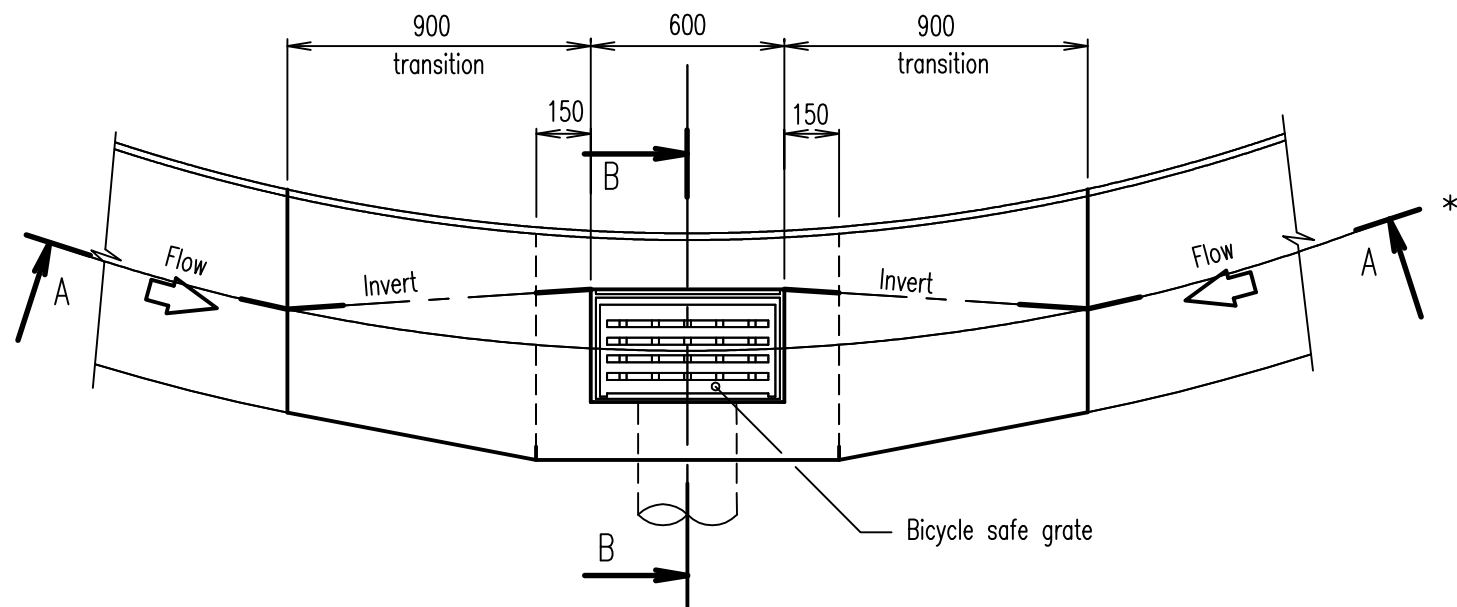
REVISIONS	DATE
C Title amended	5/7/00
B Part of Note 7 omitted	16/1/97
A ORIGINAL ISSUE	8/12/95

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.

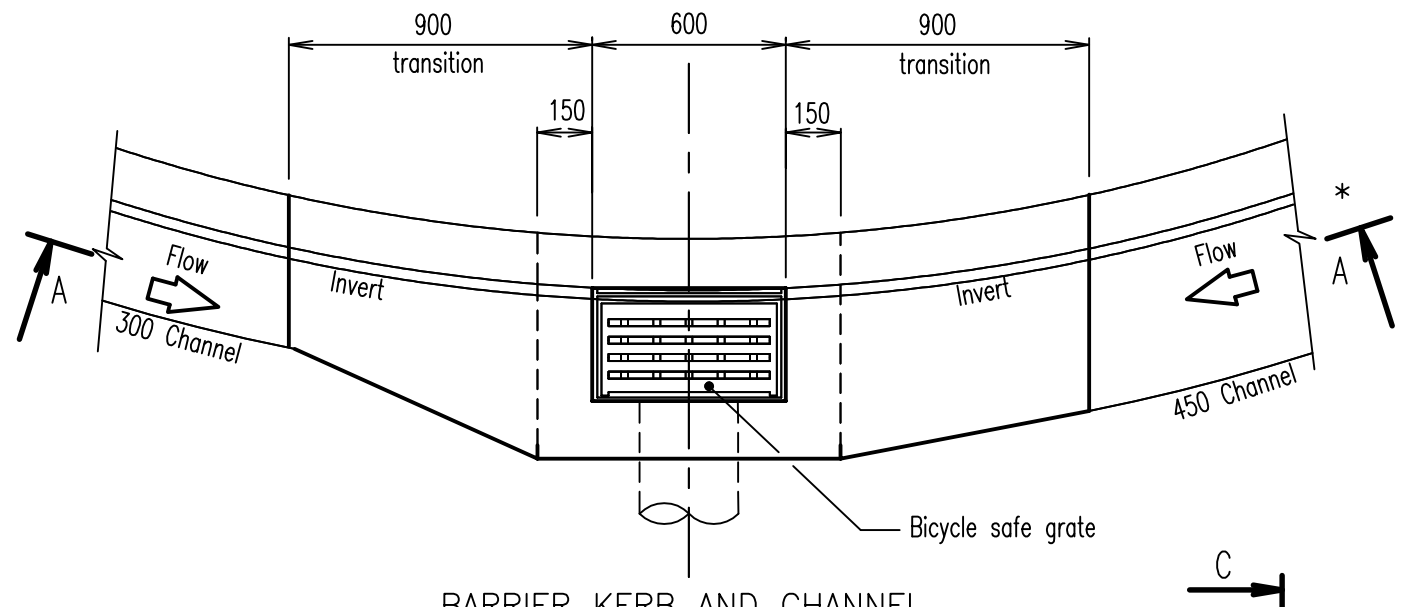


**GULLY - ROADWAY TYPE
GENERAL ARRANGEMENT
CHANNEL LIP IN LINE**

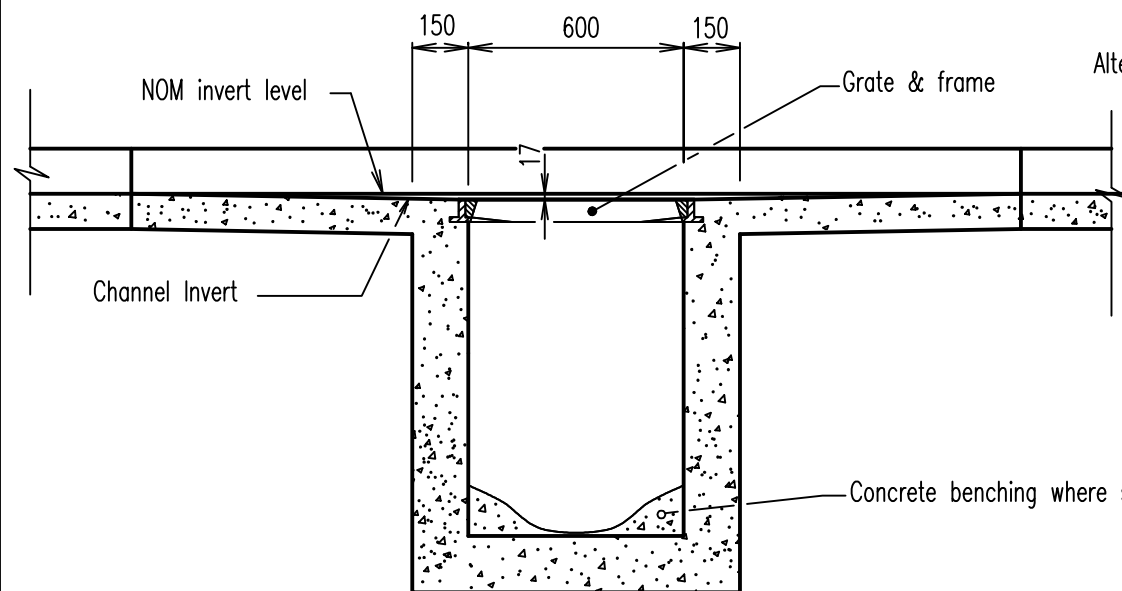
**DRAINAGE
Standard
Drawing
D-0063**



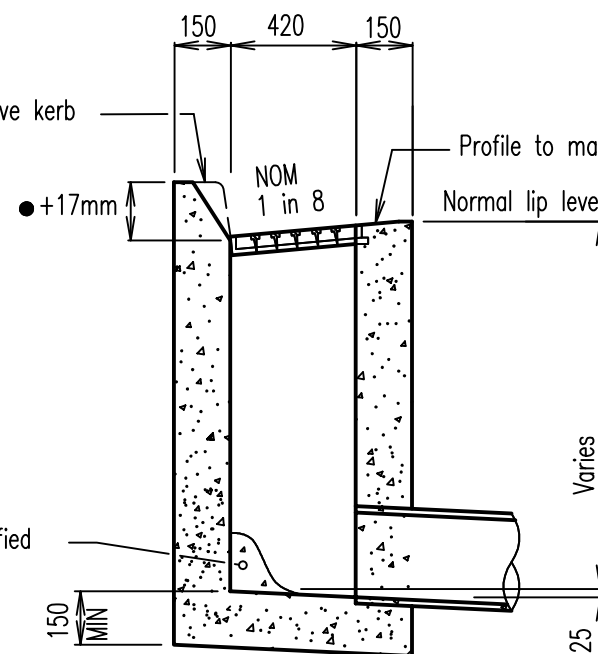
MOUNTABLE KERB AND CHANNEL
PLAN



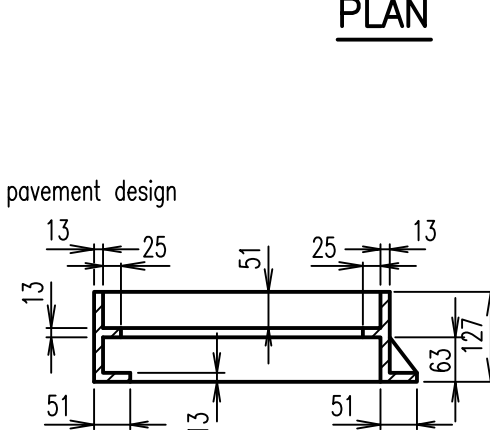
BARRIER KERB AND CHANNEL
PLAN



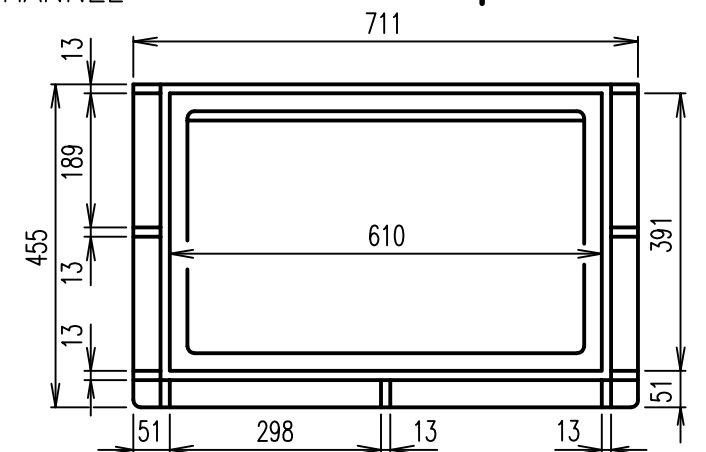
SECTION A - A



SECTION B - B



SECTION C-C



PLAN
**C.I. FRAME OR
FABRICATED GALV. STEEL**

NOTES

1. Dimensions of grate and frame may be varied subject to approval.
2. Design load for grate and frame shall be in accordance with AUSTRROADS Bridge Design Specification, W7 wheel load.
3. All grates bicycle safe to AS 3996.
4. Grate and frame, grey cast iron Grade \geq T220 to AS 1830 or alternatively fabricated steel Grade 250 to AS 3678 / 3679 and hot dip galvanized to AS 1650 may be used when approved.
5. Concrete : Benching N10, Structural N20 in accordance with AS 1379 and AS 3600.
6. Examples indicates M1 and B1 Kerb and channel types. Refer Standard Drawing R-0080, adjust for other alternatives.
7. Bitumen paint C.I. cover and frame to AS/NZS 3750.4.
8. An alternative precast concrete gully, kerb inlet, apron and pit surround may be provided subject to the approval of the superintendent. Refer Std. Dwg. D-0070 for basic dimensions.
9. Grate hinges and locking device must conform to AS 3996.
10. All dimensions in millimetres.

LEGEND

- * NOM kerb line
- NOMINAL kerb height, see note 6.

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. -1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



INSTITUTE OF
PUBLIC WORKS
ENGINEERING
AUSTRALIA
QUEENSLAND DIVISION INC.

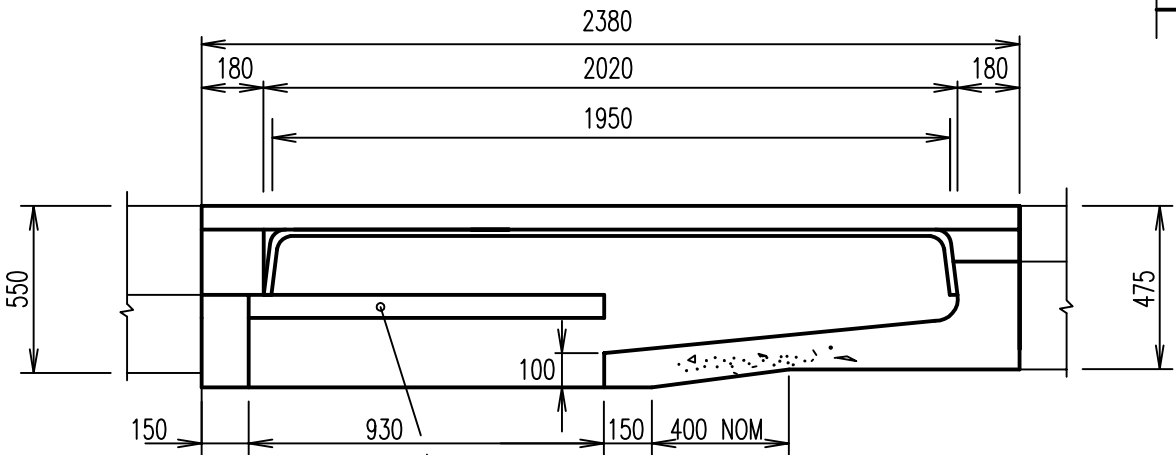
**GULLY - ANTI-PONDING
DEPRESSED 17mm**

**DRAINAGE
Standard
Drawing
D-0068**

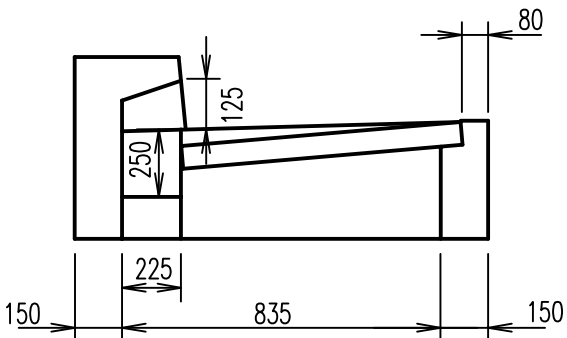
REVISIONS	DATE
B Note 8 added, Note 9 revised	16/1/97
A ORIGINAL ISSUE	8/12/95

COMPONENT	PRECAST GULLY
Proof Load	50 kN
Ultimate Load	75 kN

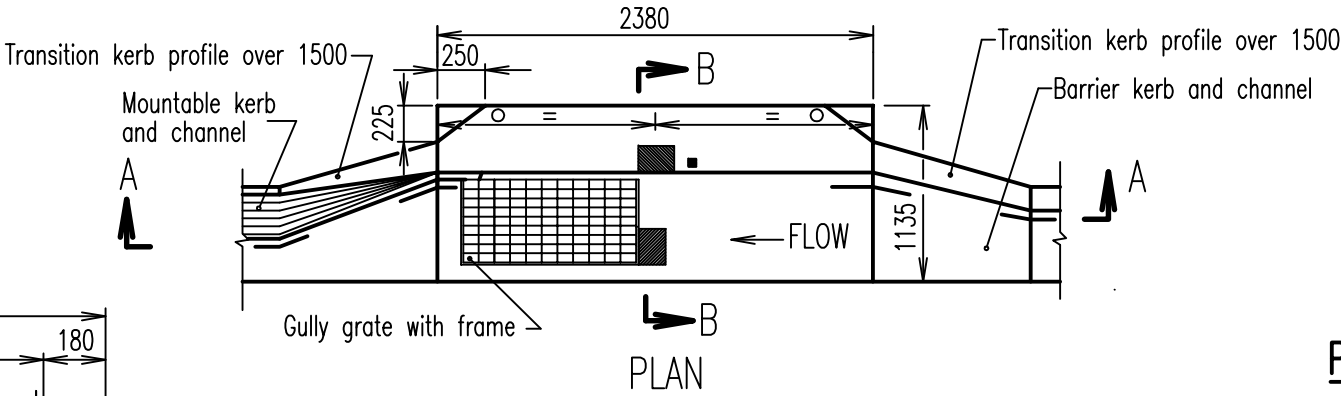
TABLE A
LOADING CRITERIA



SECTION A - A

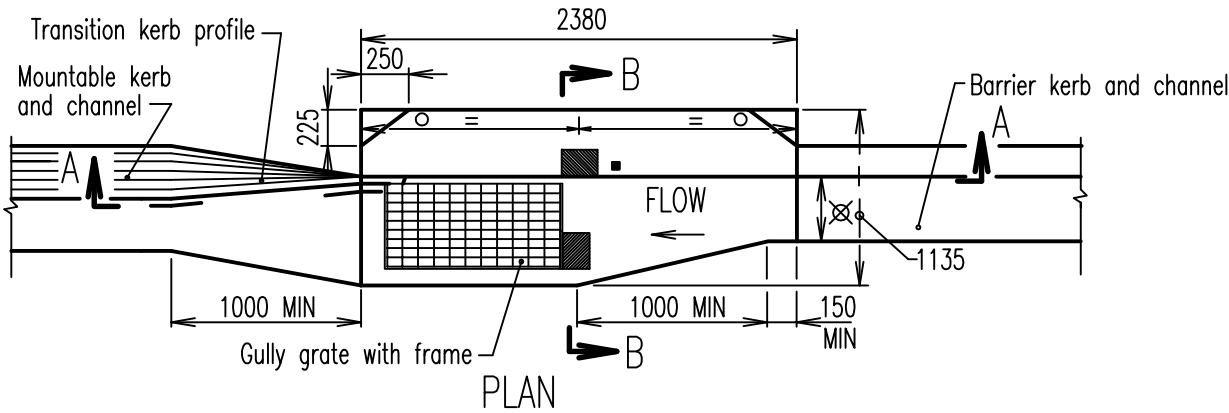


SECTION B-B



CHANNEL LIP IN LINE

Manufacture opposite hand for flow left to right

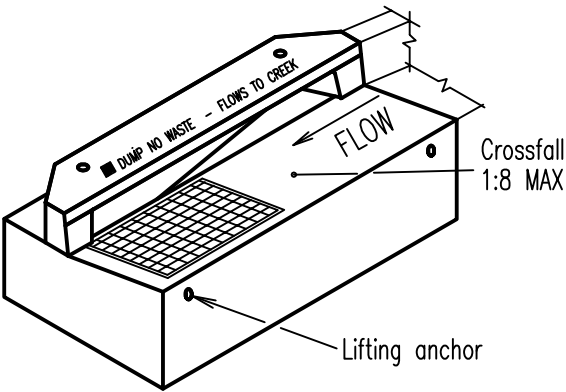


KERB IN LINE

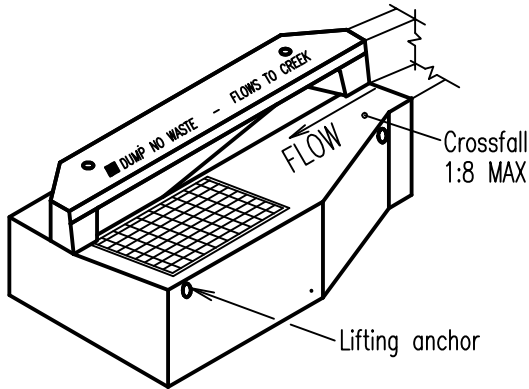
Manufacture opposite hand for flow left to right

LEGEND

- Text 'DUMP NO WASTE - FLOWS TO CREEK' (40mm high letters, imprinted 5mm into concrete.)
- Load test area (200 x 150), refer note 3.
- ⊗ Width of channel to suit project drawings/specifications



PERSPECTIVE VIEW - CHANNEL LIP IN LINE



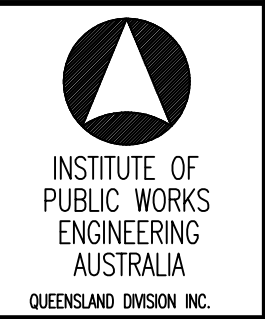
PERSPECTIVE VIEW - KERB IN LINE

NOTES

- Concrete N40 in accordance with AS 3902, Castings to AS 1830.
- Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1650 and fitted to manufacturers' specification.
- Reinforcement to AS 1302 shall be provided by the designer to obtain the strength required to pass the test criteria detailed on Std. Dwg. D-0066. The load detailed in Table A shall be applied to each location, separate tests at each location.
- All steel flats Grade 250 to AS 3678.
- All welds to AS 1554.
- H. Dr. wire to AS 1303.
- Steel plate hot dip galvanized to AS 1650.
- Grate and frame Class D to AS 3996.
- Grate frame to be cast into concrete.
- Refer Std. Dwg. D-0062 for grates and frame for sag location and D-0068 for anti-ponding location.
- Refer project drawings for layout of gully inlets.
- Precast concrete units and grate/frames must be approved by the Superintendent prior to use.
- Provide 10mm mortar (1 cement : 3 fine sand) joint between gully pit and precast units.
- All dimensions in millimeters.

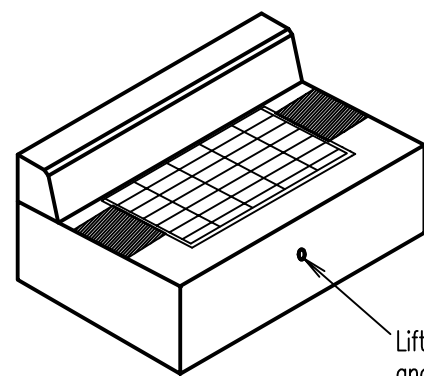
A	ORIGINAL ISSUE	8/12/95
	REVISIONS	DATE

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. - 1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



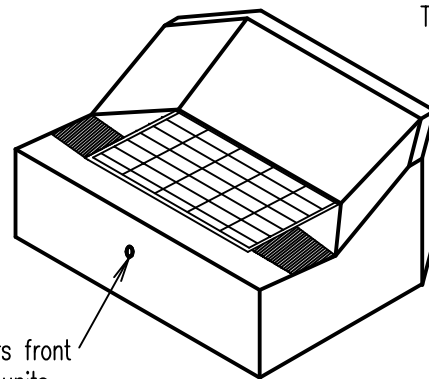
GULLY - ROADWAY TYPE
PRECAST UNITS
ON GRADE

DRAINAGE
Standard
Drawing
D-0069

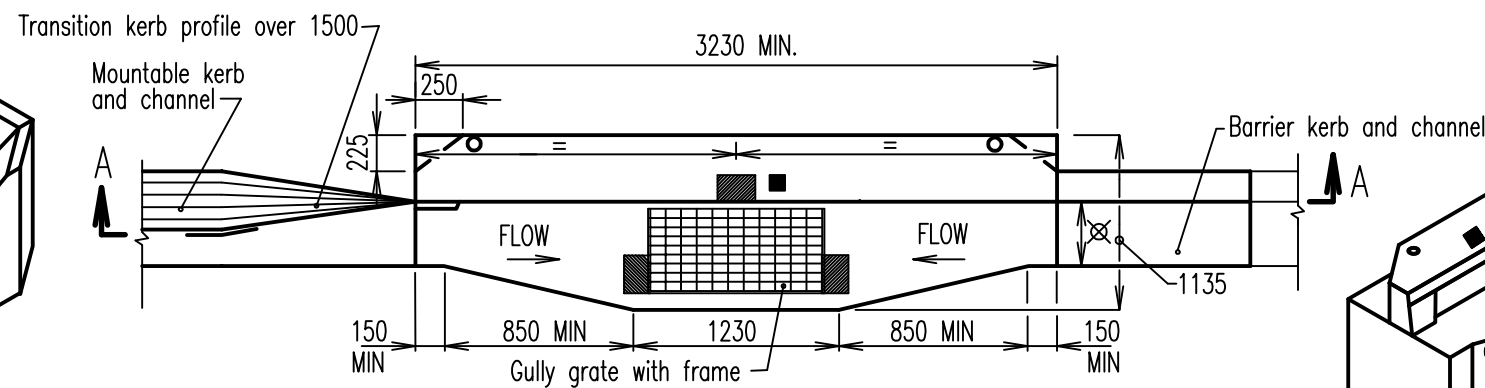


Lifting anchors front and back of units

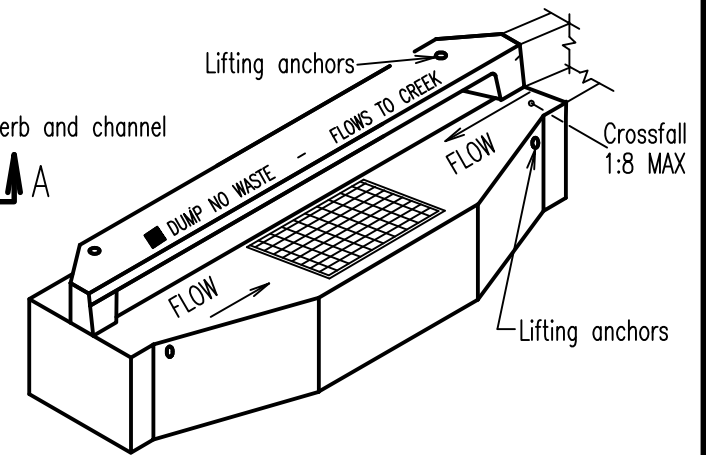
ISOMETRIC VIEW



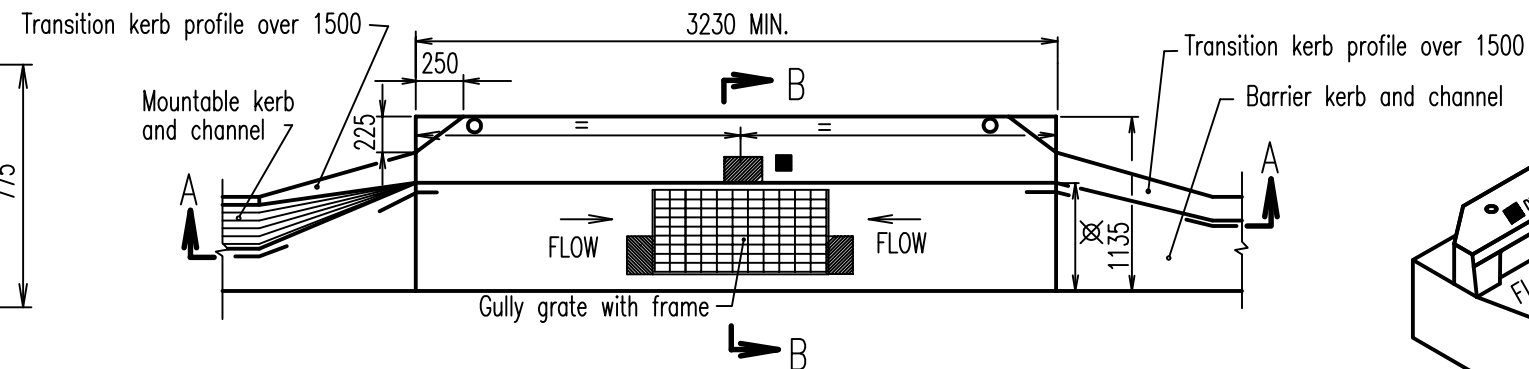
ISOMETRIC VIEW



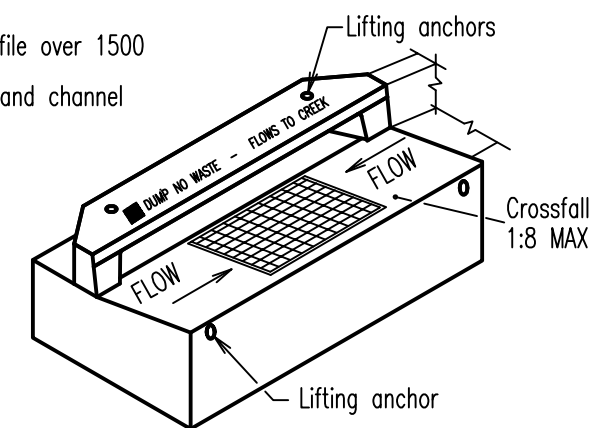
PLAN
KERB IN LINE



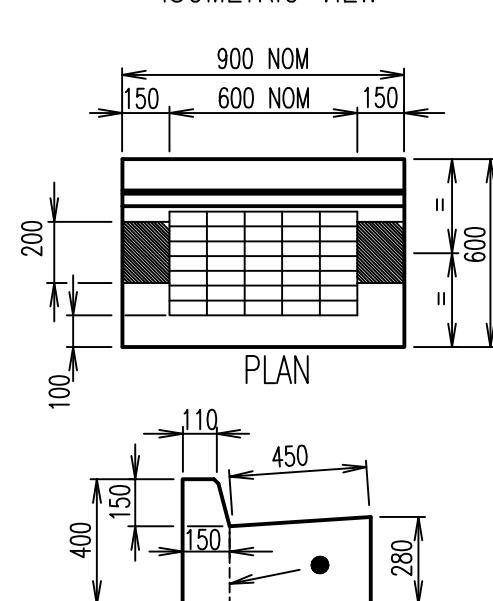
PERSPECTIVE VIEW - KERB IN LINE



PLAN
CHANNEL LIP IN LINE



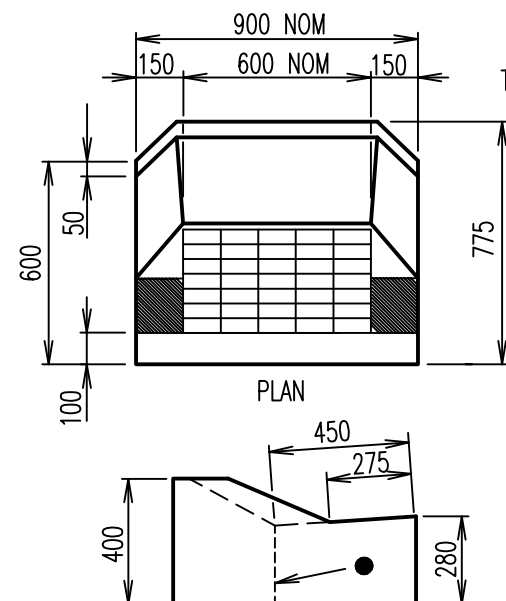
PERSPECTIVE VIEW - CHANNEL LIP IN LINE



PLAN

END ELEVATION

BARRIER KERB

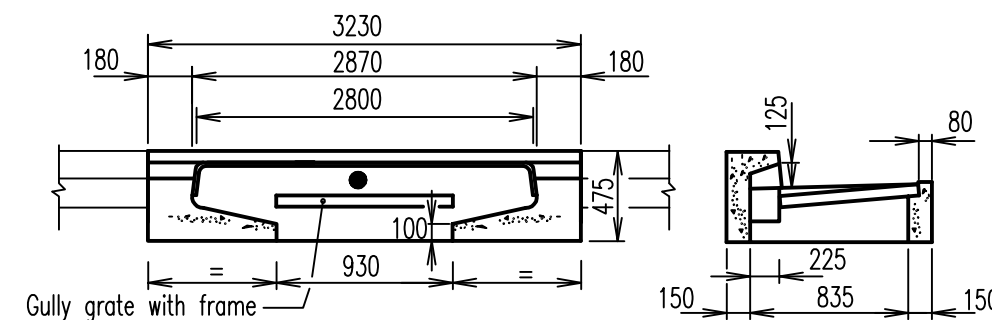


PLAN

END ELEVATION

MOUNTABLE KERB

ANTI-PONDING GULLIES



SECTION A - A

SECTION B-B

SAG GULLIES

COMPONENT	PRECAST GULLY
Proof Load	50 kN
Ultimate Load	75 kN

TABLE A
LOADING CRITERIA

LEGEND

- Text 'DUMP NO WASTE - FLOWS TO CREEK' (40mm high letters, imprinted 5mm into concrete.)
- Load test area (200 x 150), refer note 3.
- ⊗ Width of channel to suit project drawings/specifications
- Manufacturers' identification to be shown on this face.

NOTES

- Concrete N40 in accordance with AS 3902, Castings to AS 1830.
- Each lifting anchor to be "swiftlift" or equivalent 1.3 tonne, galvanized to AS 1650 and fitted to manufacturers' specification.
- Reinforcement to AS 1302 shall be provided by the designer to obtain the strength required to pass the test criteria detailed on Std. Dwg. D-0066. The load detailed in Table A shall be applied to each location, separate tests at each location.
- All steel flats Grade 250 to AS 3678.
- All welds to AS 1554.
- H. Dr. wire to AS 1303.
- Steel plate hot dip galvanized to AS 1650.
- Grate and frame Class D to AS 3996.
- Grate frame to be cast into concrete.
- Refer Std. Dwg. D-0062 for grates and frame for sag location and D-0068 for anti-ponding location.
- Refer project drawings for layout of gully inlets.
- Precast concrete units and grate/frames must be approved by the Superintendent prior to use.
- Provide 10mm mortar (1 cement : 3 fine sand) joint between gully pit and precast units.
- All dimensions in millimeters.

© INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA QUEENSLAND DIVISION INC. - 1995
DISCLAIMER. The authors and sponsoring organisations shall have no liability or responsibility to the user or any other person or entity with respect to any liability, loss or damage caused or alleged to be caused, directly or indirectly, by the adoption and use of these Standard Drawings including, but not limited to, any interruption of service, loss of business or anticipatory profits, or consequential damages resulting from the use of these Standard Drawings. Persons must not rely on these Standard Drawings as the equivalent of, or a substitute for, project-specific design and assessment by an appropriately qualified professional.



INSTITUTE OF
PUBLIC WORKS
ENGINEERING
AUSTRALIA
QUEENSLAND DIVISION INC.

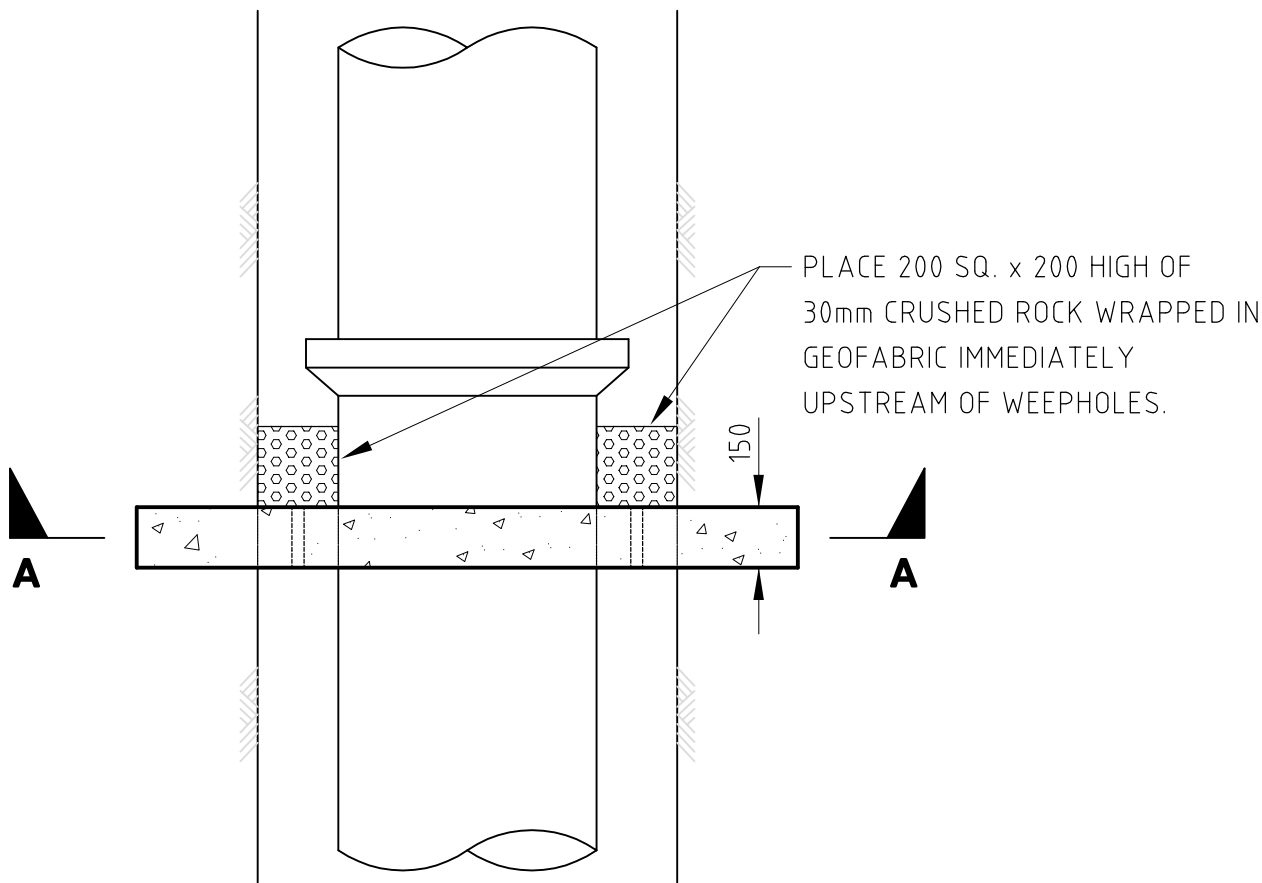
**GULLY - ROADWAY TYPE
PRECAST UNITS
SAG AND ANTI-PONDING**

**DRAINAGE
Standard
Drawing
D-0070**

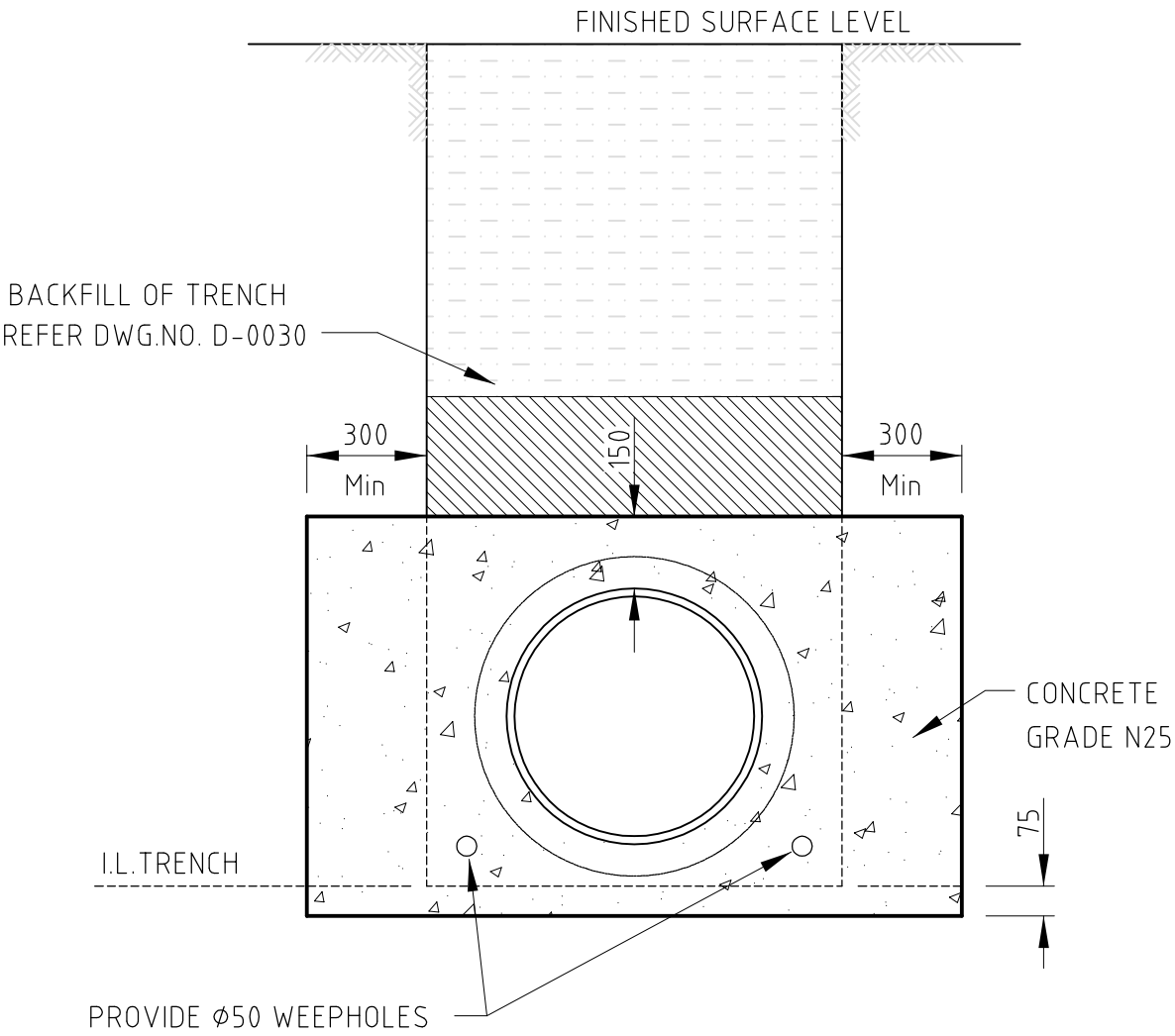
A	ORIGINAL ISSUE	16/1/97
	REVISIONS	DATE

NOTES:

1. CONCRETE BULKHEADS TO BE LOCATED AT MAXIMUM INTERVALS OF 10m WHERE PIPE GRADES EXCEED 15%.
2. WHERE SPECIFIED SCOUR BULKHEADS TO EXTEND TO THE TOP OF THE TRENCH.



PLAN



SECTION A-A

						REDCLIFFE CITY COUNCIL		SURVEY:		A3		DATUM: A.H.D.		<div>REDCLIFFE</div> <div></div> <div>CITY COUNCIL</div>		IRENE STREET REDCLIFFE PO BOX 66, REDCLIFFE QLD 4020 PHONE: (07) 3283 0233 FAX: (07) 3883 1723 WEB SITE: www.redcliffe.qld.gov.au		RCC STANDARD DRAWINGS – DRAINAGE		<div></div> <div>DERIVED FROM IPWEAQ STANDARD DRAWINGS</div>		DATE: 16.05.06			
				Copyright in the whole and every part of this drawing belongs to Redcliffe City Council and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or on any media, to any person other than by agreement with Redcliffe City Council.		DESIGNED:		CHECKED:		DRAWING No:															
				This document is produced by Redcliffe City Council solely for the benefit of and use by RCC in accordance with the terms of the register. Redcliffe City Council does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.		RECOMMENDED:		APPROVED:		D-0085		A													
A	DATE	ORIGINAL ISSUE		REVISIONS		REC.	APPR.																		



- ## **NOTES:**
1. PIPE DETAILS ARE AS FOLLOWS:
 - (a) 375 TO 750 DIA. – FRCP CLASS 2. 'SUPERTITE' JOINTS
 - (b) GREATER THAN 750 DIA. – RCP CLASS 2. RRJ & SWCH.D.P.E. MAY BE SUBSTITUTED AS DIRECTED BY THE SUPERINTENDENT
 2. TO MINIMISE VISUAL IMPACT THE PIPE GRADING IS TO FOLLOW THE FINAL BEACH PROFILE
 3. MARKER POST TO COMPLY WITH THE FOLLOWING:
 - (a) MINIMUM $\phi 150$ UPVC PIPE INFILLED WITH CONCRETE
 - (b) PAINTED APPROVED YELLOW
 - (c) EXTEND 1.0m ABOVE MEAN HIGH WATER LEVEL (MHW)
 - (d) A BAND OF APPROVED YELLOW REFLECTIVE TAPE TO BE PLACED AROUND EXPOSED TOP OF PIPE (NOMINAL 25 WIDTH)
 4. MINIMUM COVER TO REINFORCEMENT TO BE 50
 5. ALL CONCRETE TO BE GRADE S40 FIBREMESH, (POLYPROPYLENE FIBRE TO BE ADDED) AT NOT LESS THAN 0.90kg/m^3 .
 6. ALL CONCRETE EDGES TO HAVE MIN 25 RADIUS, NO SQUARE EDGES PERMITTED.
 7. PIER/CRADLE TO BE DESIGNED AND APPROVED BY COUNCIL.
 8. DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE SHOWN

PIPE ϕ	x
300-450	350
525-600	400
675-750	500
825-900	600

				REDCLIFFE CITY COUNCIL Copyright in the whole and every part of this drawing belongs to Redcliffe City Council and may not be used, sold, transferred, copied or reproduced in whole or in part in any manner or form or on any media, to any person other than by agreement with Redcliffe City Council.		SURVEY: DESIGNED:		A3 DATUM: A.H.D.		<div>REDCLIFFE</div> <div></div> <div>CITY COUNCIL</div>		RCC STANDARD DRAWINGS – DRAINAGE		<div></div> <div>DERIVED FROM PWEAQ STANDARD DRAWINGS</div>		DATE: 16.05.06			
				This document is produced by Redcliffe City Council solely for the benefit of and use by RCC in accordance with the terms of the reseller. Redcliffe City Council does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by third party on the content of this document.		RECOMMENDED:		CHECKED: APPROVED:		IRENE STREET REDCLIFFE PO BOX 66, REDCLIFFE QLD 4020 PHONE: (07) 3283 0233 FAX: (07) 3883 1723 WEB SITE: www.redcliffe.qld.gov.au		GULLY STORMWATER OUTLET				D-0086		A	
A Rev.		DATE		ORIGINAL ISSUE		REVISIONS		REC.		APPR.									

- NOTES: 1. CONTRACTION JOINTS are to be provided where (a) the length of the base slab and/or (b) the width of the base slab exceeds 20m. When contraction joints are required across the width of the base slab, they are to be located at 1/4 span points of the culvert cell. Contraction joints across the width of the base slab are to be continued across the aprons. A minimum of 24 hours is to be allowed prior to the placement of adjacent concrete.
2. EXPANSION PIERS must be provided such that the maximum number of spans without an expansion pier is five.
3. CONTRACTION JOINTS - where the length between kerbs of a culvert exceeds 20m, a contraction joint will be provided in the abutments and piers. The contraction joint is not to be extended into the base slab. Mesh shall be terminated on either side of the contraction joint with the required cover. A minimum of 24 hours is to be allocated prior to the placement of adjacent concrete and the exposed face is to be coated with bitumen. The same joint treatment is to be provided at the wing-to-abutment joint.
4. APRONS - if aprons are specified, they shall be nominally between ends of wings as drawn. Any extended or reduced length will be shown on the drawings. Cut-off walls may be relocated from the end of the culvert floor to the end of the apron.
5. ABUTMENT WIDTH B - culverts with fill shall have the deck set on the same cross slope as the base so that H is constant over the length of the abutment. For culverts with no fill, the slope of deck and base may differ so that H is not constant. In such cases the abutment width B is to be constant at $H \max./6 + 250$.

3. AGGRESSIVE ENVIRONMENT – where applicable will be shown elsewhere in the documents. Dimensions, cover and concrete grade shown in brackets are for aggressive environment.
4. CONCRETE – reinforced concrete grade S32/20 (S50/20) (floor, type 3 apron, abutments and piers). Unreinforced concrete grade N20/20 (wings and cut-off walls).
5. STEEL – bar reinforcement to be grade D500N to AS/NZS 4671.
6. OVERLAPS – where 4 sheets overlap, cut across wires to limit build-up in thickness of mesh.
Laps in reinforcing mesh:
210 for 6 dia. wire 280 for 8 dia. wire 350 for 10 dia. wire
7. WEEPHOLES – 90 dia. with a 300x300x150 no fines concrete block or approved equivalent at each weephole. Alternatively a sheet filter drain may be used over the back face of the abutments and wings. Backfill used with sheet filter drain is to be earthworks material unless specified otherwise in the documents.
8. HEIGHT OF FILL – maximum height of fill over deck is 2500.
9. DESIGN LOADING – design loading W7, T44 and HLP320.
10. DETAILS TO BE GIVEN ELSEWHERE IN THE DOCUMENTS –
Apron type. Apron cut-off walls D/S and/or U/S. Skew angle.
Apron depth if type 2. Wing type, W1–W2 dimensions.
11. DIMENSIONS are in millimetres unless shown otherwise.

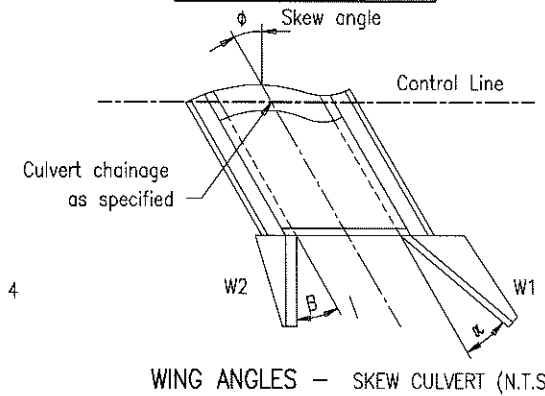
NOTE:

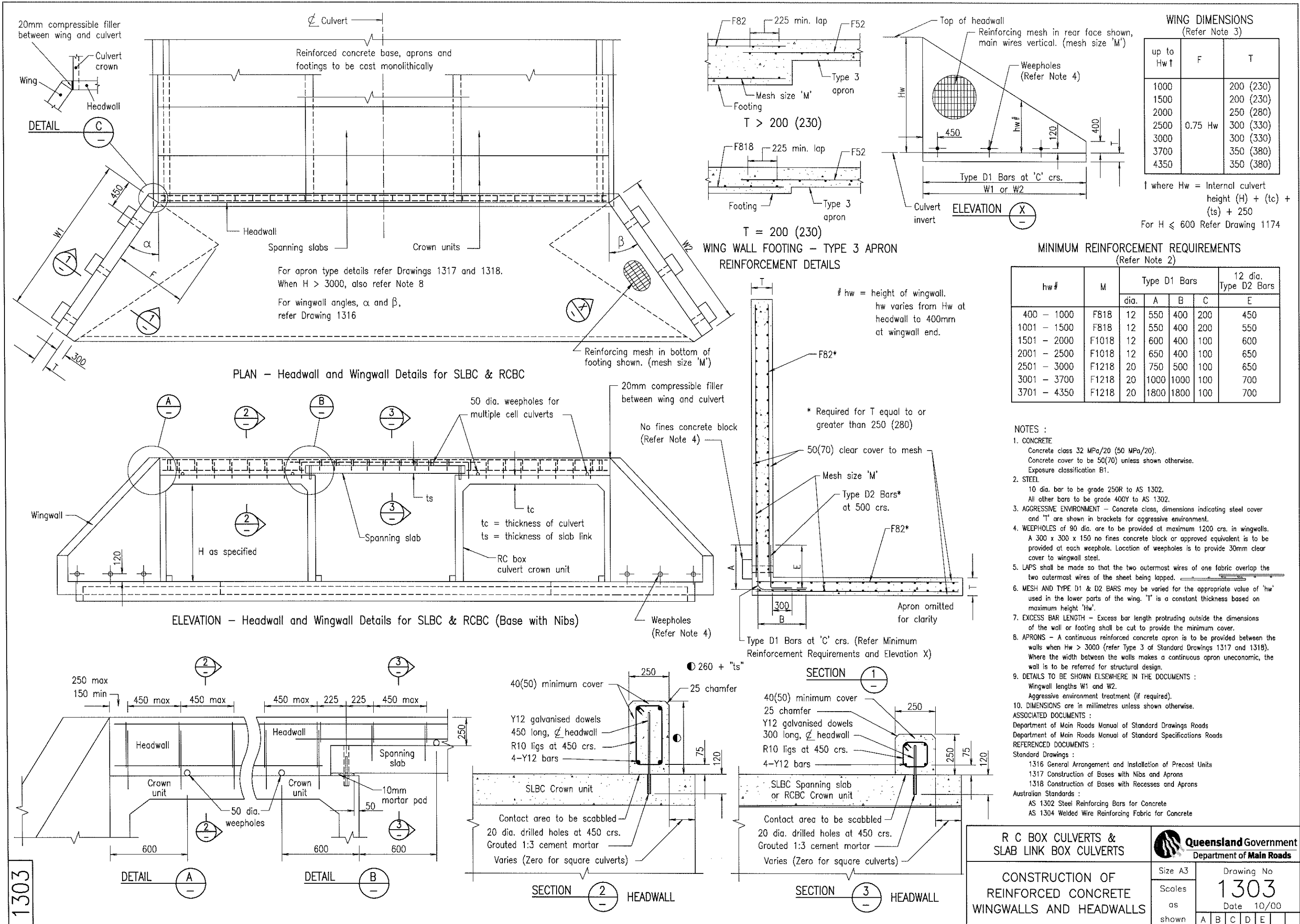
For culverts with a base $> 10\text{m}$ along road centreline, this design should not be used in:-

- Highly reactive or expansive clay soils (linear shrinkage $> 8\%$)
- Where large differential settlements are expected to occur

Specialist design advice should be obtained in these circumstances.

Skew angle ϕ	Wing angle	
	α	β
0 - 10	30	30
11 - 20	25	30
21 - 30	20	30
31 - 45	15	30





WING DIMENSIONS (Refer Note 3)		
up to Hw†	F	T
1000	0.75 Hw	200 (230)
1500		200 (230)
2000		250 (280)
2500		300 (330)
3000		300 (330)
3700		350 (380)
4350		350 (380)

† where Hw = Internal culvert height (H) + (tc) + (ts) + 250
For H ≤ 600 Refer Drawing 1174

MINIMUM REINFORCEMENT REQUIREMENTS
(Refer Note 2)

hw#	M	Type D1 Bars				12 dia. Type D2 Bars
		dia.	A	B	C	E
400 – 1000	F818	12	550	400	200	450
1001 – 1500	F818	12	550	400	200	550
1501 – 2000	F1018	12	600	400	100	600
2001 – 2500	F1018	12	650	400	100	650
2501 – 3000	F1218	20	750	500	100	650
3001 – 3700	F1218	20	1000	1000	100	700
3701 – 4350	F1218	20	1800	1800	100	700

- NOTES :
- CONCRETE
Concrete class 32 MPa/20 (50 MPa/20).
Concrete cover to be 50(70) unless shown otherwise.
Exposure classification B1.
 - STEEL
10 dia. bar to be grade 250R to AS 1302.
All other bars to be grade 400Y to AS 1302.
 - AGGRESSIVE ENVIRONMENT – Concrete class, dimensions indicating steel cover and 'T' are shown in brackets for aggressive environment.
 - WEEPHOLES of 90 dia. are to be provided at maximum 1200 crs. in wingwalls. A 300 x 300 x 150 no fines concrete block or approved equivalent is to be provided at each weephole. Location of weepholes is to provide 30mm clear cover to wingwall steel.
 - LAPS shall be made so that the two outermost wires of one fabric overlap the two outermost wires of the sheet being lapped.
 - MESH AND TYPE D1 & D2 BARS may be varied for the appropriate value of 'hw' used in the lower parts of the wing. 'T' is a constant thickness based on maximum height 'Hw'.
 - EXCESS BAR LENGTH – Excess bar length protruding outside the dimensions of the wall or footing shall be cut to provide the minimum cover.
 - APRONS – A continuous reinforced concrete apron is to be provided between the walls when Hw > 3000 (refer Type 3 of Standard Drawings 1317 and 1318). Where the width between the walls makes a continuous apron uneconomic, the wall is to be referred for structural design.
 - DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Wingwall lengths W1 and W2.
Aggressive environment treatment (if required).
 - DIMENSIONS are in millimetres unless shown otherwise.
- ASSOCIATED DOCUMENTS :
Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads
- REFERENCED DOCUMENTS :
Standard Drawings :
1316 General Arrangement and Installation of Precast Units
1317 Construction of Bases with Nibs and Aprons
1318 Construction of Bases with Recesses and Aprons
- Australian Standards :
AS 1302 Steel Reinforcing Bars for Concrete
AS 1304 Welded Wire Reinforcing Fabric for Concrete

R C BOX CULVERTS & SLAB LINK BOX CULVERTS

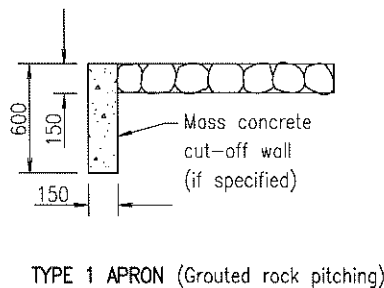
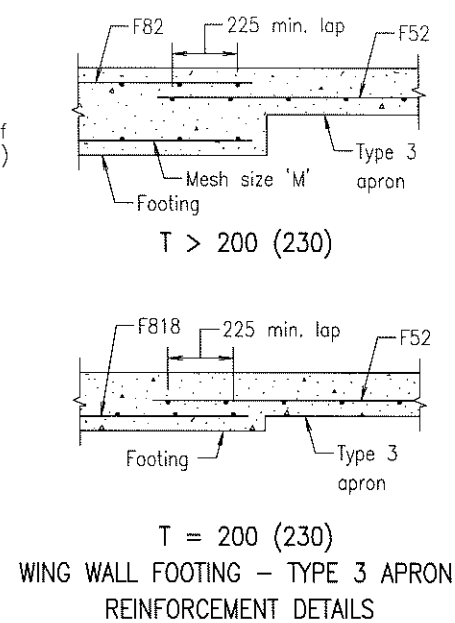
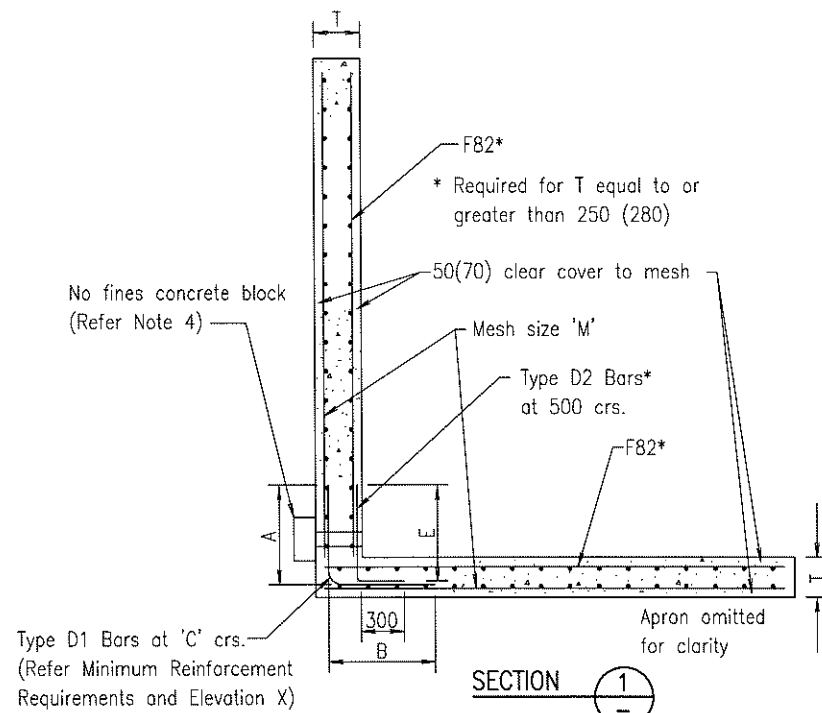
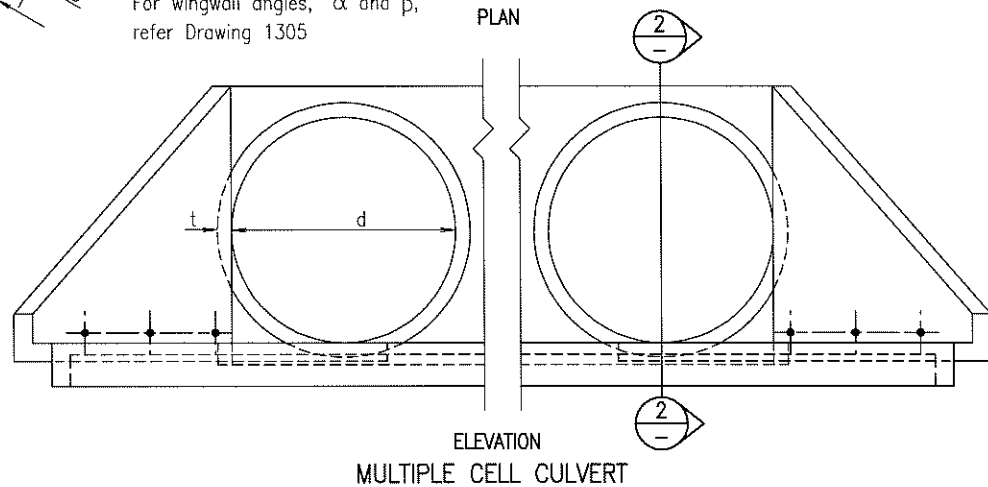
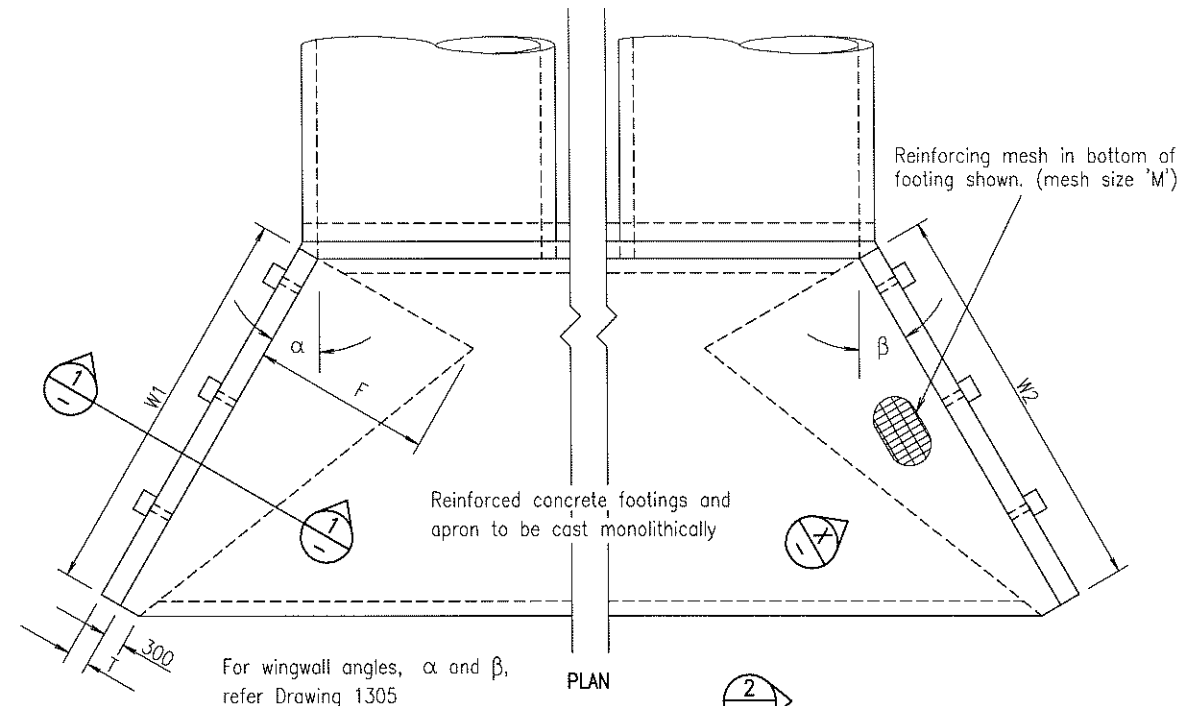
CONSTRUCTION OF REINFORCED CONCRETE WINGWALLS AND HEADWALLS

Queensland Government
Department of Main Roads

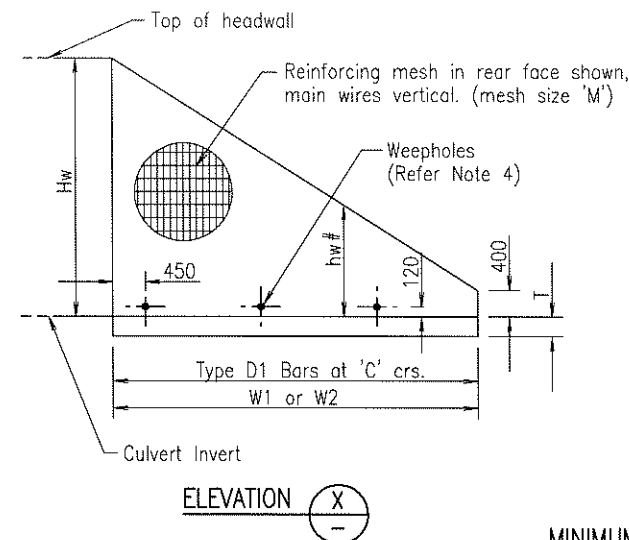
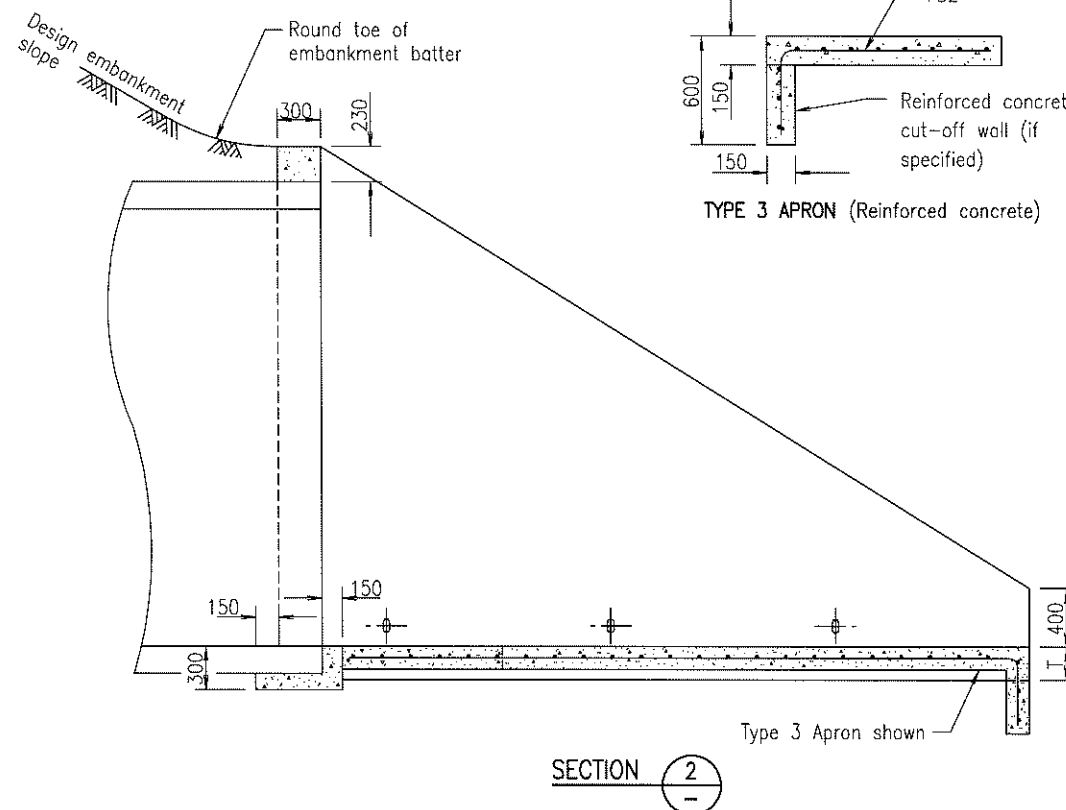
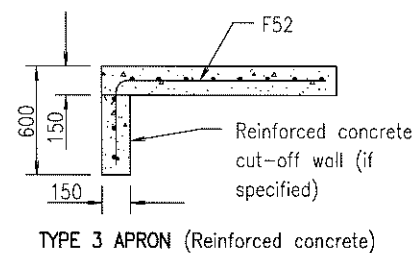
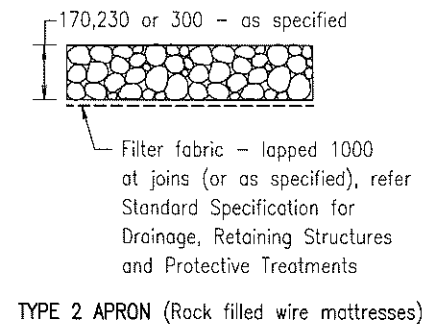
Size A3
Scales as shown

Drawing No
1303
Date 10/00

A B C D E



APRON TYPES



WING DIMENSIONS
(Refer Note 3)

up to Hw†	F	T
1000	0.75 Hw	200 (230)
1500		200 (230)
2000		250 (280)
2500		300 (330)
3000		300 (330)

† where Hw = Internal pipe diameter (d) + pipe thickness (t) + 230

MINIMUM REINFORCEMENT REQUIREMENTS
(Refer Note 2)

hw#	M	Type D1 Bars				12 dia. Type D2 Bars
		dia.	A	B	C	E
400 - 1000	F818	12	550	400	200	450
1001 - 1500	F818	12	550	400	200	550
1501 - 2000	F1018	12	600	400	100	600
2001 - 2500	F1018	12	650	400	100	650
2501 - 3000	F1218	20	750	500	100	650

NOTES :

- CONCRETE
Concrete class 32 MPa/20 (50 MPa/20).
Concrete cover to be 50(70) unless shown otherwise.
 - STEEL
Reinforcing bars to be grade 400Y to AS 1302.
 - AGGRESSIVE ENVIRONMENT - Concrete class, dimensions indicating steel cover and 'T' are shown in brackets for aggressive environment.
 - WEEPHOLES of 90 dia. are to be provided at maximum 1200 crs. in wingwalls. A 300 x 300 x 150 no fines concrete block or approved equivalent is to be provided at each weephole. Location of weepholes is to provide 30mm clear cover to wingwall steel.
 - LAPS shall be made so that the two outermost wires of one fabric overlap the two outermost wires of the sheet being lapped.
 - MESH AND TYPE D1 AND D2 BARS may be varied for the appropriate value of 'hw' used in the lower parts of the wing. 'T' is a constant thickness based on maximum height 'Hw'.
 - EXCESS BAR LENGTH - Excess bar length protruding outside the dimensions of the wall or footing shall be cut to provide the minimum cover.
 - DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Wingwall lengths W1 and W2.
Apron type (1, 2 or 3), depth of Type 2 apron (if required).
Apron cutoff wall, U/S and/or D/S (if required).
Aggressive environment treatment (if required).
 - DIMENSIONS are in millimetres unless shown otherwise.
- ASSOCIATED DOCUMENTS :
Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads
- REFERENCED DOCUMENTS :
Standard Drawings :
1305 General Arrangement and Installation of Wingwalls, Headwalls and Aprons
Standard Specifications :
Drainage, Retaining Structures and Protective Treatments
Australian Standards :
AS 1302 Steel Reinforcing Bars for Concrete
AS 1304 Welded Wire Reinforcing Fabric for Concrete

PIPE CULVERTS

CONSTRUCTION OF
REINFORCED CONCRETE
WINGWALLS AND APRONS FOR
PIPE DIAMETER UP TO 2400

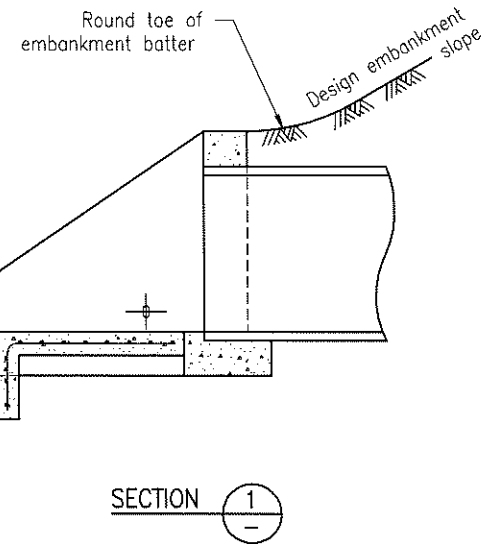
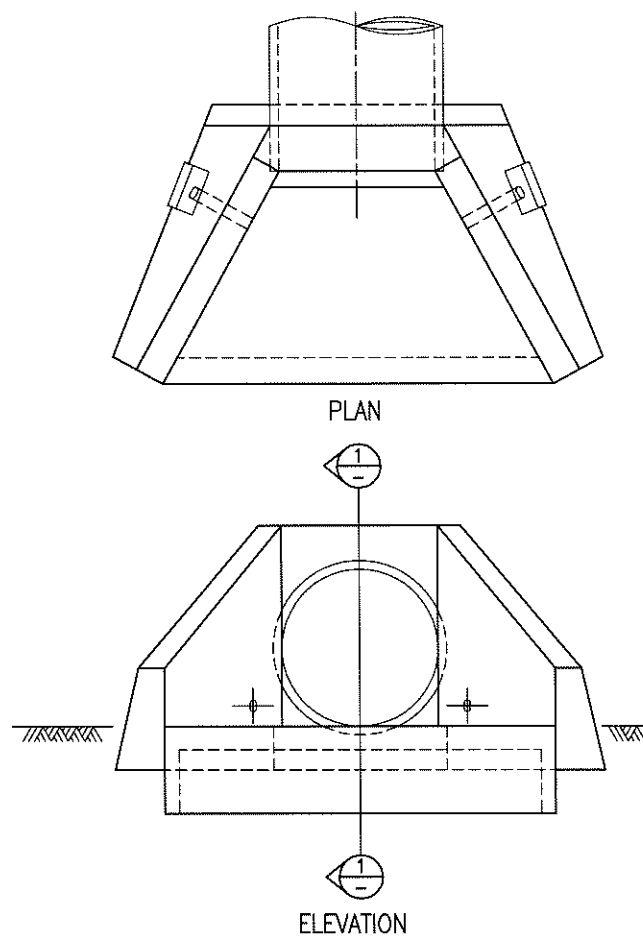


Size A3
Scales
as shown

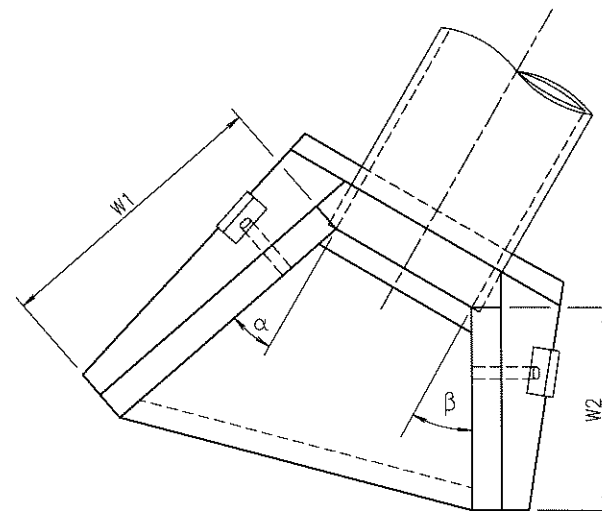
Drawing No
1304
Date 10/00

A	B	C	D	E
---	---	---	---	---

1304

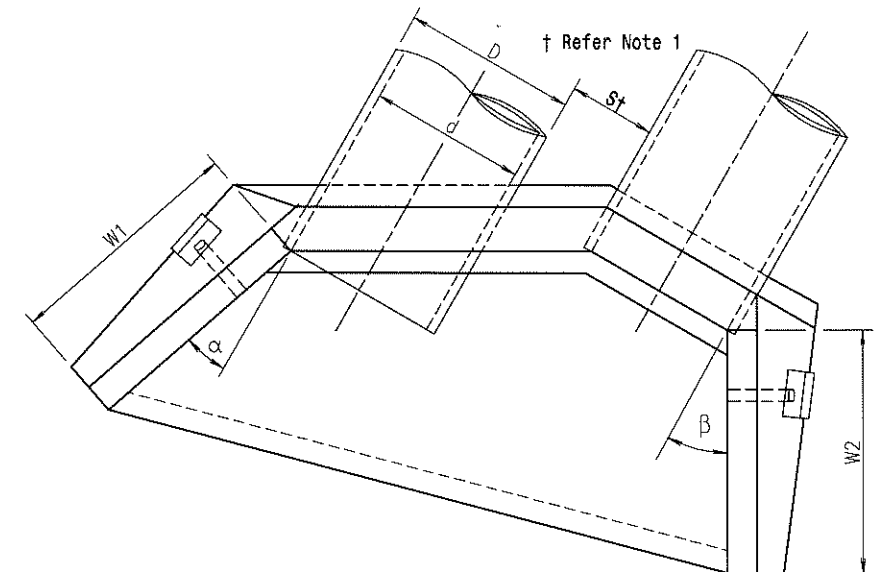


750–2400 dia. PIPE
300–675 dia. PIPE



PLAN – SINGLE SKEW CULVERT

For reinforced wingwall construction detail
refer Drawing 1304,
for unreinforced wingwall construction detail
refer Drawing 1306



PLAN – MULTIPLE SKEW CULVERT

Skew angle θ	Wingwall angle	
	α	β
0 – 10	30	30
11 – 20	25	30
21 – 30	20	30
31 – 45	15	30

WINGWALL ANGLES – SKEW CULVERT
Not to scale

NOTES :

- SPACING FOR MULTIPLE PIPES "S" is as specified on Standard Drawing 1359.
- DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Wingwall lengths W1 and W2.
Wingwall type (1, 2 or 3).
Apron type (1, 2 or 3), depth of Type 2 apron (if required).
Apron cutoff wall, U/S and/or D/S (if required).
- DIMENSIONS are in millimetres unless shown otherwise.

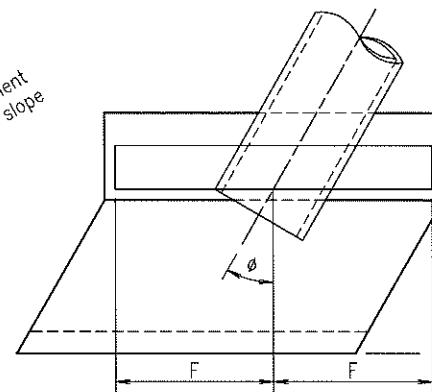
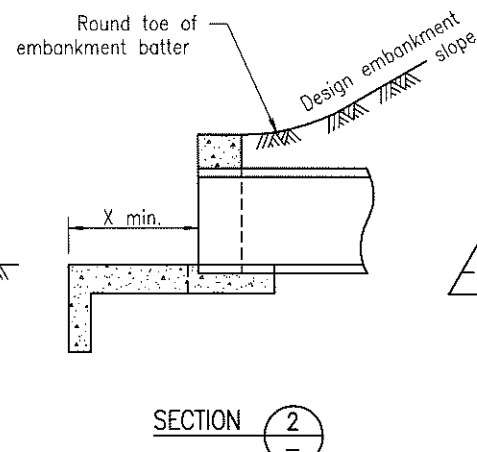
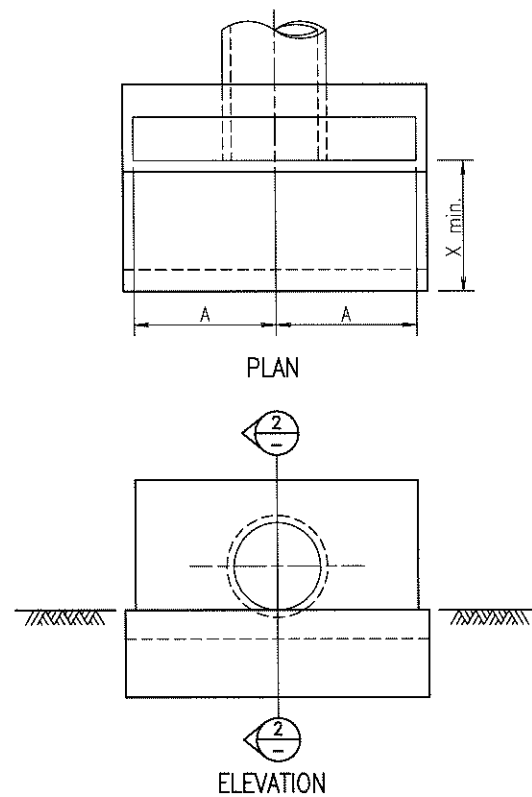
ASSOCIATED DOCUMENTS :

Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads

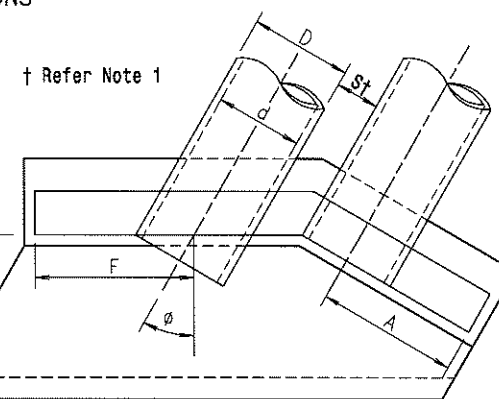
REFERENCED DOCUMENTS :

Standard Drawings :

- 1304 Construction of Reinforced Concrete Wingwalls and Aprons for Pipe Diameter up to 2400
- 1306 Construction of Unreinforced Wingwalls, Headwalls and Aprons
- 1359 Installation, Bedding and Filling/Backfilling Against/Over Culverts



PLAN – SINGLE SKEW CULVERT



PLAN – MULTIPLE SKEW CULVERT

Dim	Nominal internal diameter, d					
	300	375	450	525	600	675
A	475	600	725	850	975	1100
F	550	700	825	950	1100	1250
X	450	565	675	790	900	1015

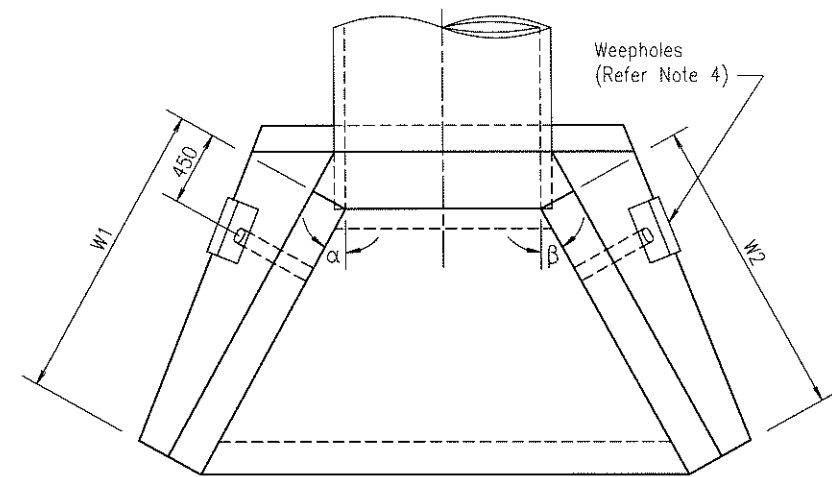
TABLE OF DIMENSIONS

ENDS TO PIPE CULVERTS

Main Roads

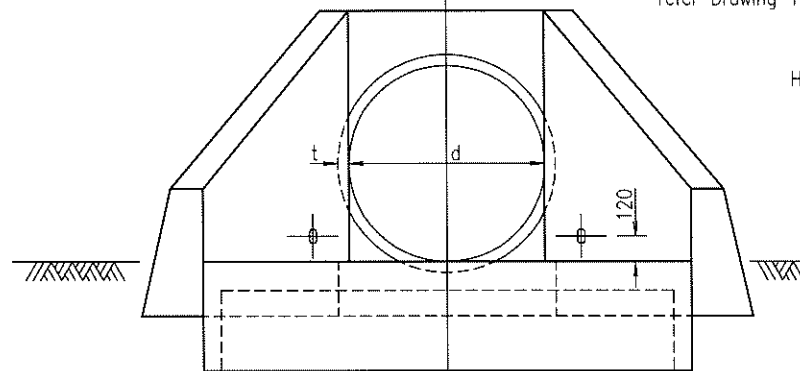
GENERAL ARRANGEMENT AND
INSTALLATION OF WINGWALLS,
HEADWALLS AND APRONS

Size A3
Not to scale
Drawing No
1305
Date 9/96



PLAN

For wingwall angles α and β , refer Drawing 1305

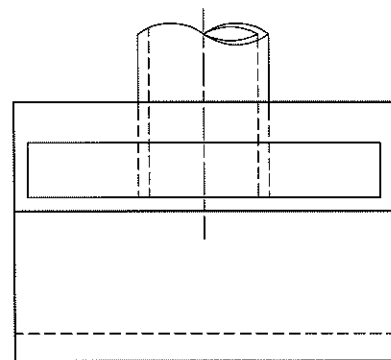


ELEVATION

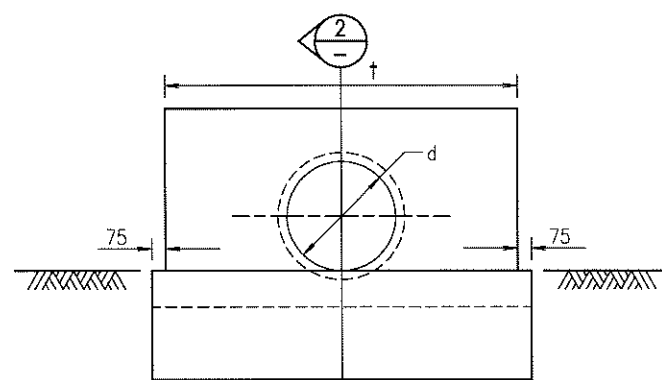
Scale 1:40

750–2400 dia. PIPE

300–675 dia. PIPE



PLAN

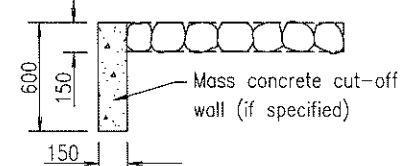


ELEVATION

Scale 1:40

170,230 or 300 – as specified (Refer Note 8)
Filter fabric – lapped 1000 at joints (or as specified), refer Standard Specification for Drainage, Retaining Structures and Protective Treatments

TYPE 2 APRON (Rock filled wire mattresses)

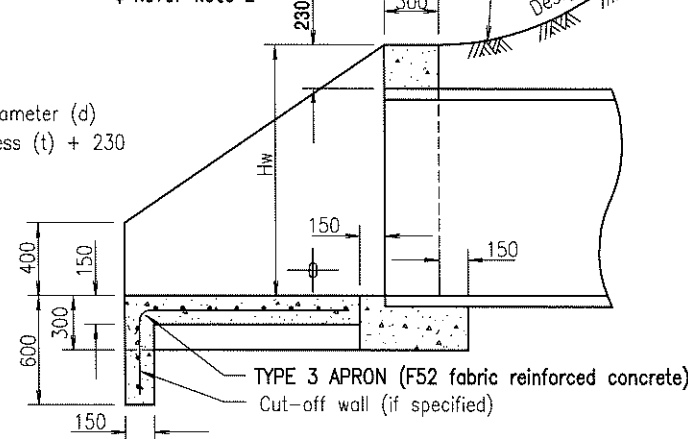


TYPE 1 APRON (Grouted rock pitching)

APRON TYPES

Scale 1:40

± Refer Note 2



SECTION

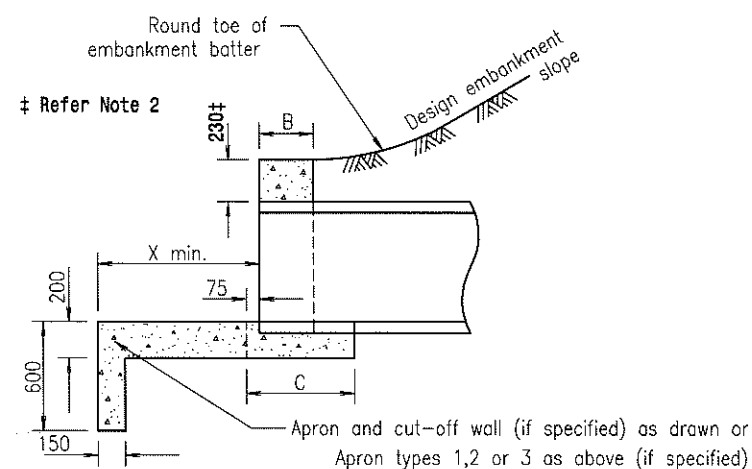
Scale 1:40



Dim	Nominal internal diameter, d					
B	250	250	250	300	300	300
C	450	450	450	600	600	600
X	450	565	675	790	900	1015

TABLE OF DIMENSIONS

† For headwall length, refer Drawing 1305



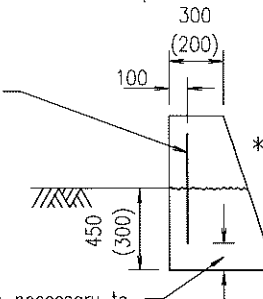
SECTION

Scale 1:40



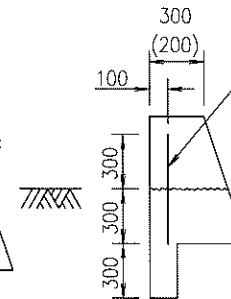
* Wingwall slopes
When nom. pipe dia. = 750–1800
When nom. pipe dia. = 2100–2400

Y12 galvanized bars, 600 long, at 400 crs., bonded 300 into base.



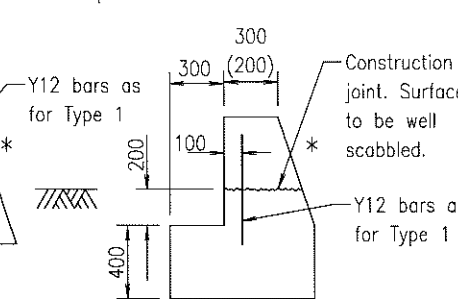
TYPE 1

Normal foundation



TYPE 2

With cut-off wall



TYPE 3

With footing – when foundation bearing capacity < 150 kPa

Bars not required if walls are cast without a construction joint

WINGWALL TYPES

Scale 1:40

Dimensions in brackets are when nom. pipe dia. = 750 – 1200

NOTES :

- CONCRETE
Wingwalls unreinforced concrete class 20 MPa/20.
Type 3 Apron reinforced concrete class 32 MPa/20.
- HEADWALL HEIGHT may be increased to meet standard formwork when pipes other than reinforced concrete are used.
- WINGWALLS are to be built monolithically with headwall. However for culverts where $d \geq 1500$ or where Type 3 wingwalls are used when the foundation bearing capacity < 150 kPa, the Engineer may direct that wingwalls be separated from headwalls by a bitumen coated joint.
- WEEPHOLES of 90 dia. are to be provided at 1200 crs. A 300 x 300 x 150 no fines concrete block or approved equivalent is to be provided at each weephole.
- GROUTED RUBBLE AND RUBBLE MASONRY ENDS are to be constructed to generally the same shape as shown. Dimensions are to be not less than those for concrete ends.
- PIPE DIAMETERS greater than 2400 require a special design.
- APRONS – If aprons are specified, lengths shall be nominally between the ends of the wingwalls.
- DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Wingwall lengths W1 and W2.
Wingwall type (1, 2 or 3).
Apron type (1, 2 or 3), depth of Type 2 apron (if required).
Apron cutoff wall, U/S and/or D/S (if required).
End material (concrete, grouted rubble or rubble masonry).
- DIMENSIONS are in millimetres unless shown otherwise.

ASSOCIATED DOCUMENTS :

Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads

REFERENCED DOCUMENTS :

Standard Drawings :

1305 General Arrangement and Installation of Wingwalls, Headwalls and Aprons

Standard Specifications :

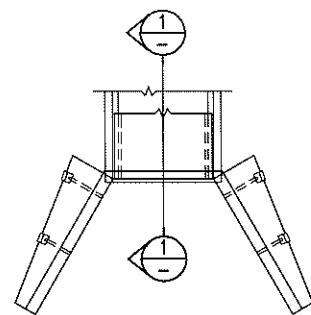
Drainage, Retaining Structures and Protective Treatments

Australian Standards:

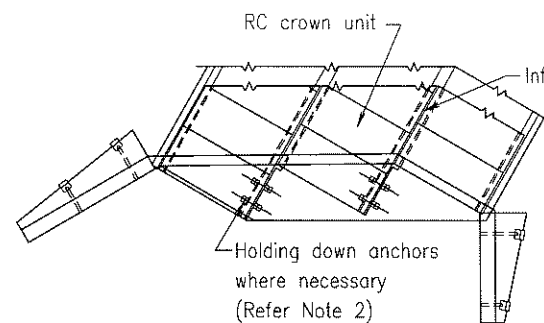
AS 1302 Steel Reinforcing Bars for Concrete

AS 1304 Welded Wire Reinforcing Fabric for Concrete

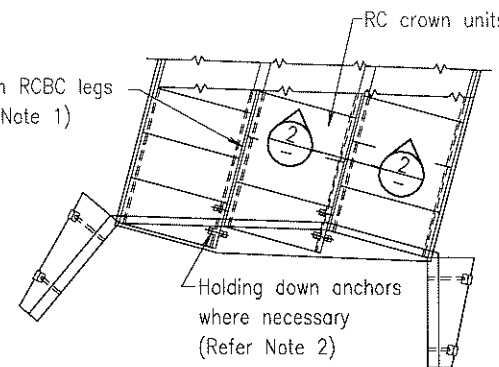
AS 1650 Hot-dipped Galvanized Coatings on Ferrous Articles



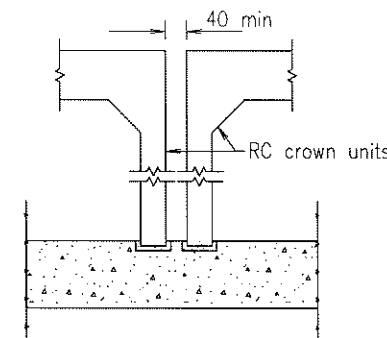
PLAN - Square Culvert



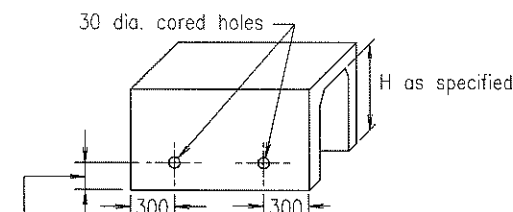
PLAN - Typical Multiple Skew RCBC



PLAN - Typical Multiple Skew RCBC



SECTION 2
Not to Scale
Unit Spacing

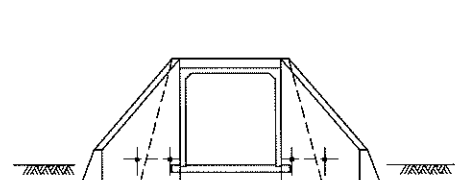


130 when used with cast in situ base slabs without recesses
150 when $H < 1500$ } For use with cast in situ
170 when $H \geq 1500$ } base slabs with recesses

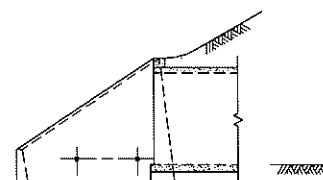
For anchor detail refer Drawing 1320

CORED HOLES IN CROWN UNITS FOR
HOLDING DOWN ANCHORS

Not to Scale



ELEVATION

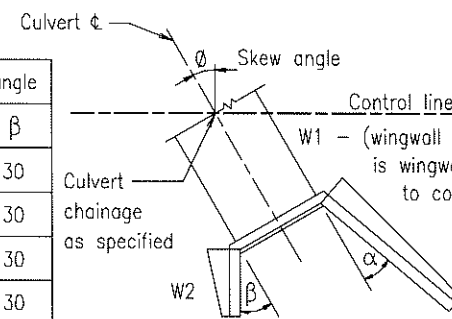


SECTION 1

Skew angle θ	Wingwall angle	
	α	β
0 - 10	30	30
11 - 20	25	30
21 - 30	20	30
31 - 45	15	30

WINGWALL ANGLES - SKEW CULVERT

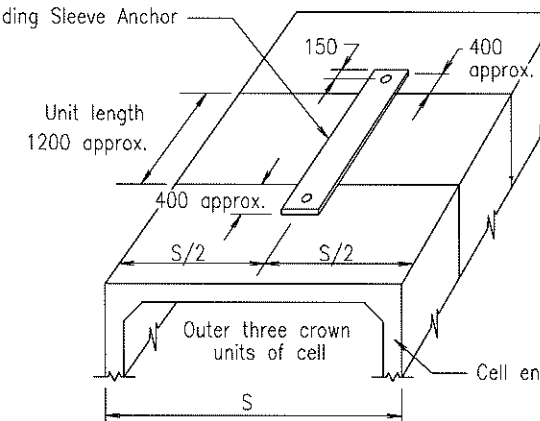
Not to scale



Headwall anchor bars for $H=150-600$
refer Drawing 1174

DETAIL - Headwall Anchoring Provisions

2000 x 65 x 6 galvanised steel plate with
2 x 18 dia. holes fixed with 2 x M12 x 58
Expanding Sleeve Anchor



CROWN UNIT RESTRAINING PLATE FOR
USE WITH SLBC (1200 UNITS ONLY)

Not to Scale
(Refer Note 4)

NOTES :

- INFILL between legs of multiple culverts is achieved by placing N20/20 concrete plugs of 250mm minimum length at both ends of the structure and infill the remaining gap with 1:10 lean mix having maximum aggregate size of 10mm packed dry. Do not use fluid grout as hydrostatic head will damage culvert legs. (Where headwalls are required for multiple culverts without wingwalls, refer to the 'Headwall Anchoring Provisions' detail.)
- HOLDING DOWN ANCHORS are to be installed where the leg(s) of the crown unit extend more than 300mm beyond the outside face of the headwall. Refer to Standard Drawing 1320. Nibs are not required for these crown units. Where nibs are required, they are to extend for the full length of all other units.
- LEAN MIX CONCRETE is to be placed between spanning slabs on crown unit cells.
- CROWN UNIT RESTRAINING PLATES are required on the outer 3 of all internal cells when SLBC > 5 cells and crown units ≥ 1800 mm high are used.
- DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Wingwall unreinforced concrete type (1, 2 or 3).
Wingwall reinforced concrete.
Headwall design (if required).
Special spanning slab details (if required).

- DOWELS AND RESTRAINING PLATES to be hot dipped galvanised after fabrication to AS/NZS 4680.

7. DIMENSIONS are in millimetres unless shown otherwise.

ASSOCIATED DOCUMENTS :

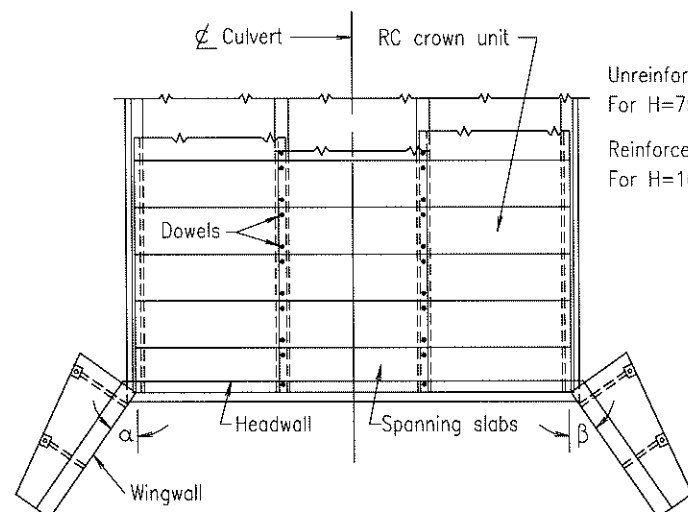
Department of Main Roads Manual of Standard Drawings Roads

Department of Main Roads Manual of Standard Specifications Roads

REFERENCED DOCUMENTS :

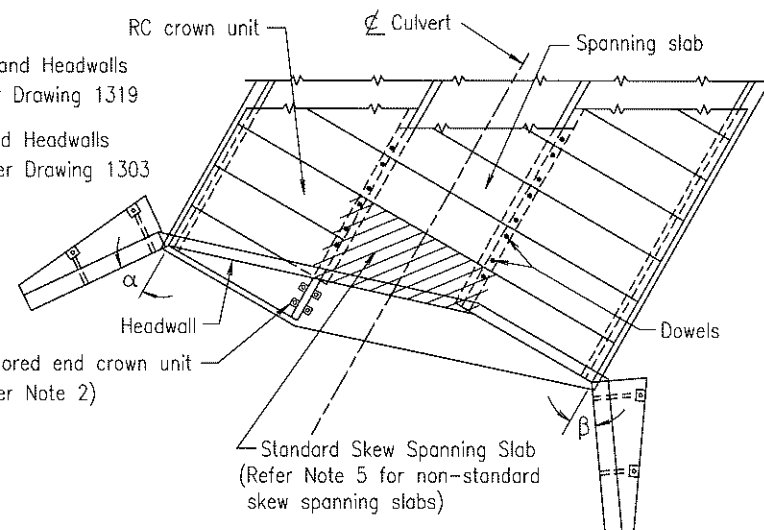
Standard Drawings :

- 1174 Construction of End Structures $H = 150 - 600$
 - 1303 Construction of Reinforced Concrete Wingwalls and Headwalls
 - 1317 Construction of Bases with Nibs and Aprons
 - 1318 Construction of Bases with Recesses and Aprons
 - 1319 Construction of Wingwalls and Headwalls $H = 750 - 2400$
 - 1320 Crown Unit Holding Down Anchors
 - 1359 Installation, Bedding and Filling/Backfilling Against/Over Culverts
- Australian Standards :
AS/NZS 4680 Hot-dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

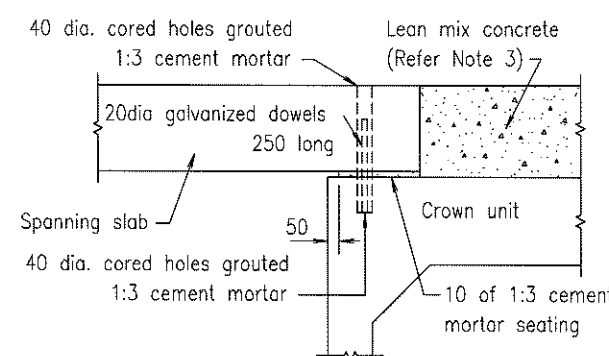


PLAN - Typical Square SLBC
(Base with recesses)

Unreinforced Wingwalls and Headwalls
For $H=750-2400$, refer Drawing 1319
Reinforced Wingwalls and Headwalls
For $H=1000-4350$, refer Drawing 1303

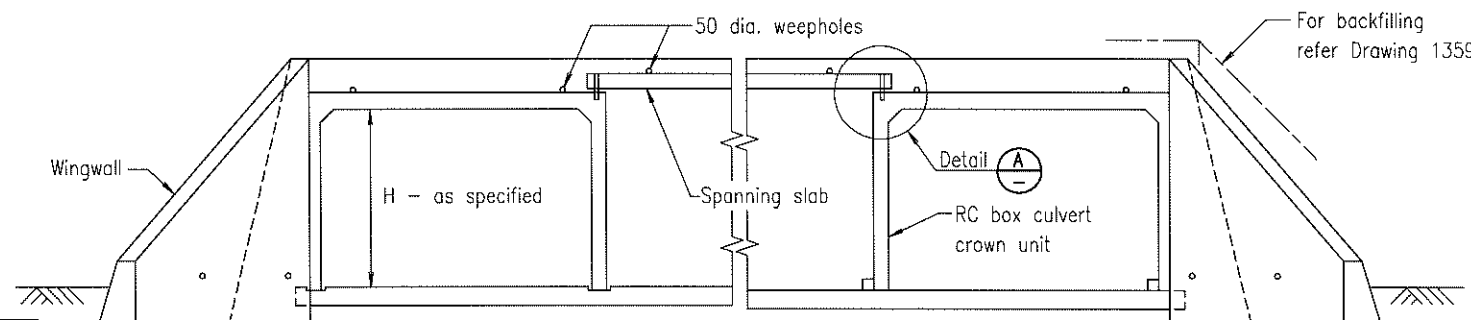


PLAN - Typical Skew SLBC
(Base with nibs)



DETAIL A
Scale 1:20

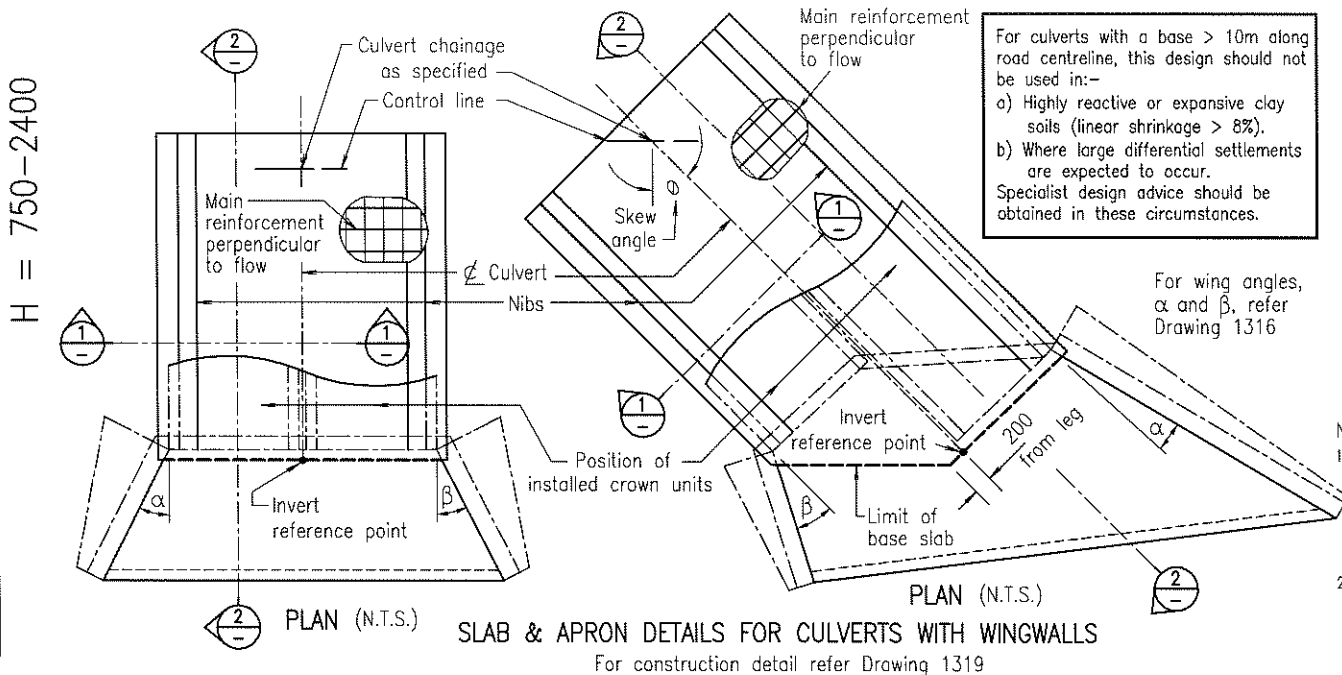
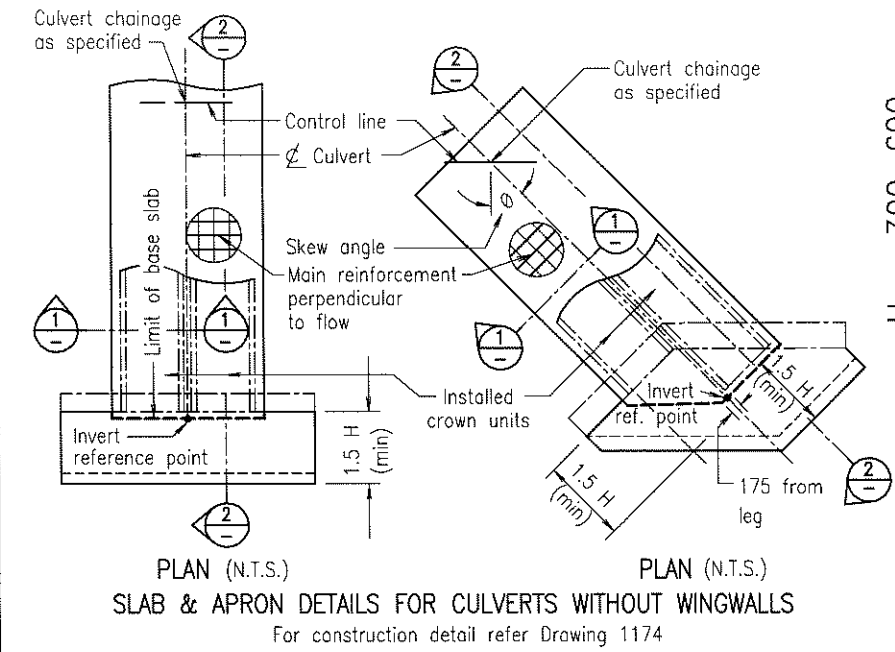
Spanning slab support and lean mix concrete fill



ELEVATION - Typical SLBC

1316

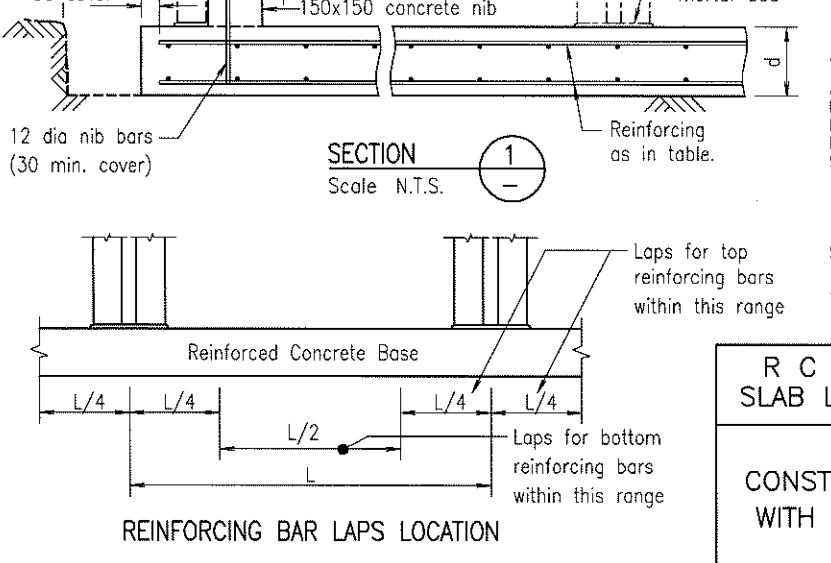
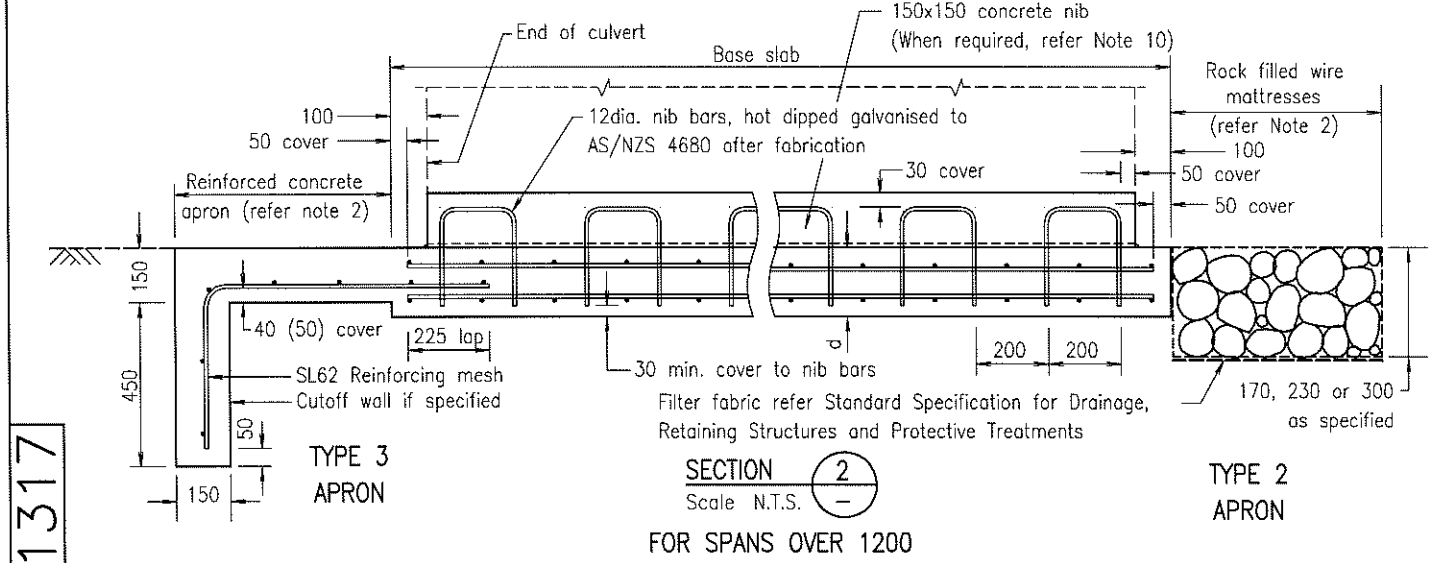
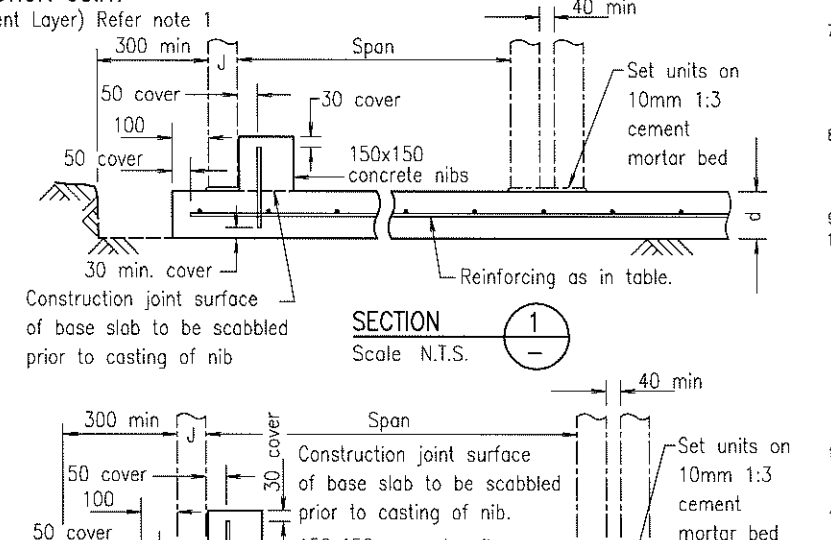
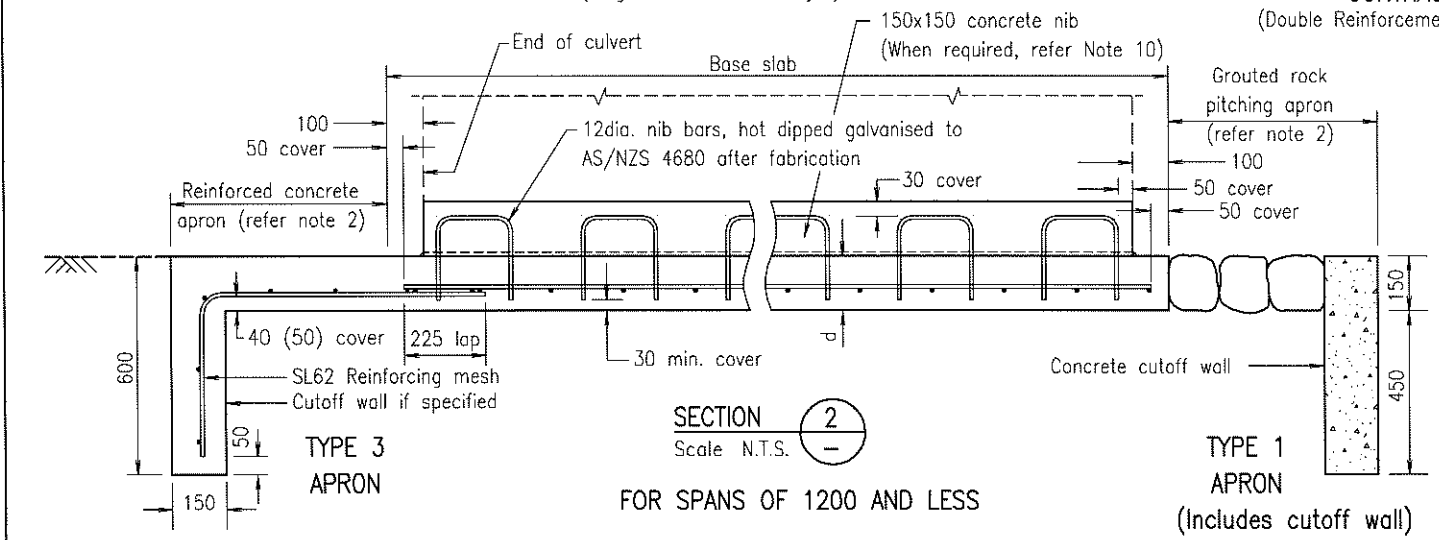
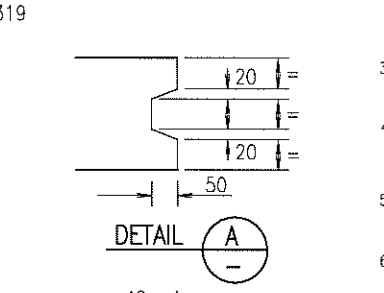
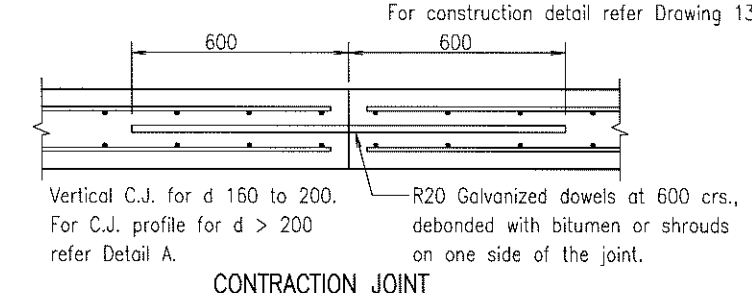
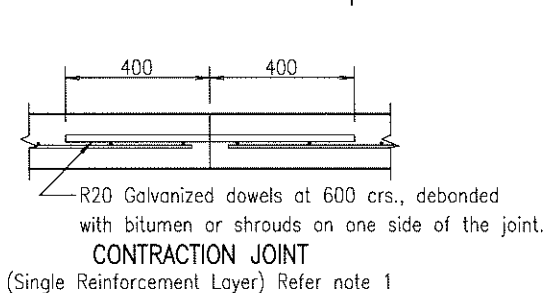
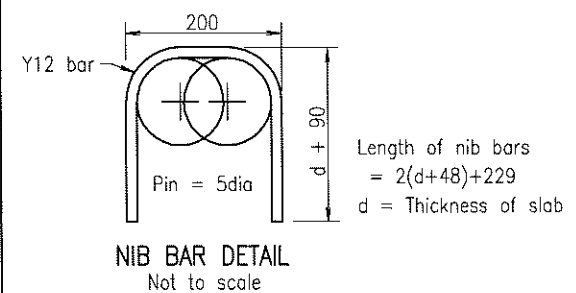
RC BOX CULVERTS & SLAB LINK BOX CULVERTS		Queensland Government Department of Main Roads	
GENERAL ARRANGEMENT AND INSTALLATION OF PRECAST UNITS	Size A3	Drawing No	
	Scales	1316	
	as shown	Date 2/04	
		F	G



Span	Thickness of slab, d	Main Reinforcement	Secondary Reinforcement	Position	Length of nib bars
300	150 (170)	N16 at 200	N12 at 220	Single layer on centre line	N/A
375	150 (170)	N16 at 175	N12 at 220		N/A
450	150 (170)	N16 at 175	N12 at 220		N/A
600	150 (170)	N16 at 175	N12 at 220		N/A
750	150 (170)	N16 at 175	N12 at 220		625
900	170	N16 at 200	N12 at 220		665
1200	170	N16 at 200	N12 at 220		665
1500	190	N16 at 200	N12 at 220		705
1800	190	N16 at 175	N12 at 220	Top and bottom 45 (70) cover	705
2100	210	N16 at 175	N12 at 220		745
2400	220	N16 at 175	N12 at 220		765
2700	210 (260)	N16 at 200	N12 at 220		745
3000	210 (260)	N16 at 200	N12 at 220		745
3300	220 (270)	N16 at 200	N12 at 220		765
3600	230 (280)	N16 at 200	N12 at 220		785
4000	230 (280)	N16 at 200	N12 at 220		785

TABLE 1 - SLAB DETAILS (Refer Notes 8 and 9)

- NOTES:
- CONTRACTION JOINTS are to be provided where (a) the length of the base slab and/or (b) the width of the base slab exceed 20m. When contraction joints are required across the width of the base slab, they are to be located at 1/4 span points of crown units. Contraction joints across the width of the base slab are to be continued across the aprons. For apron contraction joints refer to detail for single reinforcement layer. 24 hours minimum is to be allowed between pours.
 - APRONS where unreinforced wingwalls are used shall be grouted rock pitching (Type 1), rock filled wire mattresses (Type 2) or concrete reinforced with SL62 mesh (Type 3). Where RC wingwalls are used, refer Standard Drawing 1303 for apron details. Protection works at outlets and inlets are typical and may be varied by the Superintendent to suit the conditions at the site. If aprons are specified, apron lengths shall be nominally between ends of the wings as shown. Any extended or reduced length will be shown on the drawings.
 - BASE DIMENSIONS given are applicable to a maximum fill height over the culvert crown of 1.5m. An on site check of the units dimensions should be made before setting out the base slab as there are variations between manufacturers.
 - UNIT DIMENSIONS: H = Height of opening, J = Thickness of leg, $Span$ = Internal width.
 - MESH LAPS shall be made so that the two outermost wires of one fabric overlap the two outermost wires of the sheet being lapped.
 - REINFORCING BAR LAPS: 400mm for N16 longitudinal reinforcement, 300mm for N12 transverse reinforcement.
 - DETAIL TO BE SHOWN ELSEWHERE IN THE DOCUMENTS: Apron type, depth of Type 2 apron (if required), Apron cutoff wall, U/S and/or D/S (if required), Exposure classification treatment (if required), Culvert location (chainage) and base distance and height.
 - EXPOSURE CLASSIFICATIONS: Dimensions indicating slab thickness, steel cover and concrete class are shown in brackets for salt-rich and areas and tidal or splash zones (ie. exposure classification C). Specialist design advice should be obtained for aggressive soils (ie. exposure classification U).
 - DESIGN LOADING HLP400, M1600, A160 and W80.
 - NIB DETAILS are as follows: Arrangements: for $H \leq 600$ - no nibs, for RCBC $H > 600$ - nibs supporting external legs of external cells, for SLBC $H > 600$ to 900 - nibs supporting external legs of external cells, for SLBC $H > 900$ - nibs supporting both legs of external cells. Installation: for $H < 1500$ - nibs cast before placement of units, for $H \geq 1500$ - nibs cast after placement of units.



- CONCRETE: Reinforced concrete class N32/20 (N50/20). Unreinforced concrete class N20/20.
 - STEEL: Reinforcing bars to be grade D500N to AS/NZS 4671. 20 dia. dowels to be grade R250N to AS/NZS 4671 & galvanised to AS/NZS 4680. Reinforcing mesh to AS/NZS 4671.
 - DIMENSIONS are in millimetres unless shown otherwise.
- ASSOCIATED DOCUMENTS:
Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads
- REFERENCED DOCUMENTS:
Standard Drawings:
1174 Construction of End Structures $H = 150 - 600$
1303 Construction of Reinforced Concrete Wingwalls and Headwalls
1316 General Arrangement and Installation of Precast Units
1319 Construction of Unreinforced Wingwalls and RC Headwalls $H = 750 - 2400$
- Standard Specifications:
Drainage, Retaining Structures and Protective Treatments
- Australian Standards:
AS/NZS 4671 Steel Reinforcing Materials
AS/NZS 4680 Hot-dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

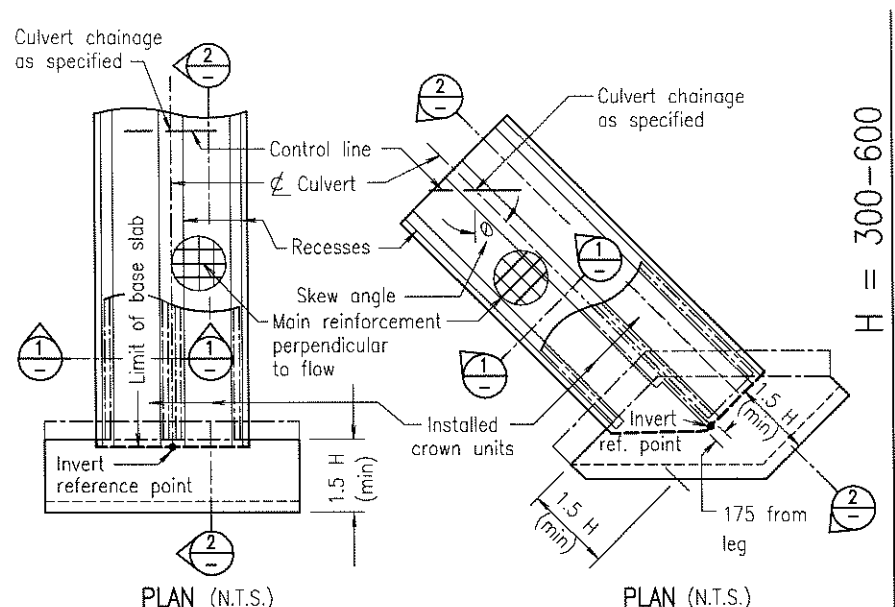
R C BOX CULVERTS & SLAB LINK BOX CULVERTS

CONSTRUCTION OF BASES WITH NIBS AND APRONS

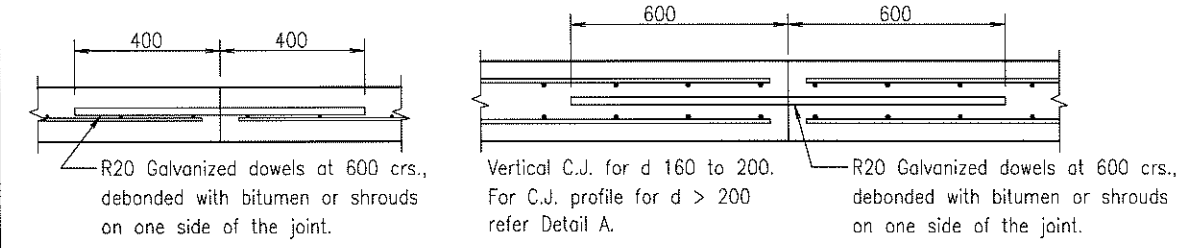
Queensland Government
Department of Main Roads

Size A3
Scales
as shown

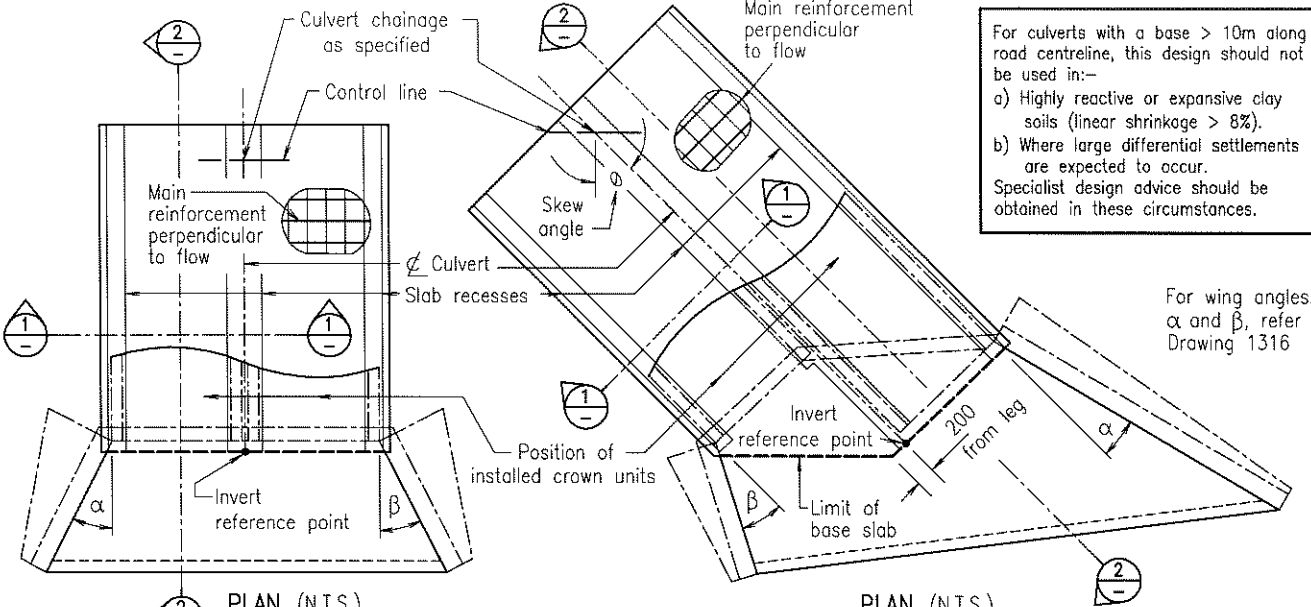
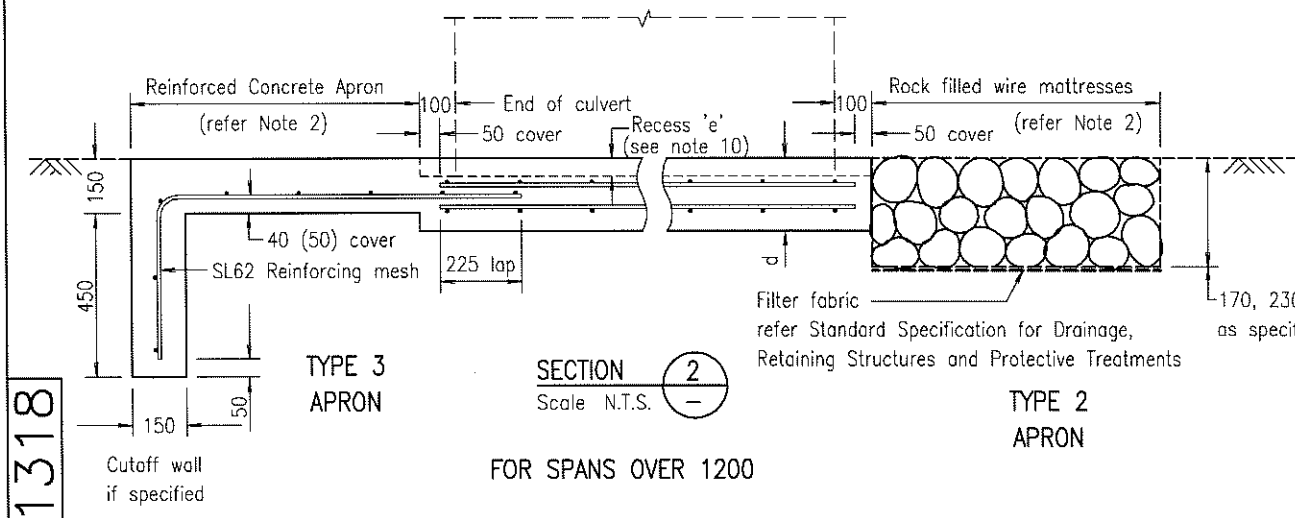
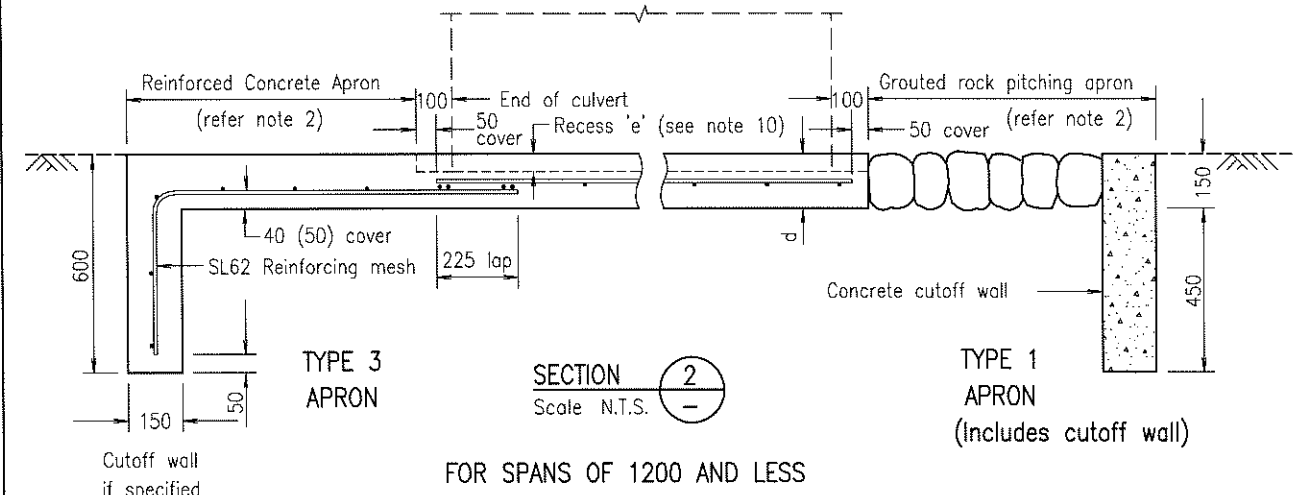
Drawing No
1317
Date 3/04



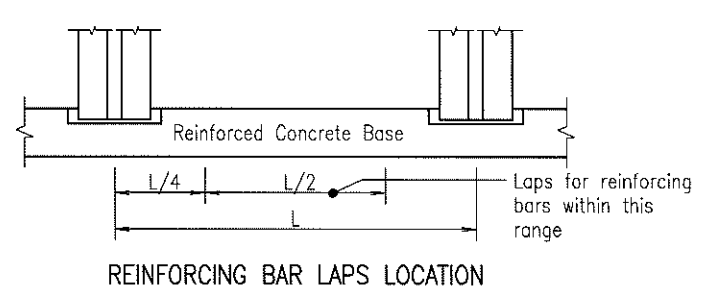
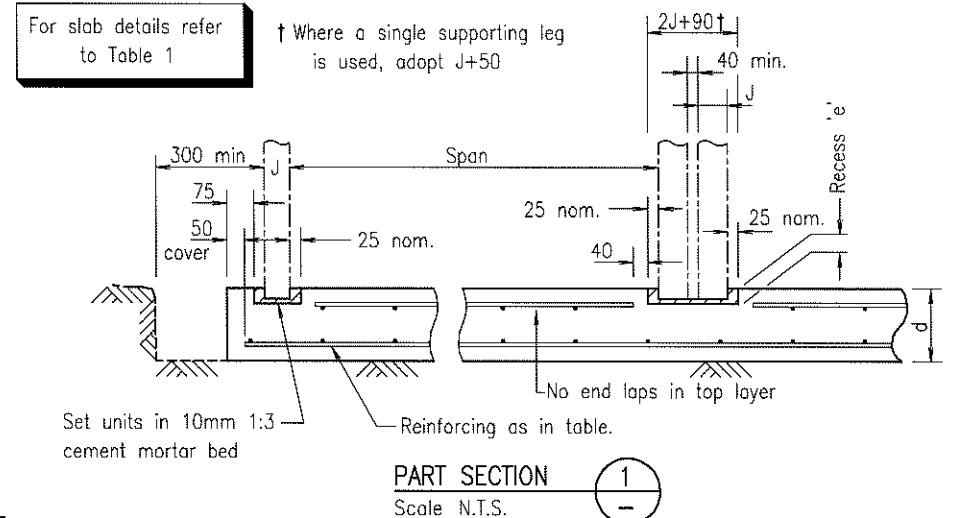
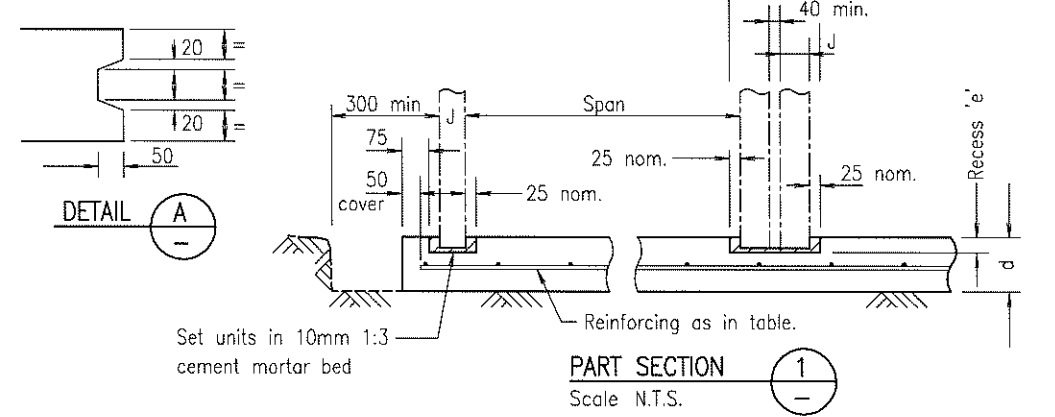
SLAB & APRON DETAILS FOR CULVERTS WITHOUT WINGWALLS
For construction detail refer Drawing 1174



CONTRACTION JOINT (Single Reinforcement Layer) Refer note 1
CONTRACTION JOINT (Double Reinforcement Layer) Refer note 1



SLAB & APRON DETAILS FOR CULVERTS WITH WINGWALLS
For construction detail refer Drawing 1319



Span	Thickness of slab, d	Main Reinforcement	Secondary Reinforcement	Position
300	150 (170)	N16 at 200	N12 at 220	Single layer on centre line
375	150 (170)	N16 at 175	N12 at 220	
450	150 (170)	N16 at 175	N12 at 220	
600	150 (170)	N16 at 175	N12 at 220	
750	150 (170)	N16 at 175	N12 at 220	
900	170	N16 at 200	N12 at 220	
1200	170	N16 at 200	N12 at 220	
1500	190	N16 at 200	N12 at 220	
1800	190	N16 at 175	N12 at 220	
2100	210	N16 at 175	N12 at 220	
2400	220	N16 at 175	N12 at 220	Top and bottom 45 (70) cover
2700	210 (260)	N16 at 200	N12 at 220	
3000	210 (260)	N16 at 200	N12 at 220	
3300	220 (270)	N16 at 200	N12 at 220	
3600	230 (280)	N16 at 200	N12 at 220	
4000	230 (280)	N16 at 200	N12 at 220	

TABLE 1 - SLAB DETAILS
(Refer Notes 8, 9 and 10)

- NOTES :**
- CONTRACTION JOINTS are to be provided where (a) the length of the base slab and/or (b) the width of the base slab exceed 20m. When contraction joints are required across the width of the base slab, they are to be located at 1/4 span points of crown units. Contraction joints across the width of the base slab are to be continued across the aprons. For apron contraction joints refer to detail for single reinforcement layer. 24 hours minimum is to be allowed between pours.
 - APRONS where unreinforced wingwalls are used shall be grouted rock pitching (Type 1), rock filled wire mattresses (Type 2) or concrete reinforced with SL62 mesh (Type 3). Where RC wingwalls are used, refer Standard Drawing 1303 for apron details. Protection works at outlets and inlets are typical and may be varied by the Superintendent to suit the conditions at the site. If aprons are specified, apron lengths shall be nominally between ends of the wings as drawn. Any extended or reduced length will be shown on the drawings.
 - BASE DIMENSIONS given are applicable to a maximum fill height over the culvert crown of 1.5m. An on site check of the units dimensions should be made before setting out the base slab as there are variations between manufacturers.
 - UNIT DIMENSIONS :
Span = Internal width
J = Thickness of leg
H = Height of opening
 - MESH LAPS shall be made so that the two outermost wires of one fabric overlap the two outermost wires of the sheet being lapped.
 - REINFORCING BAR LAPS:
400mm for N16 longitudinal reinforcement
300mm for N12 transverse reinforcement
 - DETAIL TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Apron type, depth of Type 2 apron (if required).
Apron cutoff wall, U/S and/or D/S (if required).
Exposure classification treatment (if required).
Culvert location (chainage) and base distance and height.
 - EXPOSURE CLASSIFICATIONS : Dimensions indicating slab thickness, steel cover and concrete class are shown in brackets for salt-rich arid areas and tidal or splash zones (ie. exposure classification C). Specialist design advice should be obtained for aggressive soils (ie. exposure classification U).
 - DESIGN LOADING HLP400, M1600, A160 and W80.
 - RECESS DETAILS are as follows :
H ≤ 600, no recesses
H > 600 to 750, 'e' = 20mm
H > 750 to 1200, 'e' = 30mm
H > 1200, 'e' = 40mm
 - CONCRETE :
Reinforced concrete class N32/20 (N50/20).
Unreinforced concrete class N20/20.
 - STEEL :
Reinforcing bars to be grade D500N to AS/NZS 4671.
20 dia. dowels to be grade R250N to AS/NZS 4671 & galvanized to AS/NZS 4680. Reinforcing mesh to AS/NZS 4671.
 - DIMENSIONS are in millimetres unless shown otherwise.
- ASSOCIATED DOCUMENTS :**
Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads
- REFERENCED DOCUMENTS :**
Standard Drawings :
1174 Construction of End Structures H = 150 - 600
1303 Construction of Reinforced Concrete Wingwalls and Headwalls
1316 General Arrangement and Installation of Precast Units
1319 Construction of Unreinforced Wingwalls and RC Headwalls H = 750 - 2400
- Standard Specifications :**
Drainage, Retaining Structures and Protective Treatments
- Australian Standards :**
AS/NZS 4671 Steel Reinforcing Materials
AS/NZS 4680 Hot-dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

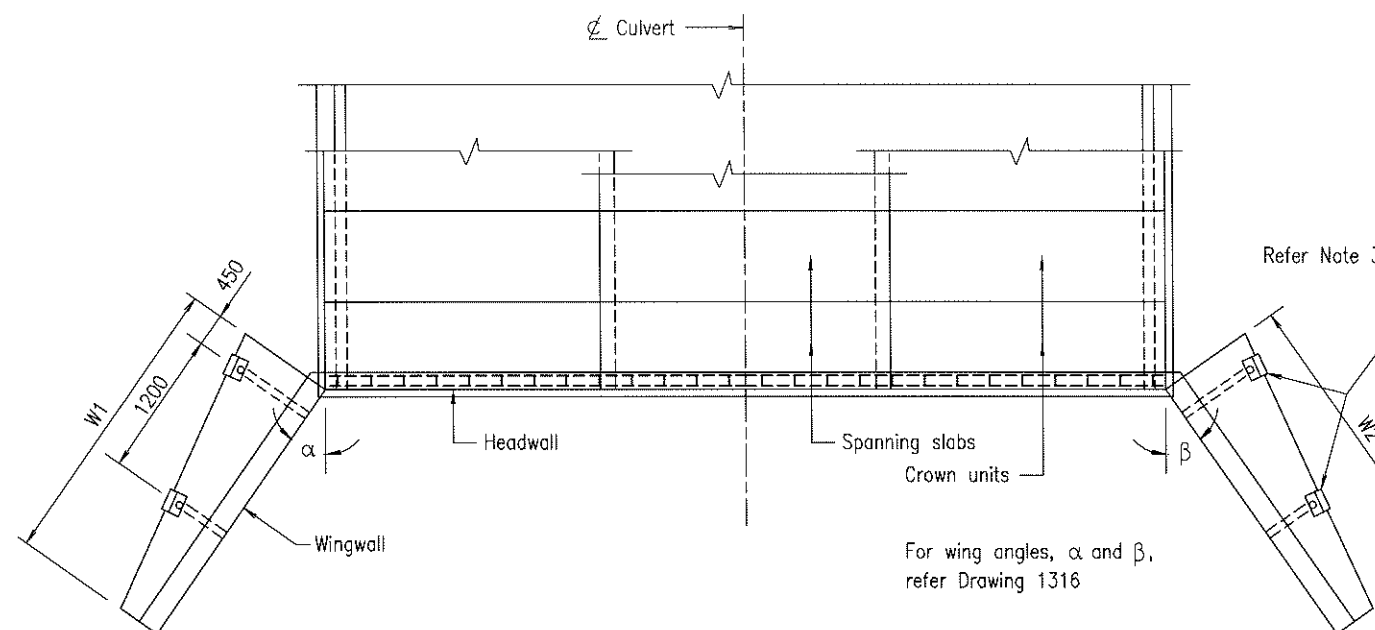
R C BOX CULVERTS & SLAB LINK BOX CULVERTS

CONSTRUCTION OF BASES WITH RECESSES AND APRONS

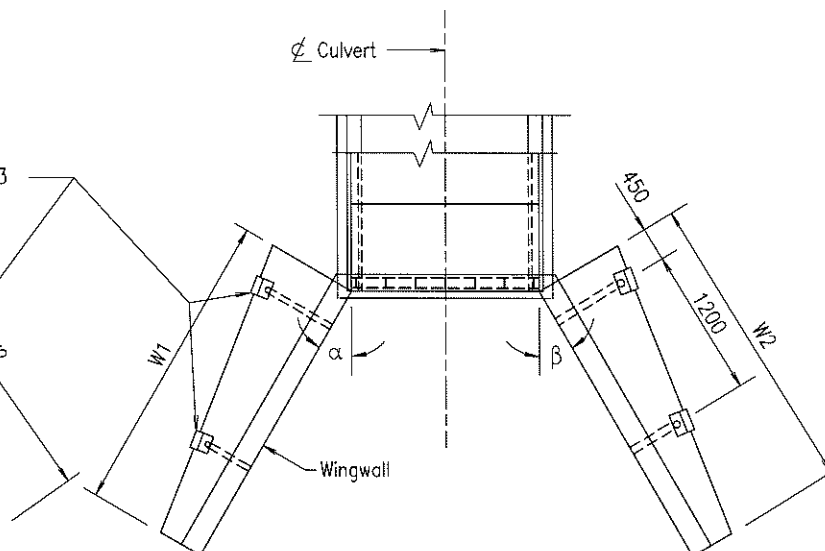
Queensland Government
Department of Main Roads

Size A3
Scales
as shown

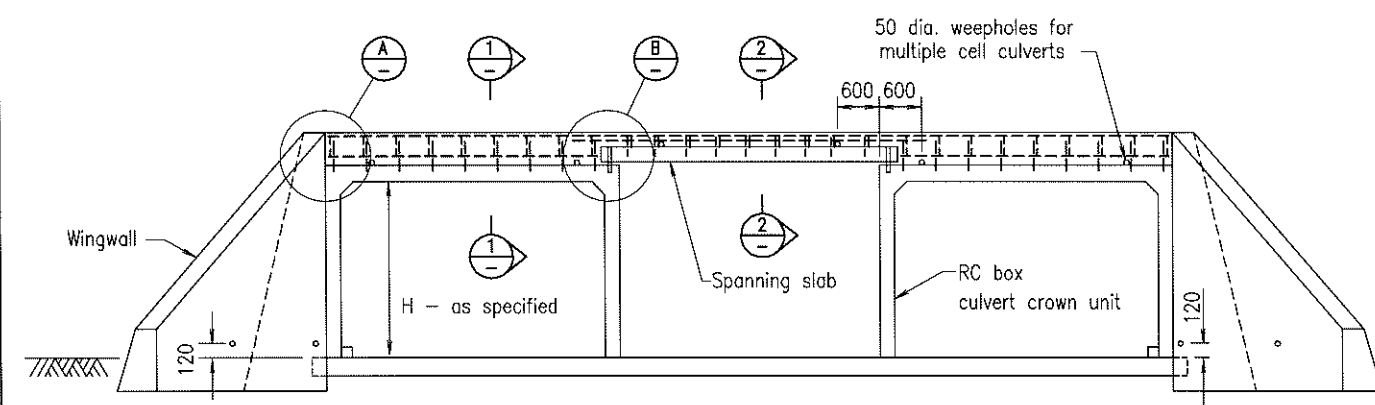
Drawing No
1318
Date 3/04



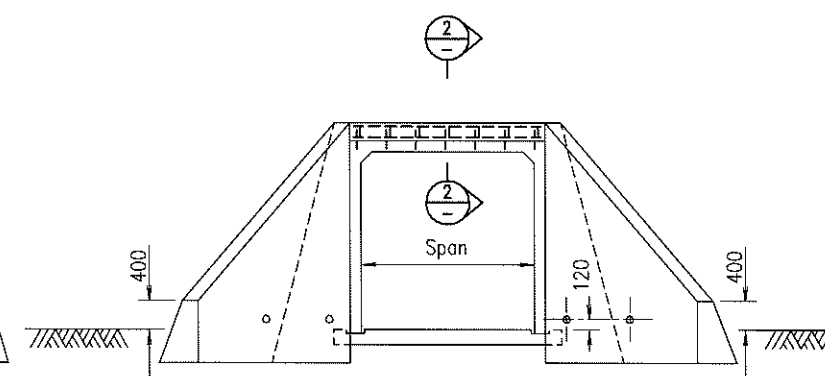
PLAN - Typical Headwall and Wings SLBC
Scale 1:100



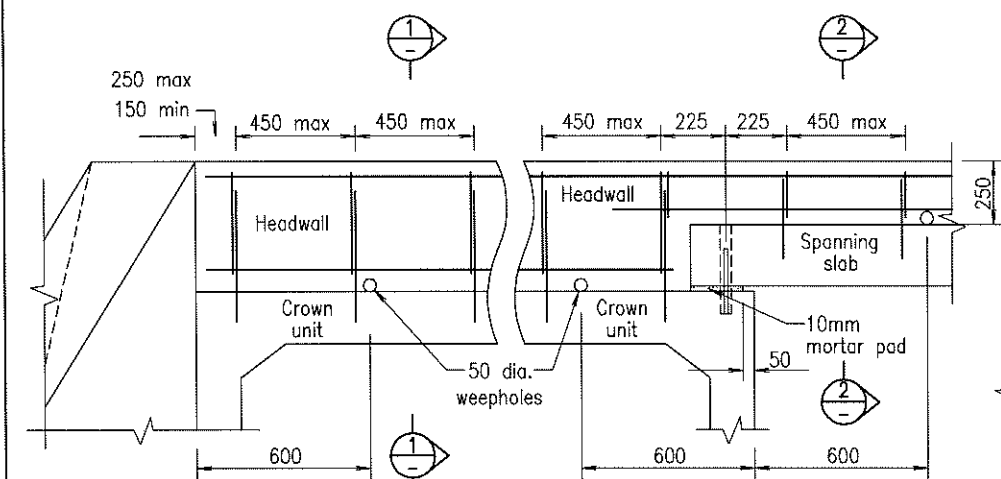
PLAN - Typical Headwall and Wings RCBC
Scale 1:100



ELEVATION - Typical Headwall and Wings SLBC
For Base with Nibs
Scale 1:100

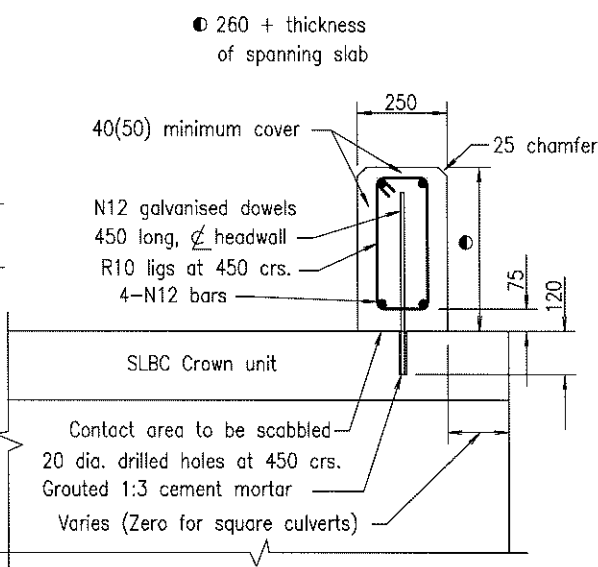


ELEVATION - Typical Headwall and Wings RCBC
For Bases with Recesses
Scale 1:100

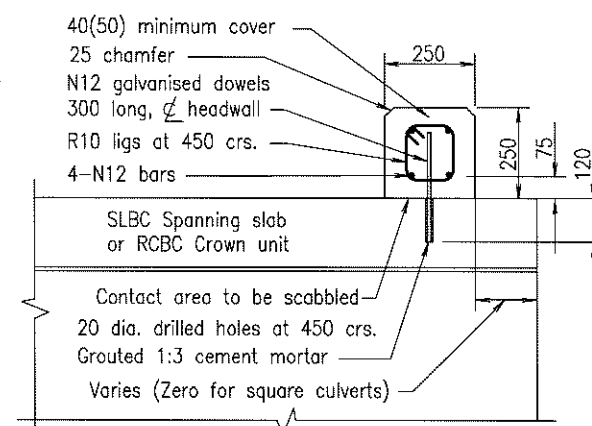


DETAIL A
Scale 1:25

DETAIL B
Scale 1:25



SECTION 1 HEADWALL
Scale 1:20



SECTION 2 HEADWALL
Scale 1:20

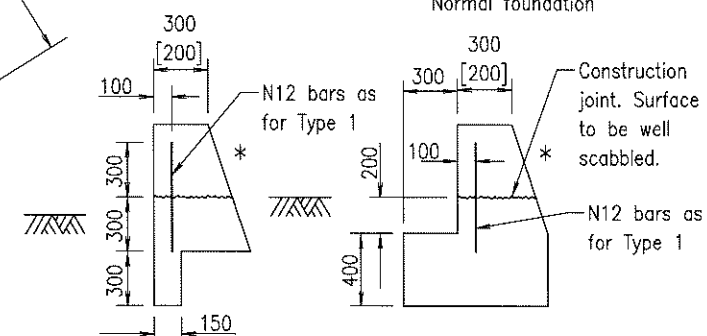
When $H = 750-1800$
When $H = 2100-2400$

* Wingwall slopes

N12 galvanised bars, 600 long, at 400 crs., bonded 300 into base.

[Bend where necessary to maintain min. 50 cover]

TYPE 1
Normal foundation



TYPE 2
With cut-off wall

TYPE 3
With footing - when foundation bearing capacity < 150 kPa

Bars not required if walls are cast without a construction joint

WINGWALL TYPES
Scale 1:40

Dimensions in square brackets [] are when $H = 750 - 1200$

NOTES :

- CONCRETE
Reinforced concrete class N32/20 (N50/20).
Unreinforced concrete class N20/20.
Concrete exposure classification B1.
- STEEL
10 dia. bar to be grade R250N to AS/NZS 4671.
All other bars to be grade D500N to AS/NZS 4671.
- WEEPHOLES of 90 dia. are to be provided at 1200 crs. in wingwalls.
A 300 x 300 x 150 no fines concrete block or approved equivalent is to be provided at each weephole.
- DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS :
Wingwall lengths W1 and W2.
Wingwall type (1, 2 or 3).
Exposure classification treatment (if required).
- EXPOSURE CLASSIFICATIONS - Concrete class and steel cover are shown in curved brackets () for salt-rich arid areas and tidal or splash zones (ie. exposure classification C). Specialist design advice should be obtained for aggressive soils (ie. exposure classification U).
- DIMENSIONS are in millimetres unless shown otherwise.

ASSOCIATED DOCUMENTS :
Department of Main Roads Manual of Standard Drawings Roads
Department of Main Roads Manual of Standard Specifications Roads

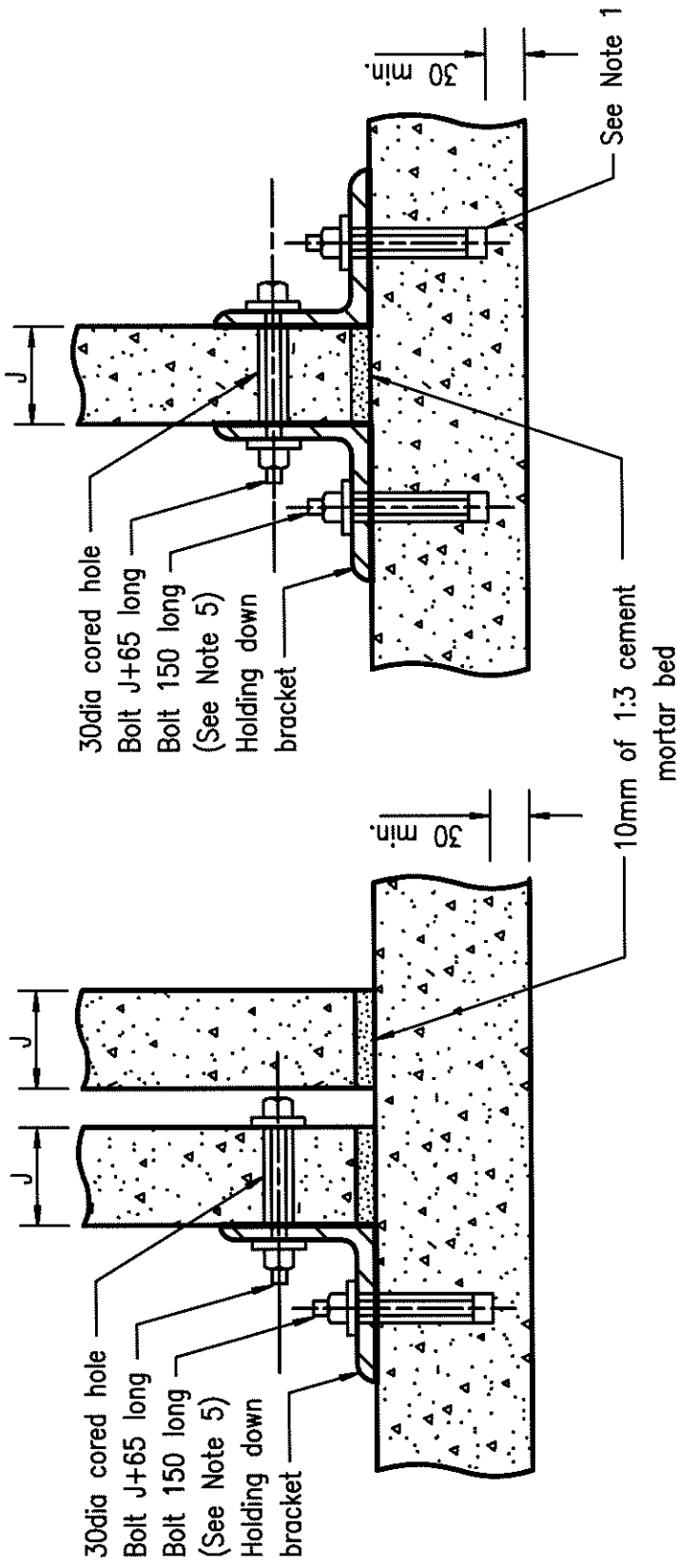
REFERENCED DOCUMENTS :
Standard Drawings :
1316 General Arrangement and Installation of Precast Units
Australian Standards :
AS/NZS 4671 Steel Reinforcing Materials
AS/NZS 4680 Hot-dip Galvanized (Zinc) Coatings on Fabricated Ferrous Articles

R C BOX CULVERTS &
SLAB LINK BOX CULVERTS

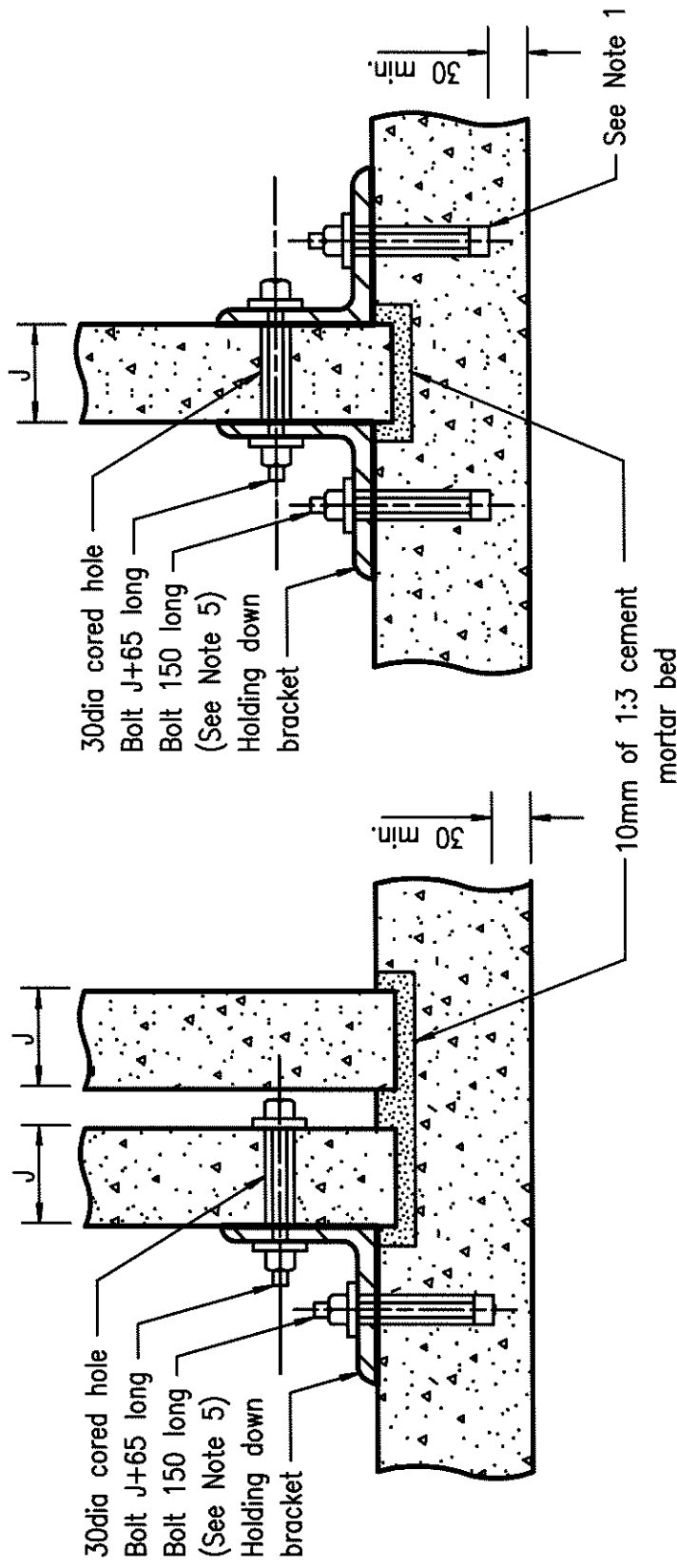
CONSTRUCTION OF
UNREINFORCED WINGWALLS
AND RC HEADWALLS
 $H = 750 - 2400$

Queensland Government
Department of Main Roads

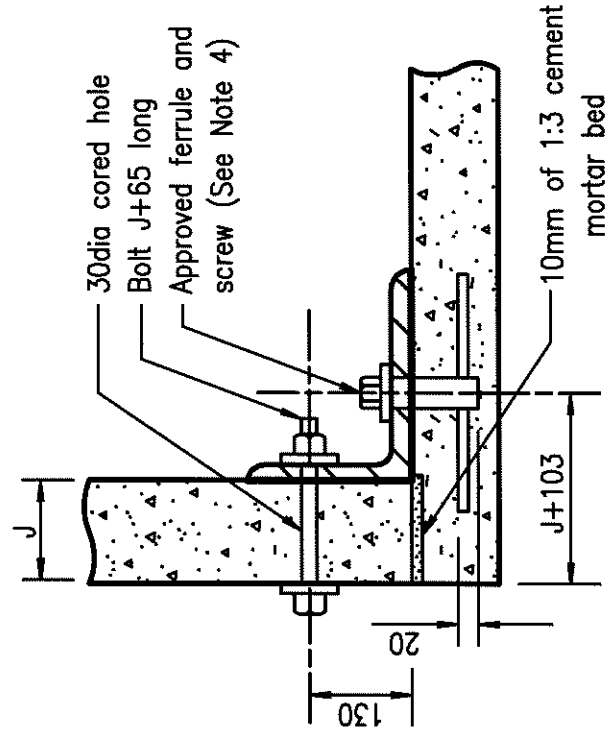
Size A3
Scales
as shown
Drawing No
1319
Date 2/04
F G H I J K L



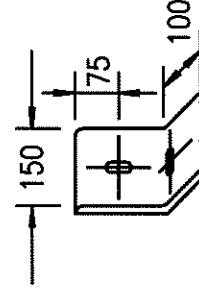
HOLDING DOWN ANCHORS (Bases without recesses)



HOLDING DOWN ANCHORS (Bases with recesses)



PRECAST BASE UNIT



200x200x16 angle with
50x25 slots for bolts,
hot dipped galv. to AS 1650.

HOLDING DOWN BRACKET (N.T.S.)

NOTES:

1. BOLTS - hexagonal bolts and screws M20 grade 4.6 to AS 1111 with M20 nuts and washers grade 5 to AS 1112 and AS 1237, hot dipped galvanised to AS 1214.
2. STEEL BRACKETS shall be Grade 250 to AS 3679.1.
3. BRACKETS to be hot dipped galvanised after fabrication to AS 1650.
4. APPROVED MILD STEEL FERRULE with cross bar for use in precast base slabs :
(a) length 65, thread depth 32, for P.C. base slabs 80 thick or greater.
(b) to take hexagonal screw M20 x 45 to AS 1111.
(c) cross holed to take 12 x 250 M.S. bar.
(d) ferrule and cross bar to be hot dipped galvanised to AS 1214.
(e) ferrule located 300 from ends to match cored holes in crown units. (if precast base slabs are less than 80 thick, the ferrule length, thread depth and screw length are to be reduced in order to maintain clear cover of 15.)
5. HOLDING DOWN BOLTS to be placed in drilled 30dia holes and grouted with 1:2 cement sand grout after placing crowns.
6. DIMENSIONS are to be in millimetres unless shown otherwise.

ASSOCIATED DOCUMENTS :

1. Department of Main Roads Manual of Standard Specifications Roads.
2. Department of Main Roads Manual of Standard Drawings Roads.

REFERENCED DOCUMENTS:

Australian Standards:

- AS 1111 ISO Metric Hexagon Commercial Bolts and Screws
- AS 1112 ISO Metric Hexagon Nuts, Including Thin Nuts, Slotted Nuts and Castle Nuts
- AS 1214 Hot-Dip Galvanized Coatings on Threaded Fasteners (ISO metric coarse thread series)
- AS 1237 Flat Metal Washers for General Engineering Purposes (metric series)
- AS 1650 Hot-Dipped Galvanized Coatings on Ferrous Articles
- AS 3679.1 Hot-Rolled Bars and Sections

R C BOX CULVERTS & SLAB LINK BOX CULVERTS

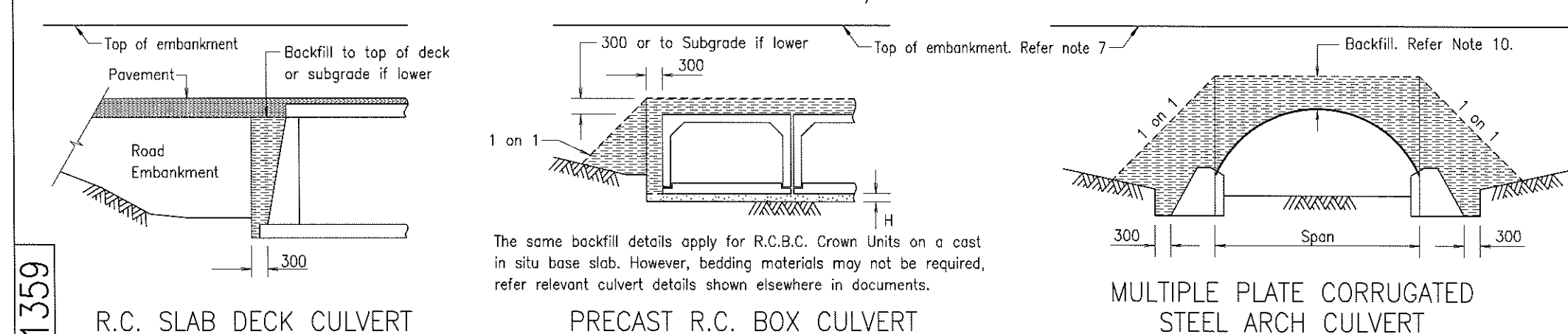
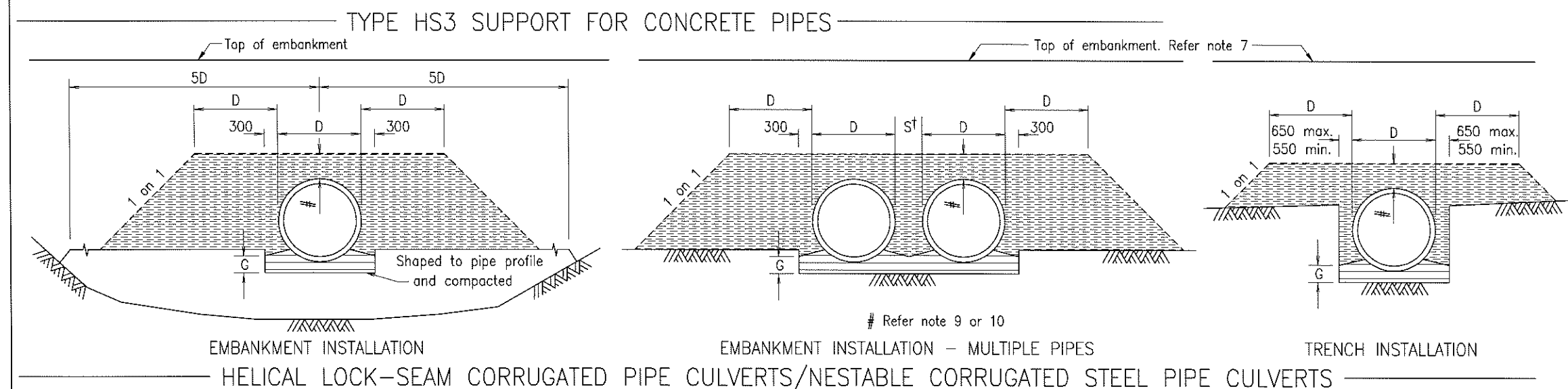
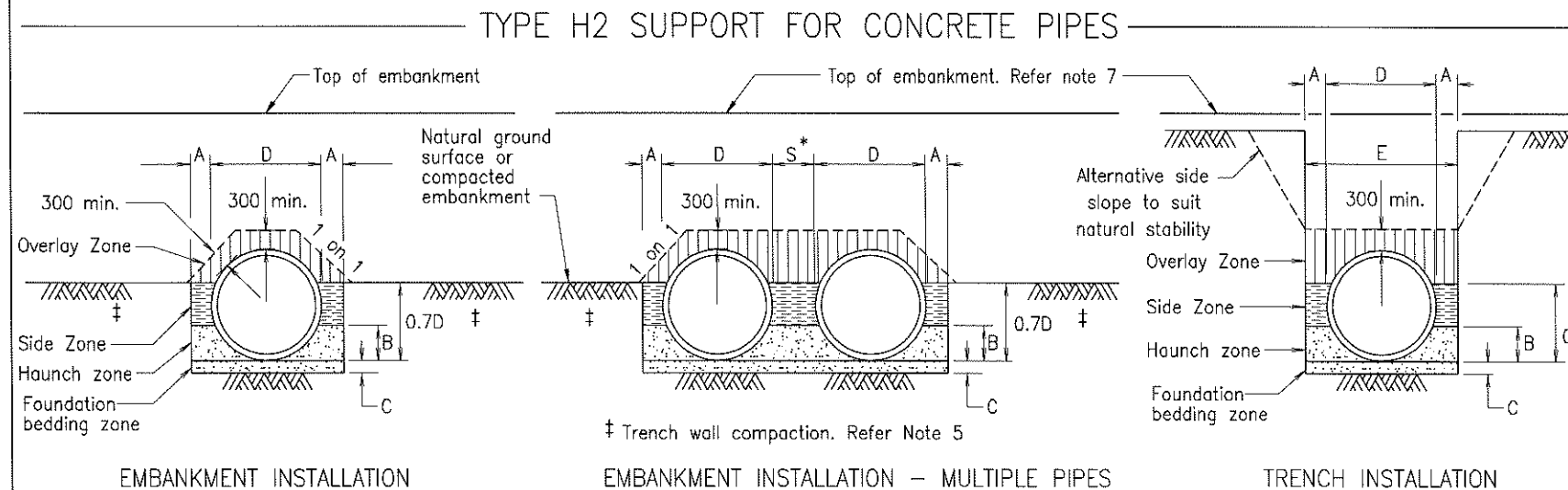
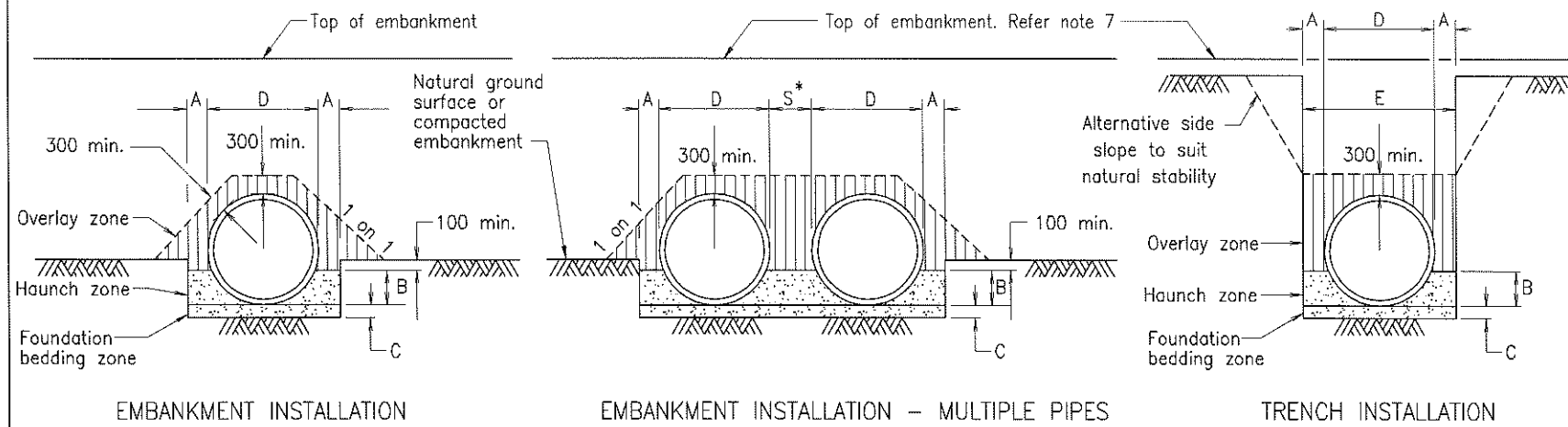
MR Main Roads

Size A4
Scales
as
shown

Drawing No
1320
Date 10/96

A B

CROWN UNIT HOLDING DOWN ANCHORS



NOMINAL INTERNAL DIAMETER, ID(mm)	MINIMUM WIDTH, A (mm)	HAUNCH DEPTH, B (0.3 x D mm)	MAXIMUM ALLOWABLE WIDTH, E(m) TRENCH INSTALLATION
300	300	110	1.1
375	300	135	1.2
450	300	160	1.3
525	300	180	1.5
600	300	205	1.6
750	450	255	1.8
900	450	310	1.9
1050	450	360	2.1
1200	450	405	2.2
1350	450	450	2.4
1500	500	505	2.7
1650	500	550	2.9
1800	500	600	3.1
1950	500	665	3.3
2100	500	715	3.5
2400	600	810	4.2
2700	600	910	4.6
3000	700	1005	5.0

LEGEND:

Overlay material	
Fill/Backfill material	
Foundation Bedding/Haunch material	
R.C. Pipes and R.C. Box Culverts	
Foundation Bedding material	
Corrugated Steel Pipes	

NOTES :

- "D" denotes external diameter of culvert.
- FOUNDATION BEDDING
 - R.C. Pipes
 - 100 if ID < 1350
 - 150 if ID ≥ 1350
 - Corrugated Steel Culverts
 - 100 in firm material other than rock
 - $\frac{D}{4}$ or 250 whichever ever the lesser in rock
 - Precast Box Culverts
 - 75 min. in firm material other than rock
 - 150 min. in rock
- SPACING BETWEEN MULTIPLE CULVERTS
 - R.C. Pipes
 - 300 when nominal ID ≤ 600
 - 600 when nominal ID > 600 and ≤ 1800
 - 900 when nominal ID > 1800
 - Corrugated Steel Culverts
 - Nestable Culverts :
 - $\frac{Dia}{2}$ or 300 min.
 - Helical Lock-seam Culvert :
 - 300 (when nominal ID ≤ 600)
 - $\frac{Dia}{2}$ (when nominal ID > 600 and ≤ 1800)
 - 1200 (when nominal ID > 1800)
 - Plate Culverts :
 - $\frac{Dia \text{ (or span)}}{2}$ or 1200 max.
- WINGWALLS fill/backfill material shall be placed 300mm thick behind wingwalls for the length and height of the wings.
- TRENCH WALL COMPACTION of natural ground or embankment Minimum 90% Standard RDD for minimum 2.5D each side of trench wall and to a minimum depth of 0.7D.
- DETAILS TO BE SHOWN ELSEWHERE IN THE DOCUMENTS concrete pipe support type.
- WORKING LOADS are those due to fill material and standard highway vehicles as per AS 3725. Allowance for construction loads shall comply with standard specification MRS11.03.
- MINIMUM DEPTH OF OVERLAY ZONE above pipes/culverts as shown may include pavement. Pavement within this area to be compacted by hand or alternatively a lean mix concrete pavement layer may be used.
- HELICAL LOCK-SEAM CORRUGATED PIPE CULVERTS MINIMUM COVER:

Diameter	Minimum Cover
≤ 1200mm	600mm
> 1200mm	$\frac{Diameter}{2}$
- NESTABLE AND MULTIPLE PLATE CORRUGATED STEEL CULVERTS: Minimum cover shall be 600mm or Diameter or Span whichever is the greater.

- DIMENSIONS are in millimetres unless shown otherwise.
- ASSOCIATED DOCUMENTS :
- Department of Main Roads Manual of Standard Drawings Roads
- Department of Main Roads Manual of Standard Specifications Roads
- REFERENCED DOCUMENTS :
- Australian Standards :
- AS 3725 Loads on Buried Concrete Pipes
- Standard Specifications :
- MRS11.03 Drainage, Retaining Structures and Protective Treatments
- MRS11.04 General Earthworks

CULVERTS		Queensland Government Department of Main Roads	
INSTALLATION, BEDDING AND FILLING/BACKFILLING AGAINST/ OVER CULVERTS	Size A3	Drawing No 1359	
	Scales	Date 10/03	
	as shown	A B C D E	