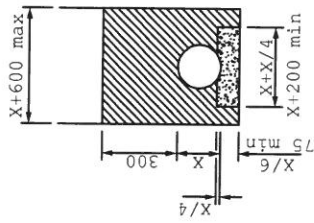
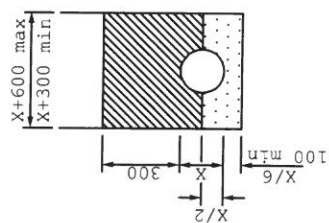


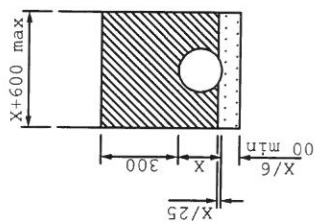
TYPE Z



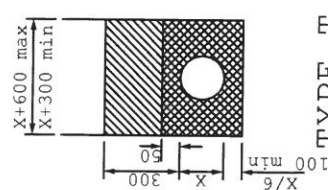
TYPE A (120°)



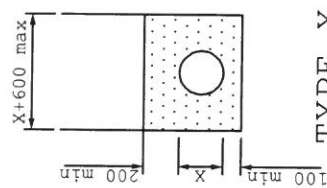
TYPE B (180°)



TYPE F (46°)



TYPE T



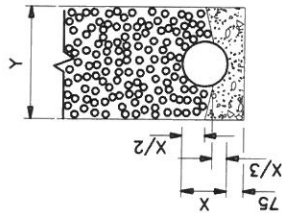
TYPE X

NOTES

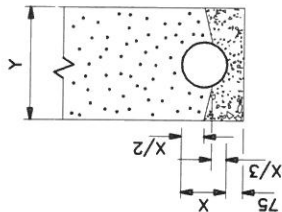
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. This drawing is to be read in conjunction with Appendix 5/1.
3. Dimension X is the external diameter of the pipe.
4. The minimum or maximum width of the trench applies on and below a line 300mm above the outside top of the pipe. Above the 300mm line the trench backfill material shall be as described in Clause 505 of SHW.
5. The concrete bed or surround may extend to the sides of the trench or be of minimum width. Class 8 material is to be used to fill any voids so formed.
6. For Type Z trench the concrete cover may be formed to a radius batter or horizontal surface. Minimum cover of concrete shall be 150.

KEY

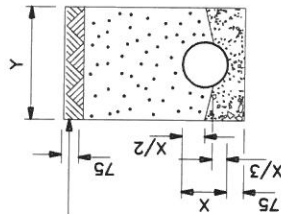
- Granular material to S.H.W. Clause 503.3(i).
- Concrete to S.H.W. Clause 503.3(iii).
- Material to S.H.W. Clause 503.3(ii). e.g. sand.
- Class 8 material to S.H.W. Clause 503.3(iv).



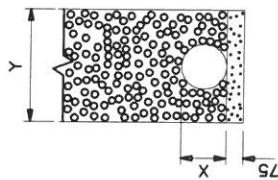
TYPE G



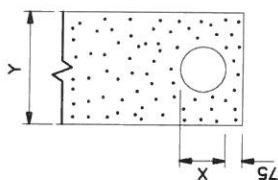
TYPE J



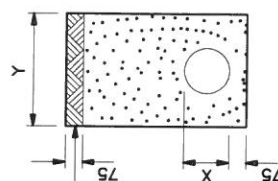
TYPE L



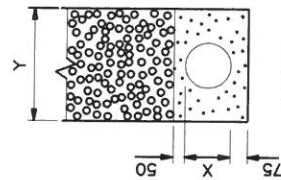
TYPE H



TYPE K



TYPE M



TYPE I

KEY

Type A or C filter material to S.H.W. Clause 505 or granular material to S.H.W. Clause 503.3(i).

Type B filter material to S.H.W. Clause 505.

ST2 concrete to S.H.W. Clause 2602.

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Dimension X is the external diameter of the pipe.
3. This drawing is to be read in conjunction with Appendix 5/1
4. For details of section of the drain at surface level refer to the 'B' series of drawings.
5. Pipes shall comply with the requirements for filter drain pipes in Table 5/1 of the S.H.W.
6. Pipes are to be laid with slots or perforations upwards where a concrete bed is used. For other beds the slots shall be orientated as described in Appendix 5/1.
7. Minimum drain width
Y = X+300 for drains not exceeding 1.5m cover below finished level.
Y = X+450 for drains exceeding 1.5m cover below finished level.

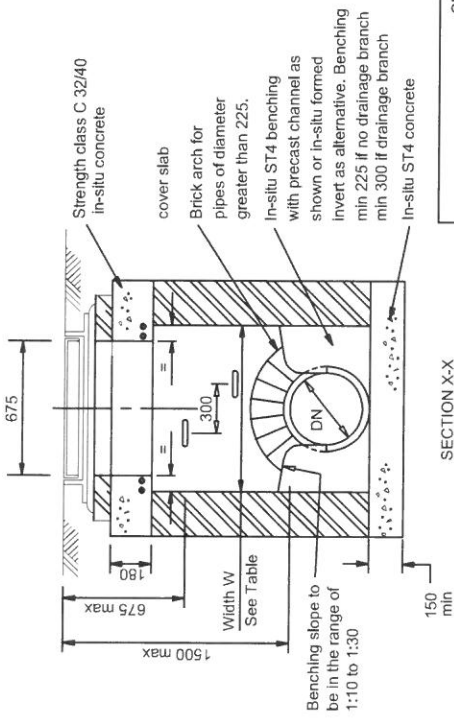
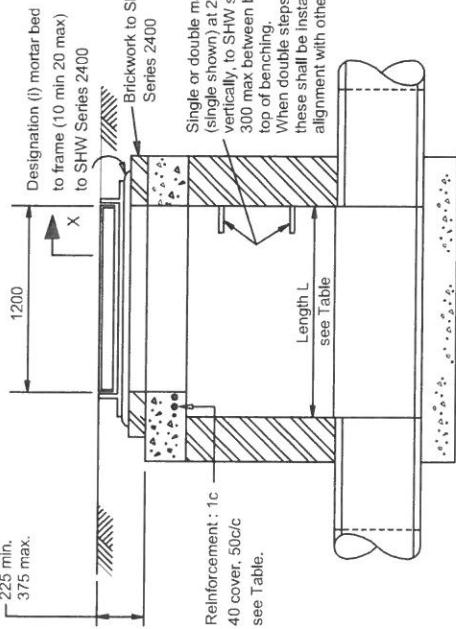
HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

FILTER DRAINS –
TRENCH AND BEDDING DETAILS

Drawing No.

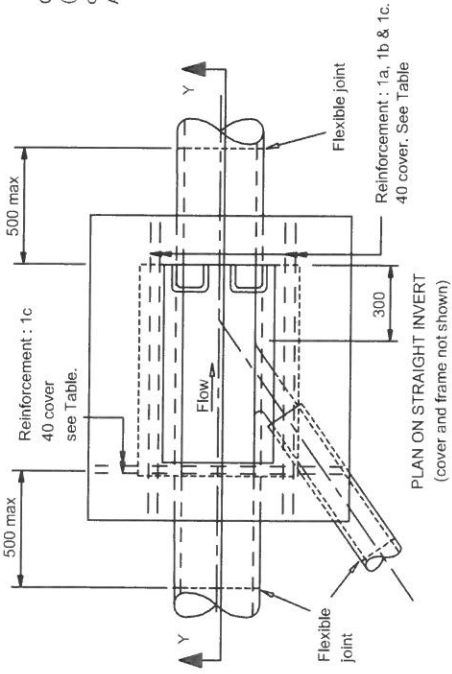
F2



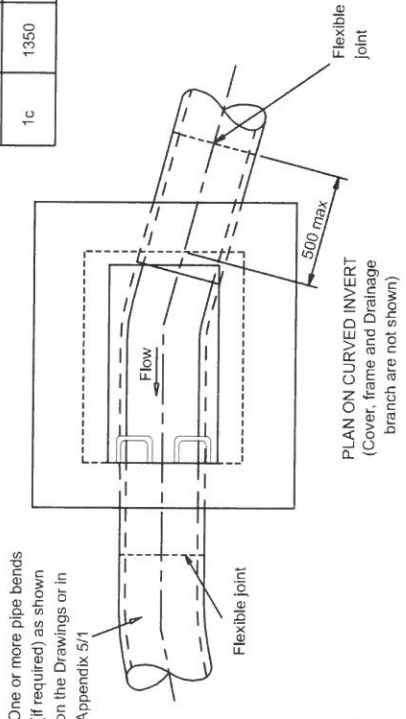
SECTION X-X

SECTION Y-Y

CHAMBER SUB-TYPE				
Sub-Type	Length L	Width W	Max. Pipe DN	Max. No. of Branches
1a	1200	750	225	1 on either side
1b	1200	825	300	1 on either side
1c	1350	975	450	1 on either side
				Reinforcement T20 bars at 50 c/c
				2 bars 1550 long
				4 bars 1550 long
				6 bars 1700 long
				3 bars 1325 long



PLAN ON STRAIGHT INVERT
(cover and frame not shown)



PLAN ON CURVED INVERT
(Cover, frame and Drainage branch are not shown)

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Chamber walls 225 thick to be constructed in class B clay engineering bricks to SHW Series 2400 in designation (i) mortar or in-situ ST4 concrete to SHW, Clause 2602.
3. For details of pipe size(s), invert level(s) and type of cover and frame, see Drawings and Appendix 5/1.
4. See SHW, sub-Clause 507.7 regarding backfilling/surround to chamber.

FOR PIPES 450 MAX. DIAMETER
MAX. DEPTH 1500 + PIPE DIAMETER

HIGHWAY CONSTRUCTION DETAILS

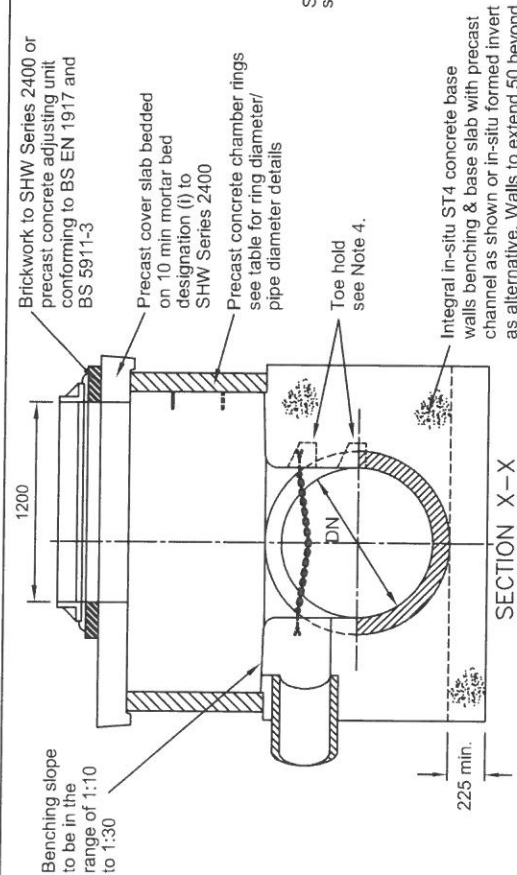
DRAINAGE

TYPE 1 CHAMBER
(BRICK OR IN-SITU CONCRETE
MANHOLE)

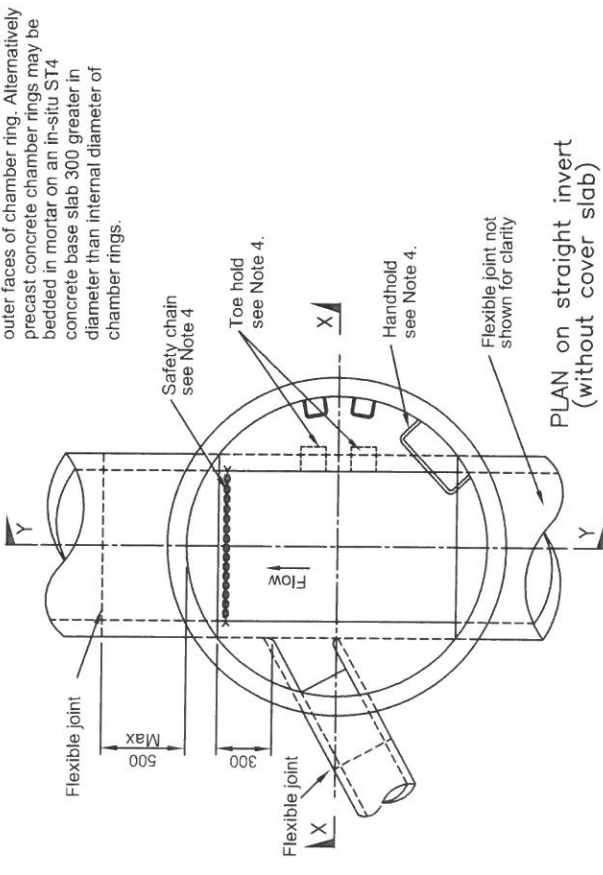
Issue	Date
E	MAY 06
D	NOV 03
C	MAY 01
B	AUG 94
A	DEC 91

Drawing No.

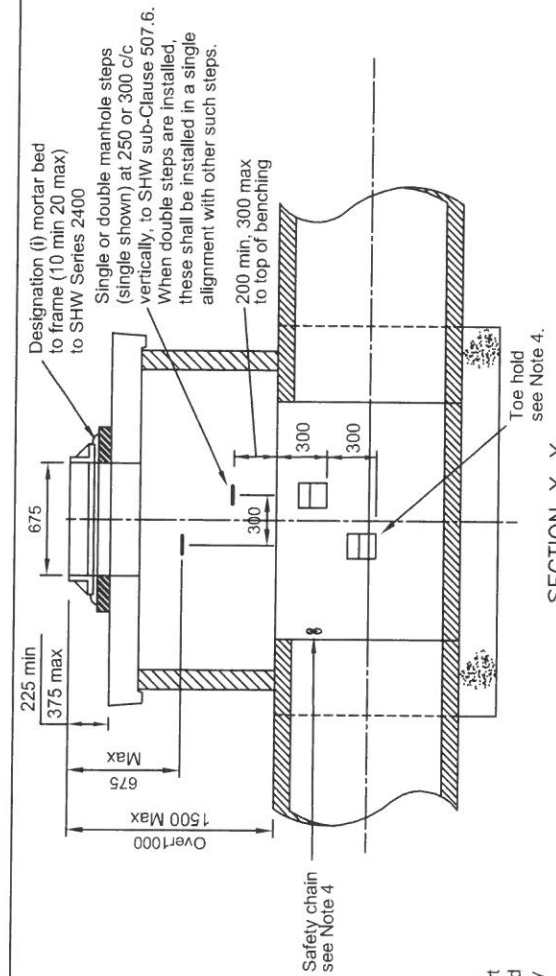
F3



SECTION X-X



PLAN on straight invert
(without cover slab)



SECTION Y-Y

- NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Chamber walls and cover slab to be constructed in precast concrete to BS EN 1917 and BS 5911-3.
 3. For details of pipe size(s), invert level(s) and type of cover and frame, see Drawings and Appendix 5/1.
 4. Safety chain required where outfall pipe is 600 diameter or greater. Toe hold and handhold required where outfall pipe is 500 diameter or greater.
 - For details of safety chain and handhold see Drawing Number F10.
 - For details of toe hold see Drawing Number F28.
 5. See SHW regarding backfilling/surround to chamber.
 6. All ST concrete shall be to SHW, Clause 2602.

Chamber Sub-Type			
Sub-Type	Minimum Chamber Ring dia.	Max. Pipe DN	Maximum No. of Branches
2a	1500	700	1
2b	1800	900	1

FOR PIPES 450+ TO 900 DIAMETER
DEPTH 1000+ TO 1500
+ PIPE DIAMETER

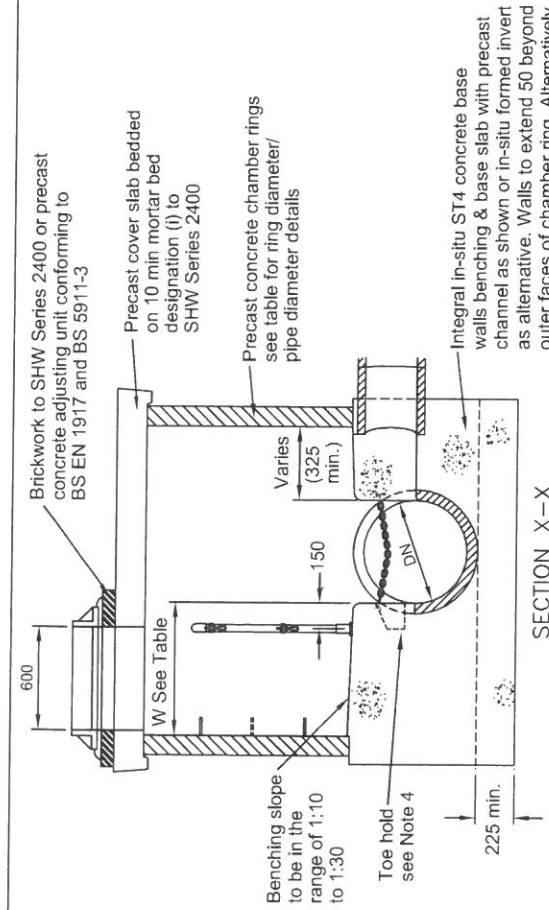
Issue	Date
E	MAY 06
D	NOV 04
C	NOV 03
B	MAY 01
A	DEC 91

DRAINAGE

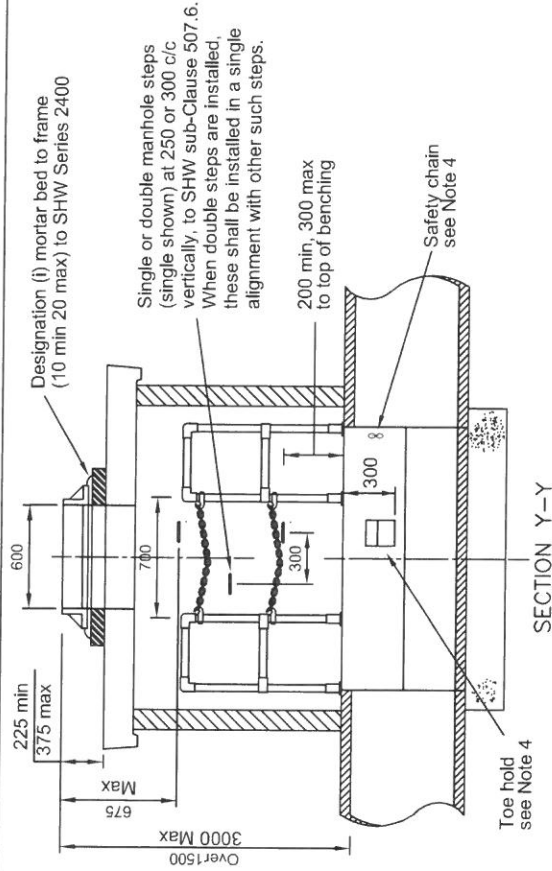
HIGHWAY CONSTRUCTION DETAILS

**TYPE 2 CHAMBER
(PRECAST CONCRETE MANHOLE)**

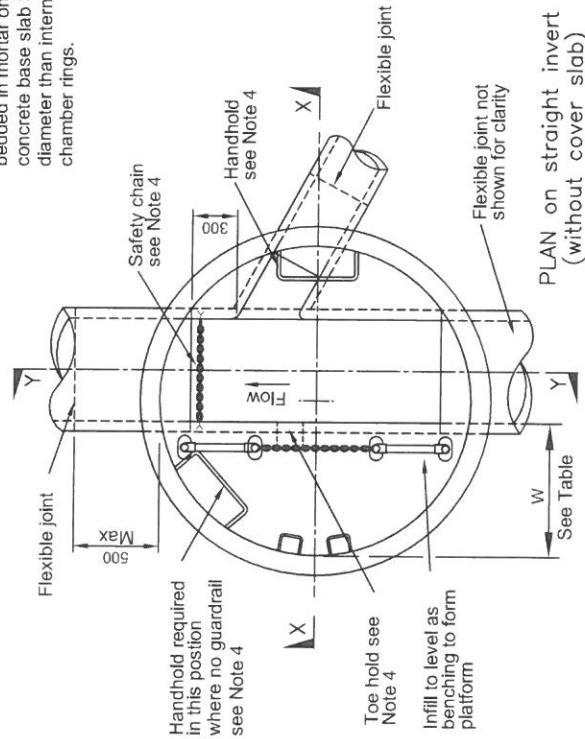
Drawing No.
F4



SECTION X-X



SECTION Y-Y



HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

FOR PIPES 900 MAX.
DIAMETER. DEPTH 1500+ TO
3000 + PIPE DIAMETER

Issue	Date
F	MAY 06
E	NOV 04
D	NOV 03
C	MAY 01
B	AUG 94
A	DEC 91

- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Chamber walls and cover slab to be constructed in precast concrete to BS EN 1917 and BS 5911-3.
 3. For details of pipe size(s), invert level(s) and type of cover and frame, see Drawings and Appendix 5/1.
 4. Safety chain and guardrail required where outfall pipe is 600 diameter or greater.
Toe hold and handhold required where outfall pipe is 500 diameter or greater.
For details of safety chain and handhold see Drawing Number F10.
For details of guardrail and toe hold see Drawing Number F28.
 5. See SHW regarding backfilling/surround to chamber.
 6. All ST concrete shall be to SHW, Clause 2602.

Chamber Sub-Type			
Sub-Type	Minimum Chamber Ring dia.	Max. Pipe DN	Maximum No. of Branches
3a	1200	300	1
3b	1500	450	1
3c	1800	700	1
3d	2100	900	1
			W
			575
			575
			775
			875

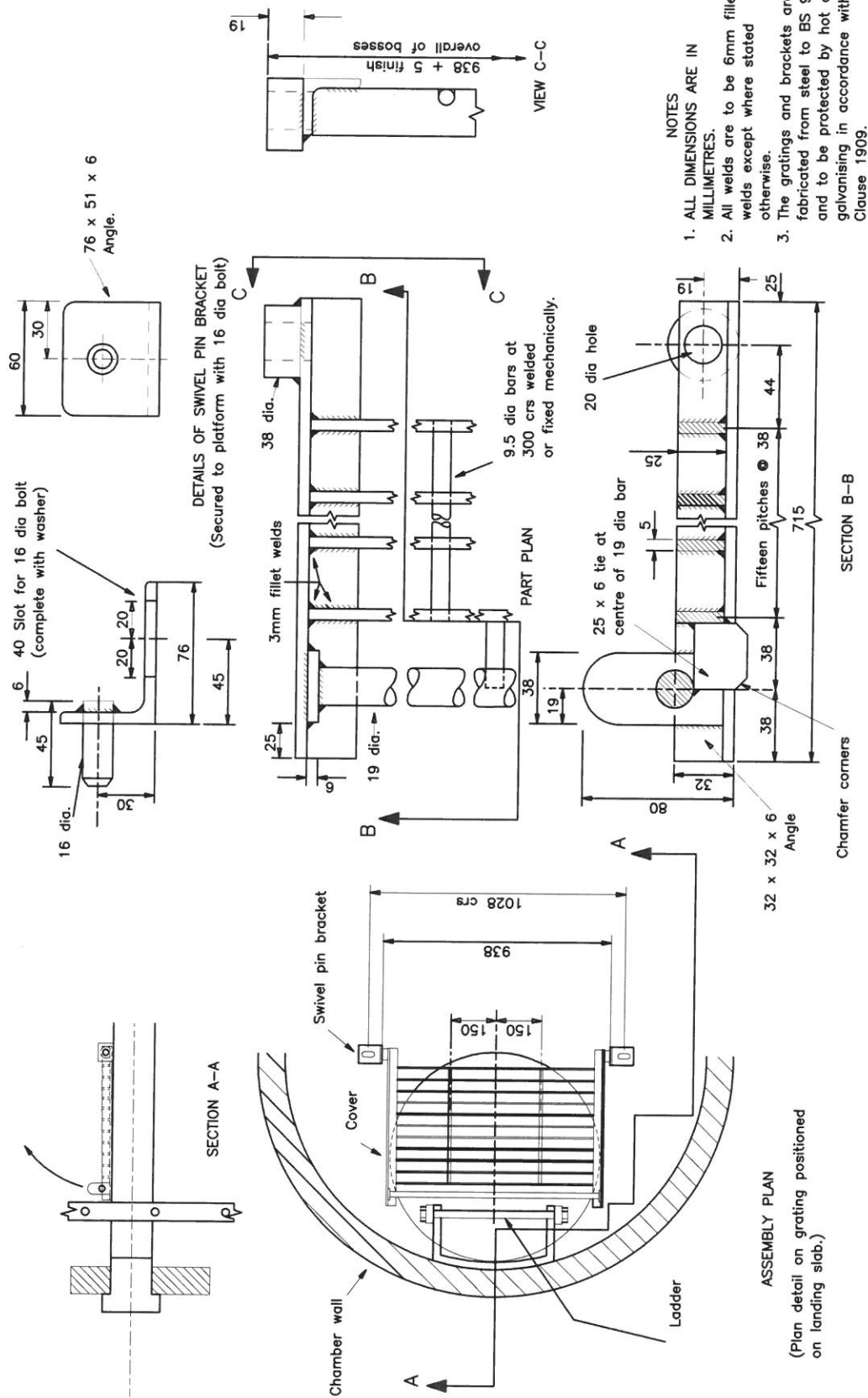
TYPE 3 CHAMBER
(PRECAST CONCRETE MANHOLE)

Drawing No.

F5

PLAN ON STRAIGHT INVERT
(Below reducing slab)

F8 not used



HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

TYPE 5 CHAMBER
GRATING DETAILS

Drawing No.

F9

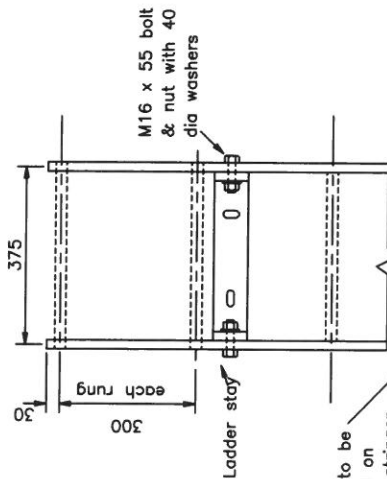
B MAY 01

A DEC 91

Issue Date

M16 stainless steel bolt with 100 x 100 x 20 & 40 dia washers.

(bolt length shall be sufficient to ensure that nuts are full-threaded when tightened in their final position)



Holes to be slotted on inside stringer overall length 31

M16 x 55 bolts & nuts with 34 dia x 3 thk washers

Chamber ring

Isolating washer

Radius of chamber ring

Four slotted holes for 16 dia stainless steel bolts

20

315

20

10

100 min 200 max

10 dia

HOOK

EYE

DETAILS OF HOOK & EYE FOR SAFETY CHAIN

PLAN

ELEVATION

End of pipe

50

130

20

100 min 200 max

10 dia

HOOK

EYE

130

20

100 min 200 max

10 dia

HOOK

EYE

130

20

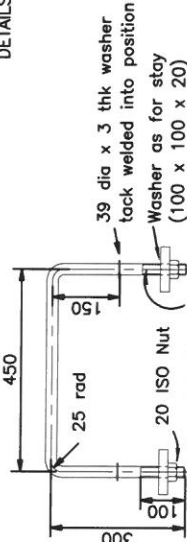
100 min 200 max

10 dia

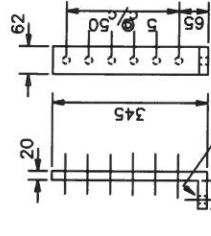
HOOK

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Unless otherwise stated, all fittings to be fabricated from steel to BS 970 : Part 1 and to be protected by hot dip galvanising in accordance with SHW Clause 1909.
3. Threaded components to be galvanised.
4. All welds are to be 6 mm fillet welds.
5. Ladder to be fabricated in one length for Type 4 chambers.
6. Chain hook & eye to be supplied with 10 dia. closed link chain of length to suit pipe dia.
7. Handhold at height 1500 max to invert 500 min to top of benching.
8. Stainless steel bolts, nuts and washers shall to BS EN 10088-1, designation 1.4401. Isolating washers shall be used between stainless steel bolts and galvanised fittings.

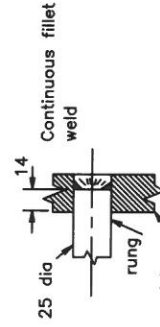


DETAILS OF HANDHOLD



DETAIL OF FIXING RUNGS TO STRINGERS

ADJUSTABLE LADDER FOOT



HIGHWAY CONSTRUCTION DETAILS

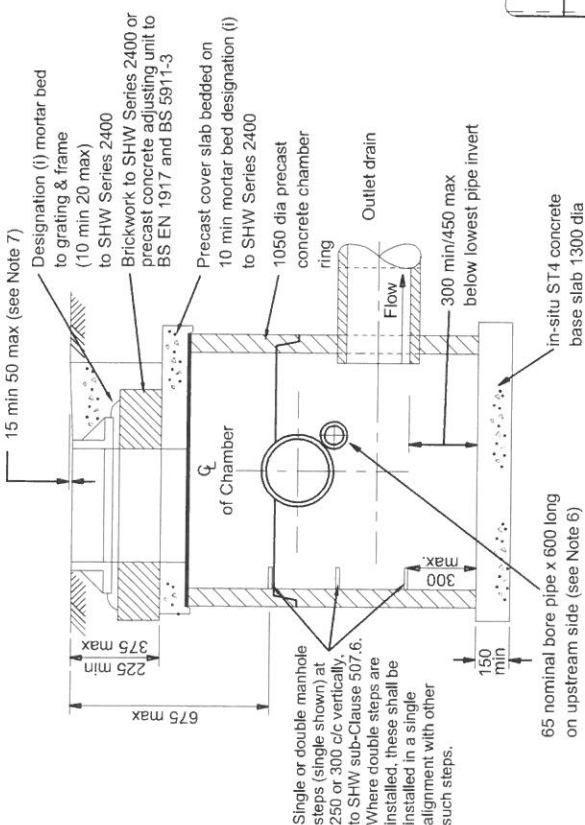
DRAINAGE

CHAMBER FITTINGS - LADDER, HANDHOLD AND SAFETY CHAIN

Drawing No.

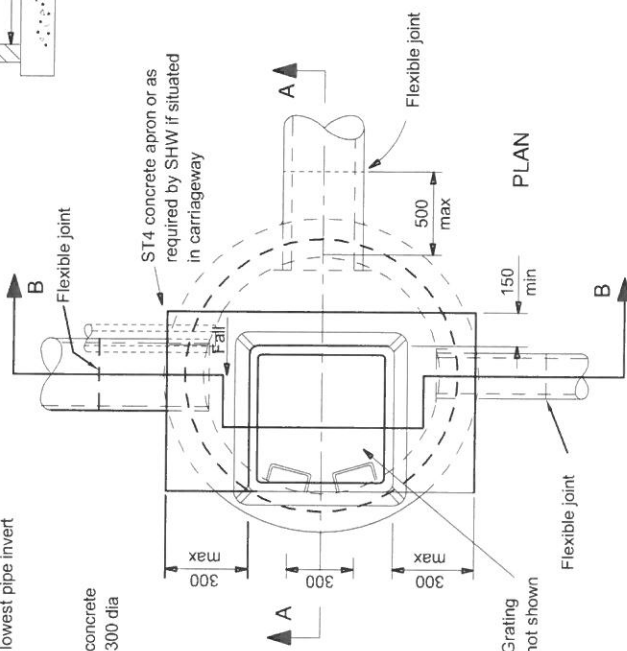
F10

Issue	Date
C	NOV 03
B	MAY 01
A	DEC 91



SECTION B-B

SECTION A-A



PLAN

- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Catchpit to be constructed in precast concrete to BS EN 1917 and BS 5911-3.
 3. Invert details, number of branches and type of gully top are shown on the Drawings and Appendix 5/1.
 4. Mortar to be designation (i) to SHW Series 2400.
 5. Pipes to be built into the catchpit with designation (i) mortar are shown on the Drawings and Appendix 5/1.
 6. Pipe to be built into catchpit to drain lower portion of trench. Pipe is to be placed above any concrete bed to filter drain.
 7. The gully top is to be set as dimensioned below the adjacent:
 - a) hard shoulder (for verges)
 - b) hard strip (for dual 2 central reserve)
 - c) finished level in other locations.
 8. See SHW, sub-Clause 507.7 regarding backfilling/surround to chamber.
 9. All ST concrete shall be to SHW, Clause 250

F	MAY 06
E	NOV 04
D	NOV 03
C	MAY 01
B	APR 94
A	DEC 91
Issue	Date

FOR PIPES 450 MAX. DIAMETER

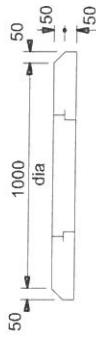
TYPE 7 CHAMBER
(1050 CATCHPIT)

DRAINAGE

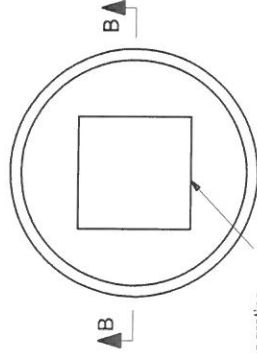
HIGHWAY CONSTRUCTION DETAILS

Drawing No.

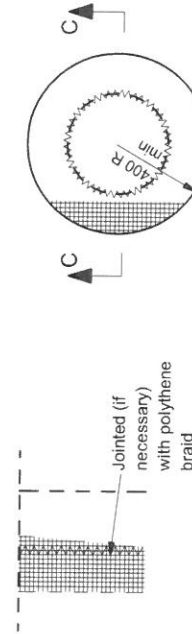
F11



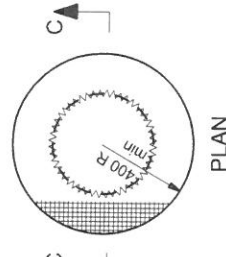
SECTION B-B



DETAILS OF COVER SLAB

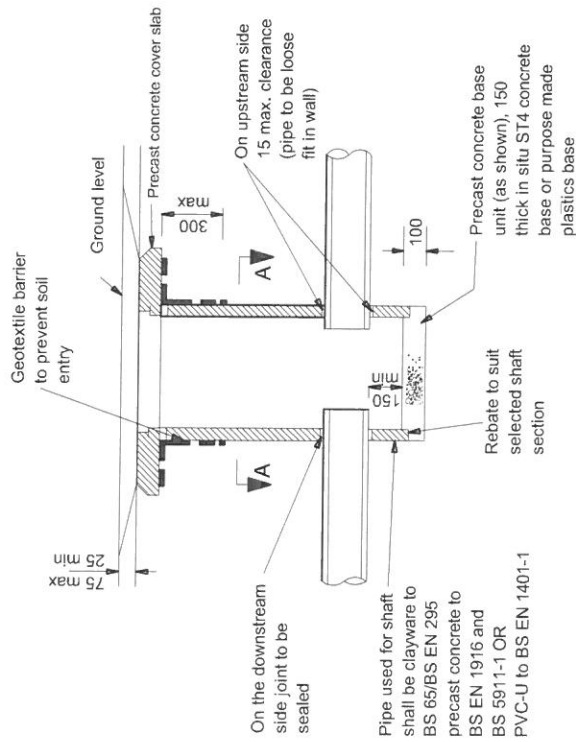


SECTION C-C

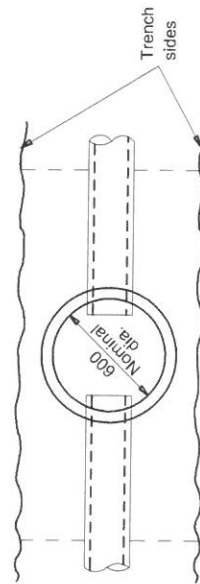


PLAN

DETAILS OF GEOTEXTILE BARRIER



SECTION THROUGH CATCHPIT



SECTION A-A

NOTE

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Gully top shall comply with BS EN 124 unless otherwise stated in Appendix 5/1. Grating to have minimum waterway area of 0.125 m² and to withstand BS EN 124 test load, described in Appendix 5/1.
3. Invert details are shown on the Drawings or Appendix 5/1.
4. Purpose made plastics upper sections with pre-fitted gratings to Note 2 may be used. Plastics upper sections shall be surrounded with ST4 concrete to SHW, Clause 2602. Dimensions shown for precast slab. Sub-Clause 507.15 of the SHW need not be applied.

Issue	Date
F	MAY 06
E	NOV 04
D	NOV 03
C	MAY 01
B	MAR 98
A	DEC 91

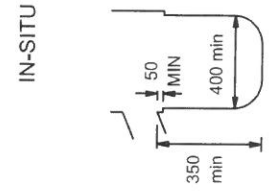
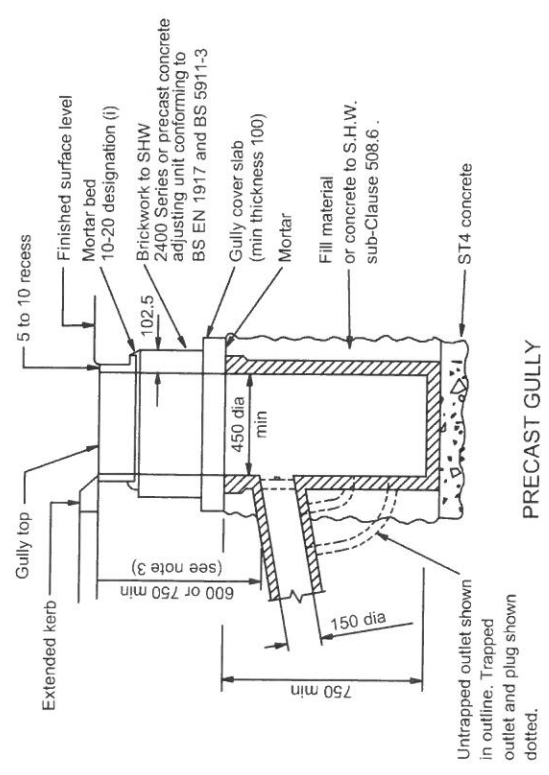
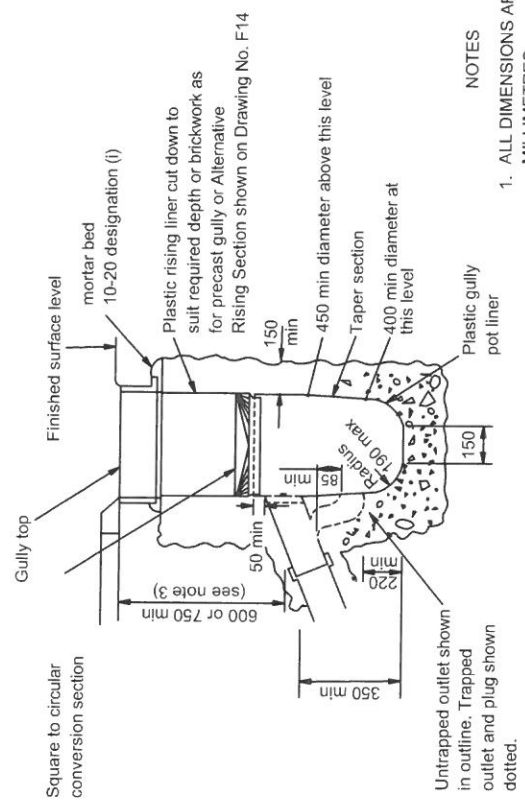
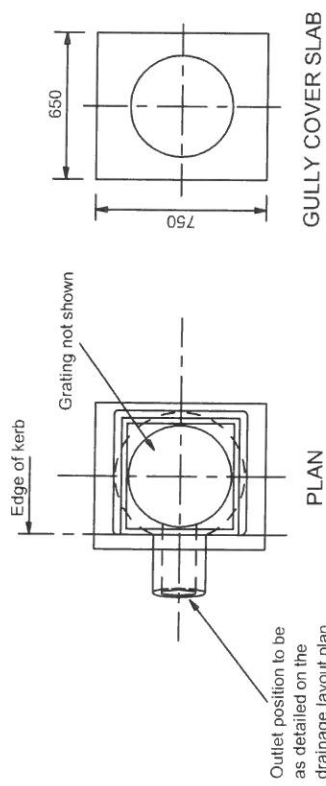
HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

TYPE 8 CHAMBER
(600 CATCHPIT)

Drawing No.

F12



IN-SITU CAST GULLY

ALTERNATIVE IN-SITU CAST SUMP (PARALLEL SIDES)

- NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. For details of gully top, see Appendix 5/1.
 3. The minimum depth from the top of the grating to the top of the gully outlet is to be 750 when the connecting pipe is under a carriageway or a hard shoulder and 600 elsewhere.
 4. Precast concrete gullies and cover slabs shall be to BS 5911-6.
 5. When an in-situ cast gully has a trap, the stoppers shall comply with the requirements of BS 5911-4 and BS EN 1917.
 6. Alternative rising section shown on Drawing No. F14 may be used.
 7. All ST concrete shall be to SHW, Clause 2602.

HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

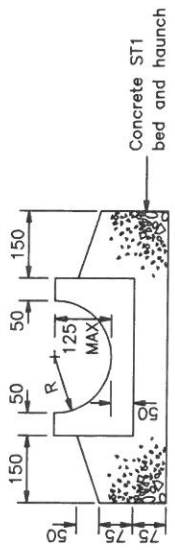
PRECAST AND IN-SITU CAST GULLIES

Issue	Date
E	MAY 06
D	MAY 05
C	NOV 03
B	MAR 98
A	DEC 91

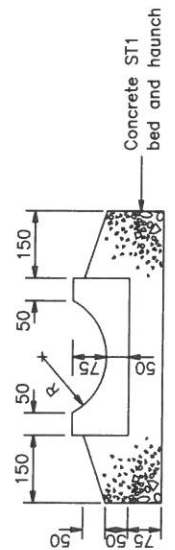
Drawing No.

F13

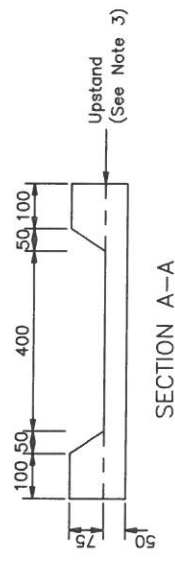
F14



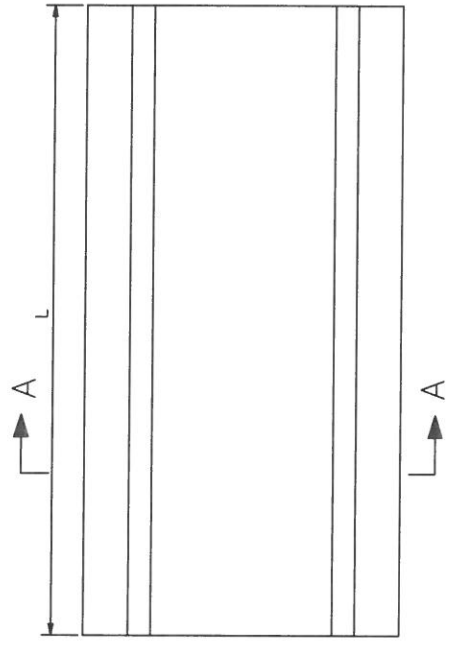
DRAINAGE CHANNEL BLOCK
TYPE A



DRAINAGE CHANNEL BLOCK
TYPE B



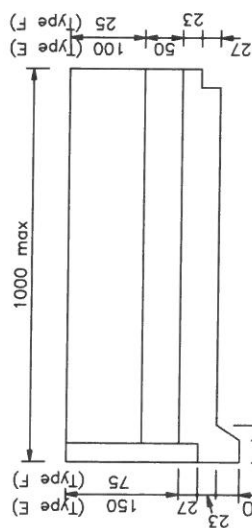
SECTION A-A



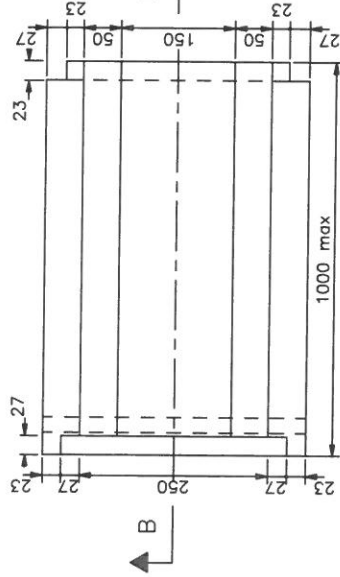
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Dimensions R & L shall be as described in Appendix 5/3.
3. Drainage channel blocks to be made of pressed concrete to BS EN 1340 or extruded in situ. For blocks Type C the upstand may be in situ concrete or the kerb type used for the carriageway.
4. All ST concrete shall be to SHW, Clause 2602.

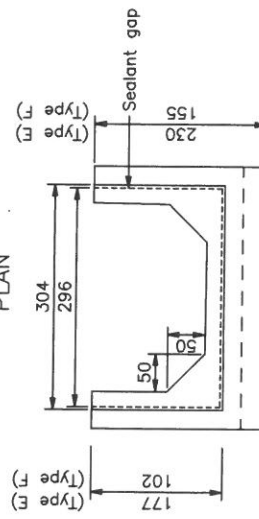
HIGHWAY CONSTRUCTION DETAILS	DRAINAGE	DRAINAGE CHANNEL BLOCKS TYPES A, B AND C				Drawing No.
		C	NOV 04			F15
		B	NOV 03			
		A	DEC 91			
		Issue	Date			



SECTION B-B

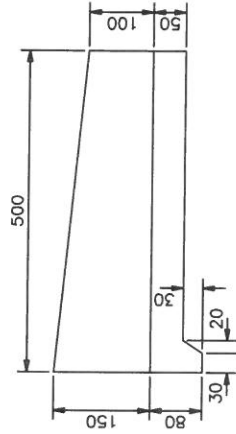


PLAN

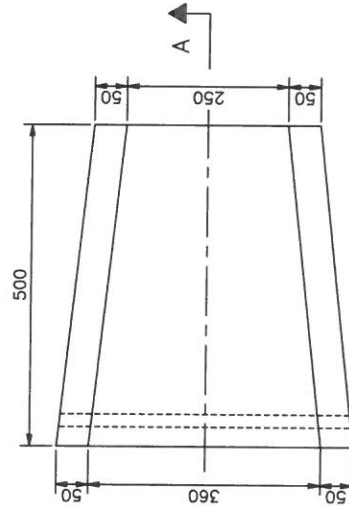


END VIEW

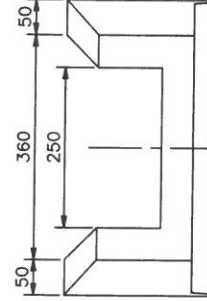
TYPE E & F Channel Block



SECTION A-A

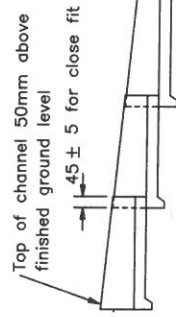


PLAN

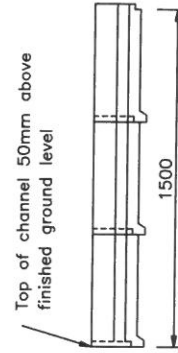


END VIEW

TYPE D Channel Block



ASSEMBLED TYPE D BLOCKS



ASSEMBLED TYPE E & F BLOCKS

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Blocks to be made of pressed concrete to BS EN 1340.

HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

DRAINAGE CHANNEL BLOCKS
TYPES D, E AND F

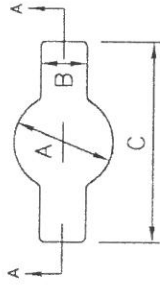
Drawing No.

F16

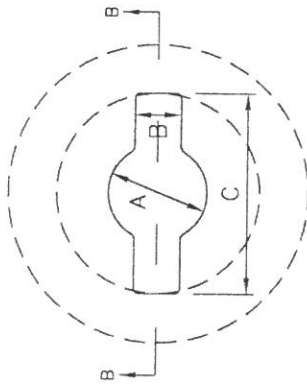
B	NOV 04
A	DEC 91
Issue	Date

KEYWAYS:

Open



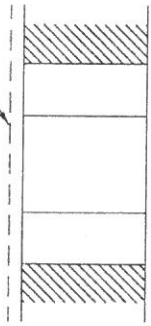
Closed



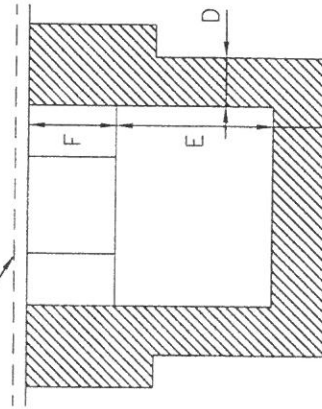
Plan

Plan

Line of raised pattern

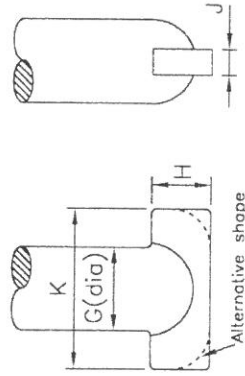


SECTION AA



SECTION BB

KEYS:



Type	Keyway		Key							
	A	B	C	D	E	F	G	H	J	K
Small	min./max.	min./max.	min.	min.	min.	min.				
	14-16	9-11	29	6	17	6	12	12	6	25
Large	22-25	9-13	44	6	35	10				
							20	15	6	40

All dimensions in millimetres.
NOTE: Small key for class B125 and kerb-type gully tops; large key for class D400 and class C250 covers.

HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

DETAIL OF KEYWAYS AND KEYS
FOR MANHOLE TOPS AND
KERB TYPE GULLY TOPS

Drawing No.

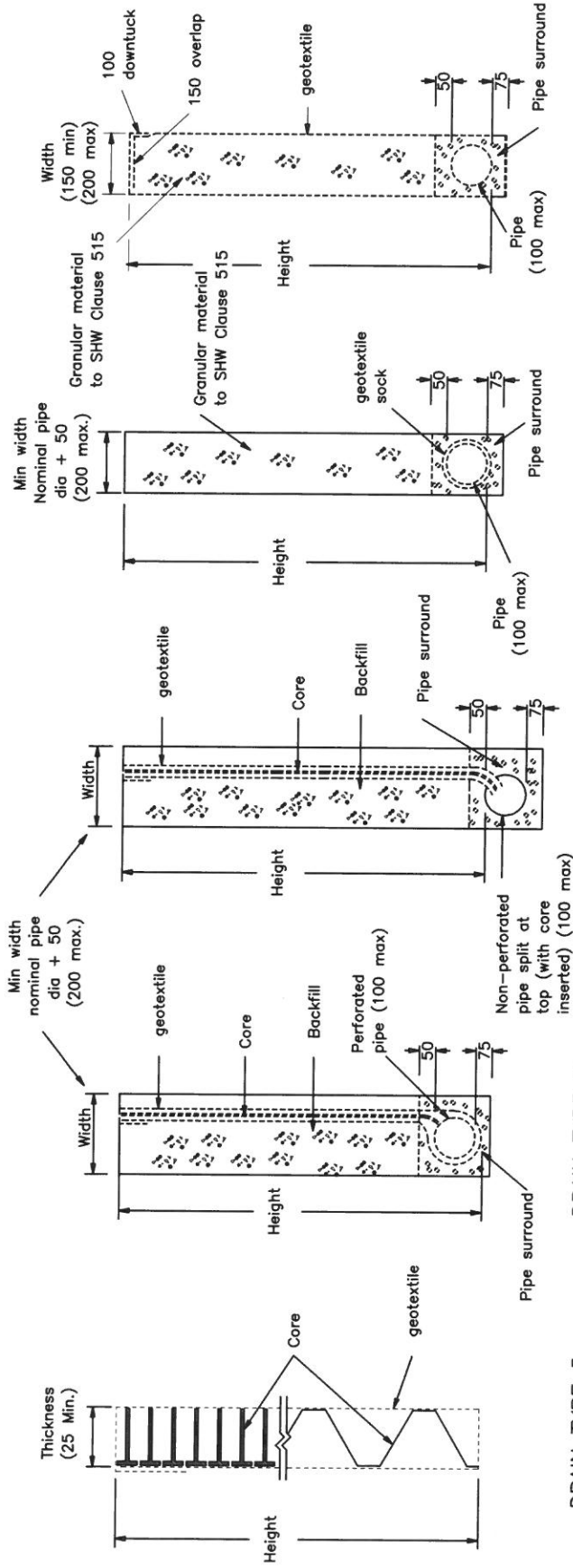
F17

Issue

Date

A

MAR 98



DRAIN TYPE 5

DRAIN TYPE 6

DRAIN TYPE 7

DRAIN TYPE 8

DRAIN TYPE 9

FIN DRAINS

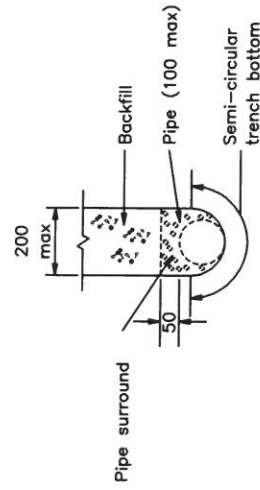
Drain types 5, 6 and 7

NARROW FILTER DRAINS

Drain types 8 and 9

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. The surround material and backfill to the pipes of drain types 6 and 7 shall comply with S.H.W. Clause 514. The surround material to pipes of drain types 8 and 9 shall be the granular material used as infill to the drain.



HIGHWAY CONSTRUCTION DETAILS

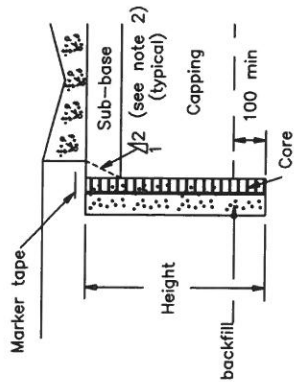
DRAINAGE

EDGE OF PAVEMENT DRAINS –
FIN DRAINS AND
NARROW FILTER DRAINS

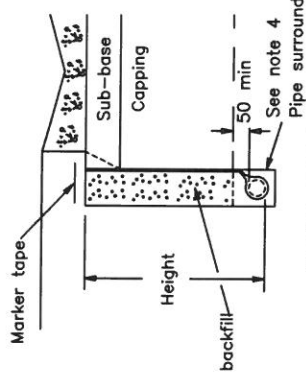
Drawing No.

F18

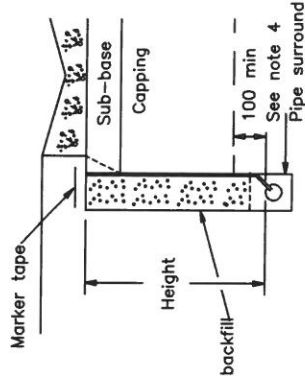
A DEC 91
Issue Date



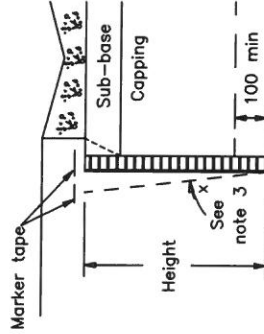
DRAIN TYPE 5



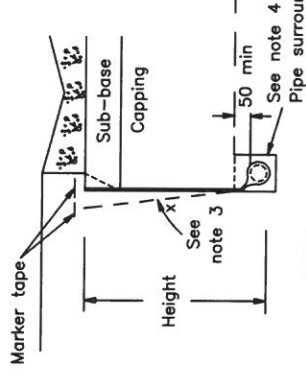
DRAIN TYPE 6



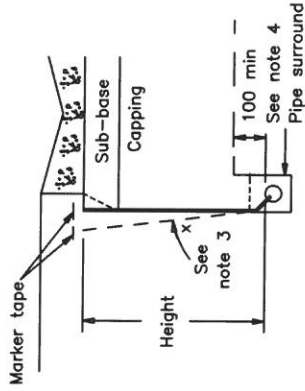
DRAIN TYPE 7



DRAIN TYPE 5



DRAIN TYPE 6



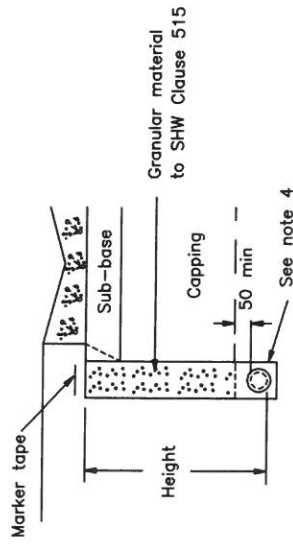
DRAIN TYPE 7

DRAINS LAID IN THE SIDE OF EXCAVATION PRIOR TO THE PLACEMENT OF PAVEMENT/CAPPING LAYERS

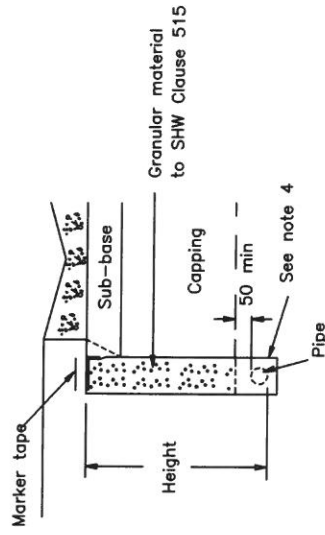
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. Fin drains shall be a minimum of 75 from the edge of the surface water channel where appropriate.
3. Marker tapes, surround/backfill materials and maximum drain slope angle (x) shall be as described in the S.H.W. Clause 514.
4. Pipe surround material shall be as shown on Drg No. F18
5. Installation of the drains shall be modified accordingly when used in conjunction with the details shown on Drg Nos. B4 & B8 to B10.
6. The drain shall be constructed with one geotextile face in contact with the side of the excavation. The side having the greater permeability shall be facing towards and be in contact with the pavement construction where appropriate.
7. Slots in drain Type 7 shall be not more than 60' from the crown of the pipe.

HIGHWAY CONSTRUCTION DETAILS	DRAINAGE	EDGE OF PAVEMENT DRAINS – INSTALLATION OF FIN DRAINS			Drawing No. F19
		A	DEC 91		
		Issue	Date		

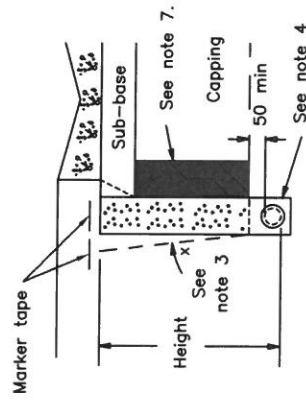


DRAIN TYPE 8

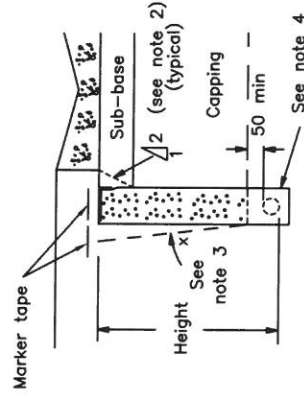


DRAIN TYPE 9

DRAINS LAID IN NARROW TRENCHES



DRAIN TYPE 8

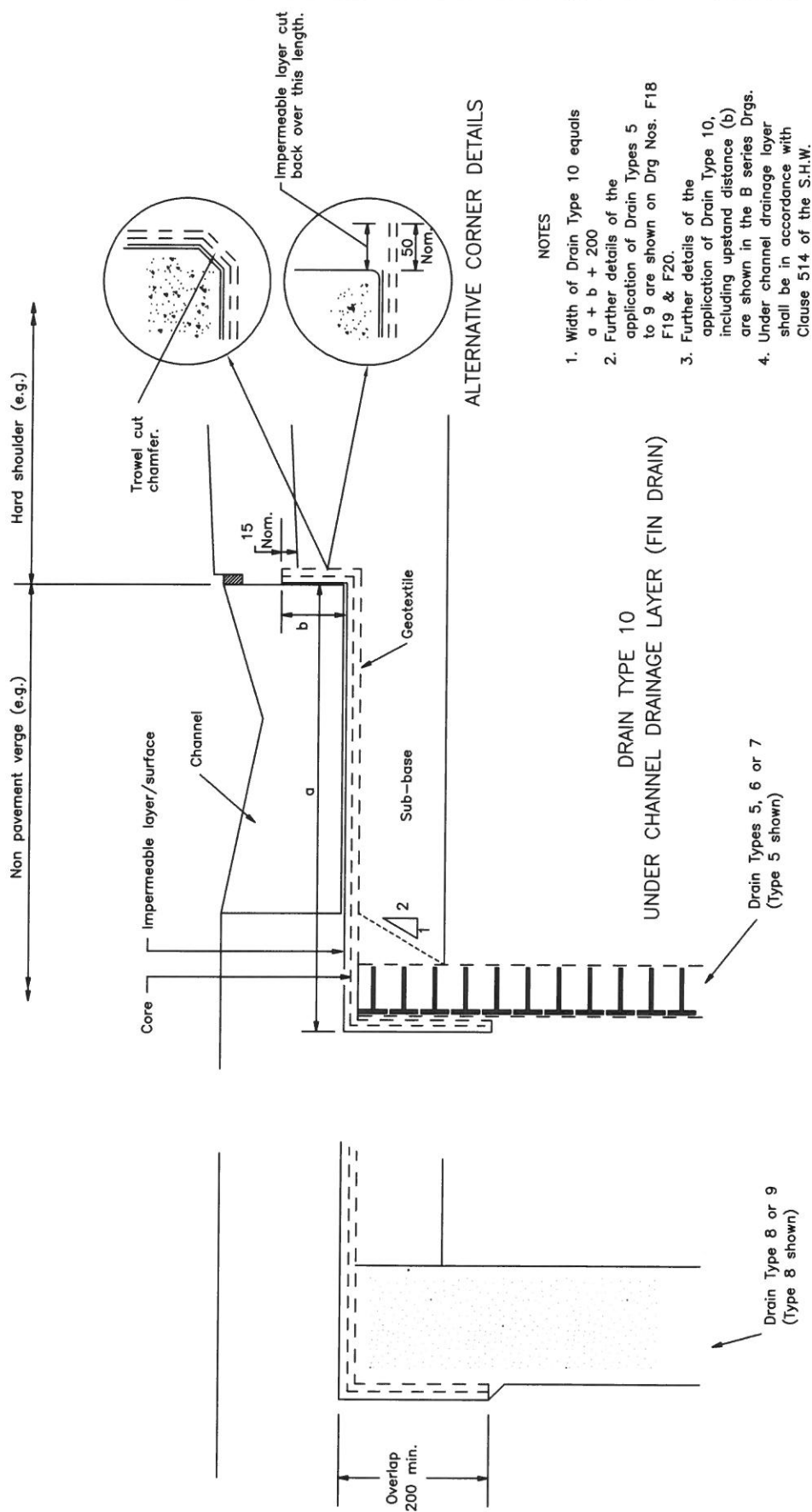


DRAIN TYPE 9

DRAINS LAID IN THE SIDE OF EXCAVATION PRIOR TO THE PLACEMENT OF PAVEMENT/CAPPING LAYERS

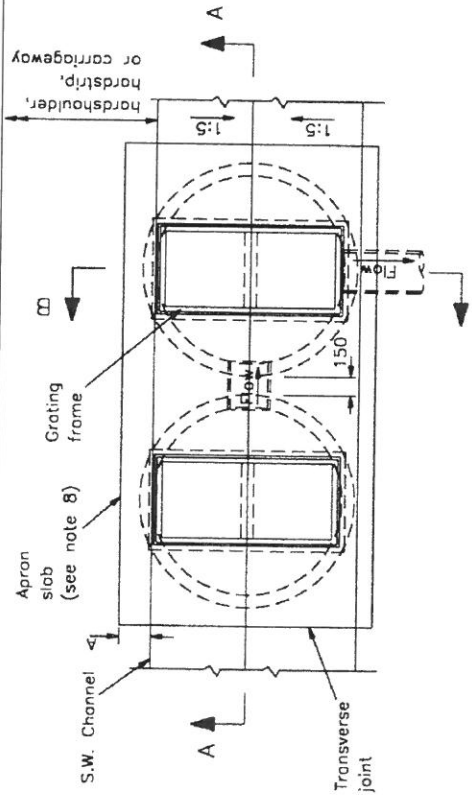
- NOTES**
1. ALL DIMENSIONS ARE IN MILLIMETRES
 2. Narrow filter drains shall be a minimum of 75 from the edge of the surface water channel where appropriate.
 3. Marker tapes, and maximum drain slope angle (x) shall be as described in the S.H.W. Clause 514.
 4. Pipe surround materials shall be as shown on Drg No. F18
 5. Installation of the drains shall be modified accordingly when used in conjunction with the details shown on Drg Nos. B4 & B8 to B10.
 6. The drain shall be constructed with one face in contact with the pavement construction.
 7. The maximum increased width of filter material shall be 150. In this area either filter material or capping material may be placed.

HIGHWAY CONSTRUCTION DETAILS	DRAINAGE	EDGE OF PAVEMENT DRAINS – INSTALLATION OF NARROW FILTER DRAINS		Drawing No. F20
		A	DEC 91	
		Issue	Date	

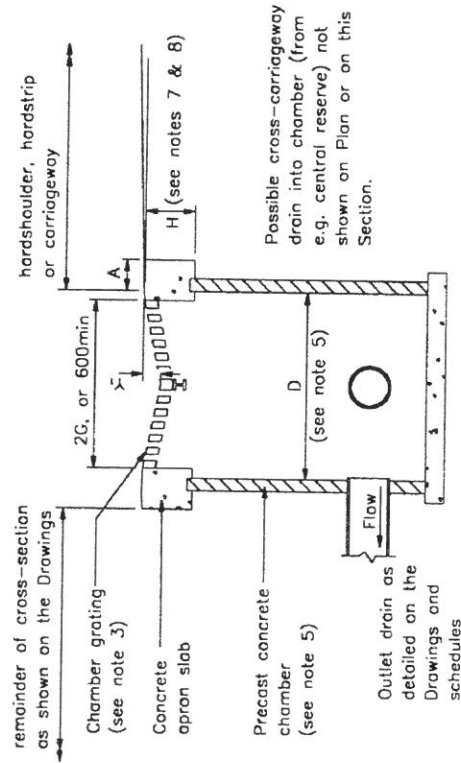


- NOTES
1. Width of Drain Type 10 equals $a + b + 200$
 2. Further details of the application of Drain Types 5 to 9 are shown on Drg Nos. F18 F19 & F20.
 3. Further details of the application of Drain Type 10, including upstand distance (b) are shown in the B series Drgs.
 4. Under channel drainage layer shall be in accordance with Clause 514 of the S.H.W.

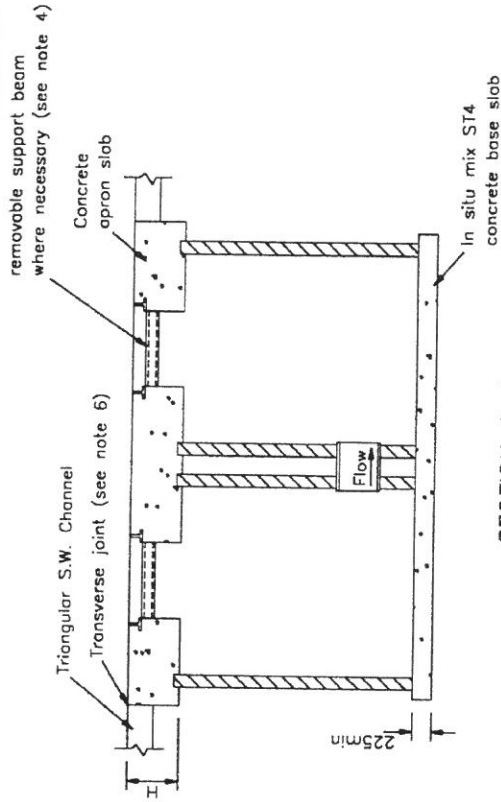
HIGHWAY CONSTRUCTION DETAILS	DRAINAGE	EDGE OF PAVEMENT DRAINS – UNDER CHANNEL DRAINAGE LAYERS		Drawing No. F21
		Issue A	Date DEC 91	



PLAN
(Gratings not shown)



SECTION B-B



SECTION A-A

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Plan and Section A-A indicate outlet with twin grating installation and associated chambers. Detail can be modified for single or triple chamber installation. Associated drains and pipework shall be as detailed on the Drawings and schedules. Apron slab on Plan and Section B-B shown to suit verge installation. Slab width and profile differs when used in central reserve location.
3. Chamber gratings as specified to suit cross-section of apron. Minimum internal dimensions 600 x 600. Grating frames to be bedded on mortar and securely fixed to concrete apron by approved mechanical means. Frame to be otherwise bedded on epoxy resin mortar.
4. Support beam permissible beneath grating where necessary to withstand loading defined in access purposes. Removable beams to be supported on purpose made steel brackets bearing upon grating frame rebates and bolted to the faces of the apron slabs within the access openings. Brackets shall restrain the beam from sideways movement. Beam rolling tolerances may be accommodated by use of purpose-made steel shims between the supporting brackets and the beams. All steelwork to be fabricated from steel to BS 970 : Part 1 and to be protected by hot dip galvanising to SHW, Clause 1909.
5. Chamber details beneath apron slab as HCD Drg. No. F11 for Type 7 chamber (1050 catchpit) but with internal diameter D as specified to provide minimum necessary clear opening beneath grating, and be not less than 1050.
6. A transverse joint shall be formed at each end of the apron slab in accordance with SHW, Clause 1009. Transverse joints shall not be permitted within the apron slab. No joints shall be permitted within adjacent lengths of concrete pavement slabs. Necessary joints in such slabs shall be spaced accordingly.
7. Dimension H to provide necessary support/bedding to removable support beam.
8. Apron slab and associated dimension H to be designed to withstand the accidental wheel loading defined in BD 37 (DMRB 1.3.14) paragraph 6.6. Dimension A to be minimised. Concrete to apron slab shall comply with SHW, Clause 1103, air-entrained in accordance with BS 5931. Plain concrete shall be a designed concrete, strength class C 28/35 to BS EN 206-1 and BS 8500. Reinforced concrete shall be strength class C 32/40 to SHW, Clause 1001. Concrete to apron slab cast in one with adjacent concrete pavement shall be as specified for the carriageway slab.
9. Dimensions Y and G shall be as defined in Appendix 5/3.

HIGHWAY CONSTRUCTION DETAILS

EDGE OF PAVEMENT
DETAILS

IN-LINE OUTLET

TRIANGULAR S.W. CHANNEL

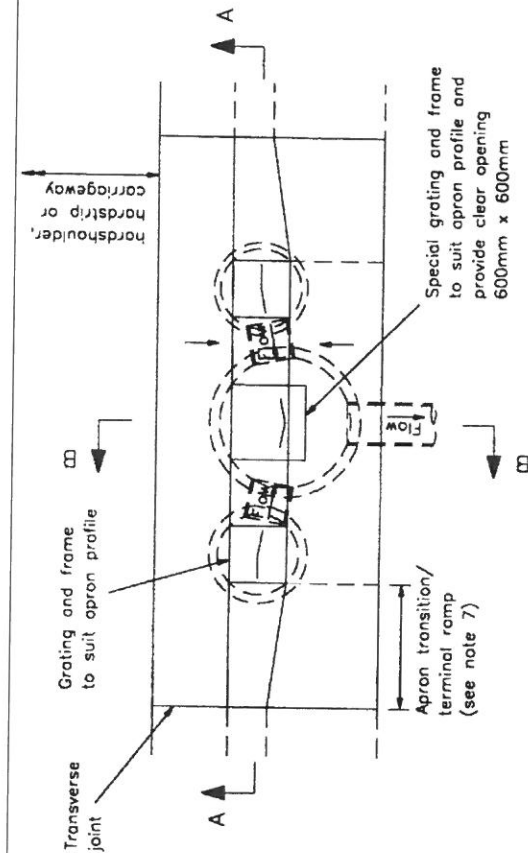
Drawing No.

F22

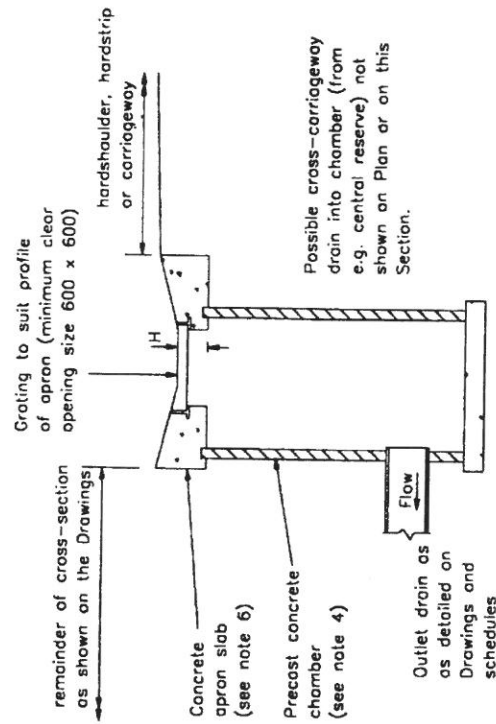
B NOV 03

A MAR 98

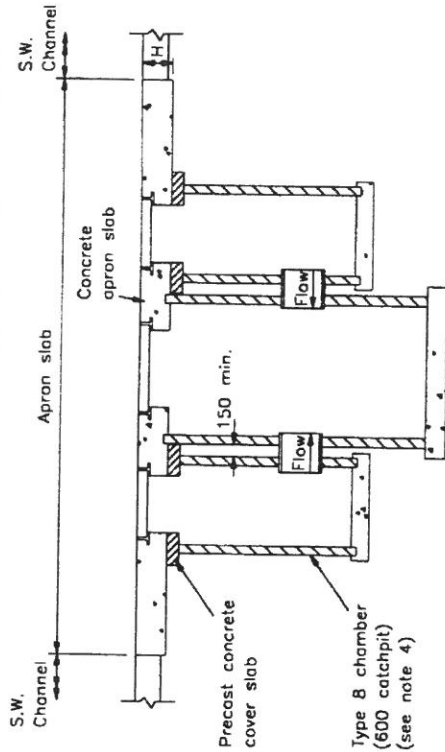
Issue Date



PLAN



SECTION B-B



SECTION A-A

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Plan and Section A-A indicate typical outlet in-line with triple grating installation and associated chambers. Detail can be modified for twin or single grating installation or for off-line outlets to trapezoidal or triangular S.W. channel. Associated drains and pipework shall be as detailed on the Drawings and schedules. Apron slab on Plan and Section B-B shown to suit verge installation. Slab width and profile differs when used in central reserve location.
3. Chamber gratings as specified in the chamber schedule to suit cross-section of apron. Grating frames to be bedded on mortar and securely fixed to rebates formed in concrete apron by approved mechanical means. Frame to be otherwise bedded on epoxy resin mortar.
4. Main chamber beneath apron slab to be as HCD Drg. No. F11 for Type 7 chamber (1050 catchpit). Subsidiary chambers shown on Plan and Section A-A to be as HCD Drg. No. F12 for Type 8 chamber (600 nominal dia.) beneath underside of apron slab. Diameter may be increased if necessary to accommodate larger grating. Where longitudinal carrier pipes in verge are connected to main chamber, Type 7 chambers with special gratings and frame (as for main chamber shown) should be substituted in place of Type 8 chambers.
5. A transverse joint shall be formed at each end of the apron slab in accordance with SHW, Clause 1009. Transverse joints shall not be permitted within the apron slab. No joints shall be permitted within adjacent lengths of concrete pavement slabs. Necessary joints in such slabs shall be spaced accordingly.
6. Apron slab and associated dimension H to be designed to withstand the accidental wheel loading defined in BD 37 (DMRB 1.3.14) paragraph 6.6. Concrete to apron slab shall comply with SHW, Clause 1103, air-entrained in accordance with BS 5931. Plain concrete shall be a designed concrete, strength class C 28/35 to BS EN 206-1 and BS 8500. Reinforced concrete shall be strength class C 32/40 to SHW, Clause 1001.
7. Transition/terminal ramp to be formed as an integral part of the apron slab.
8. Over-excavation for main chamber beneath subsidiary chambers to be backfilled with ST1 concrete to SHW, Clause 2602.

HIGHWAY CONSTRUCTION DETAILS

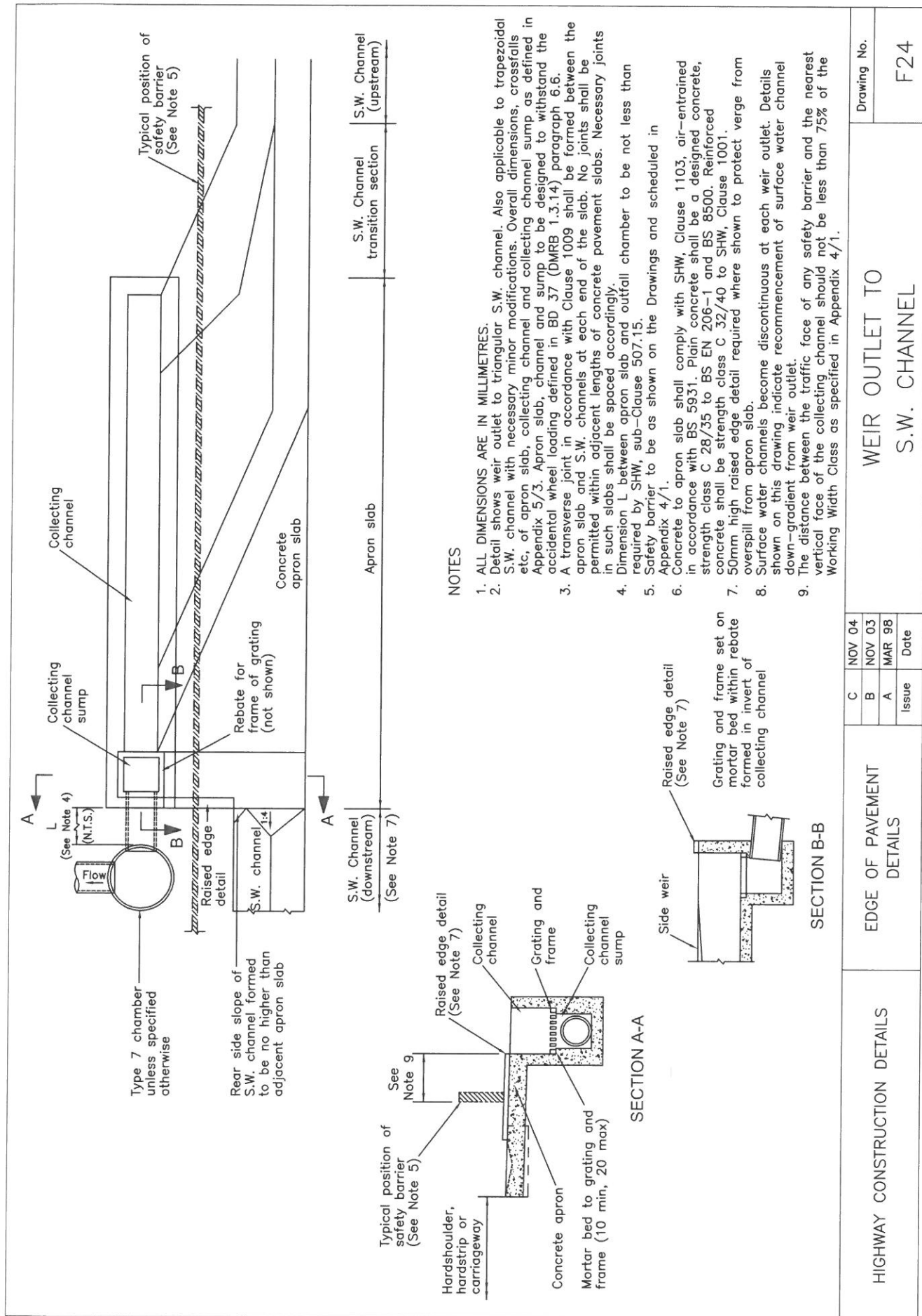
EDGE OF PAVEMENT
DETAILS

IN-LINE OUTLET TO
TRAPEZOIDAL S.W. CHANNEL

Drawing No.

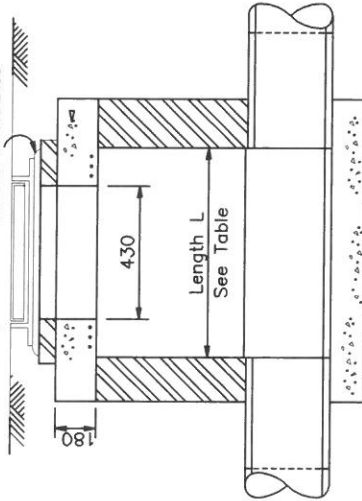
F23

B	NOV 03
A	MAR 98
Issue	Date

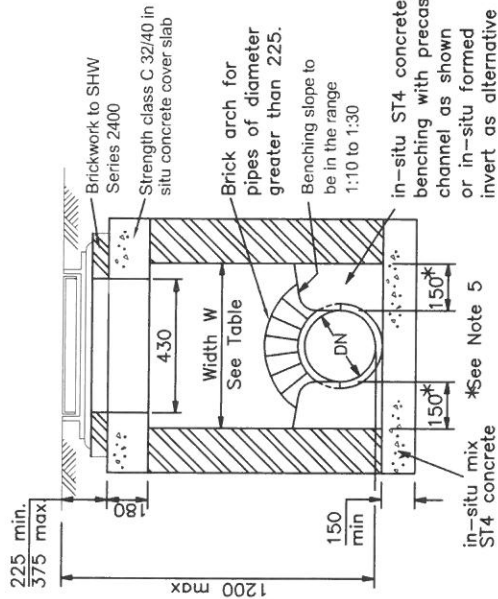


HIGHWAY CONSTRUCTION DETAILS		EDGE OF PAVEMENT DETAILS		WEIR OUTLET TO S.W. CHANNEL		Drawing No.
	C	NOV 04	Issue			F24
	B	NOV 03				
	A	MAR 98	Date			

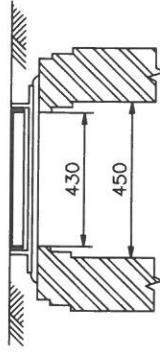
Designation (i) mortar bed to frame (10 min 20 max) to SHW Series 2400



SECTION Y-Y

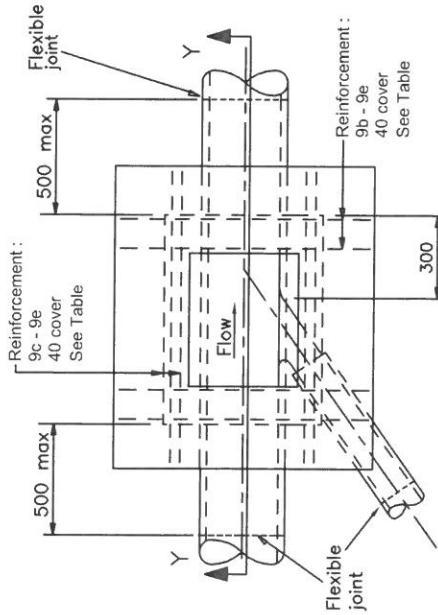


SECTION X-X



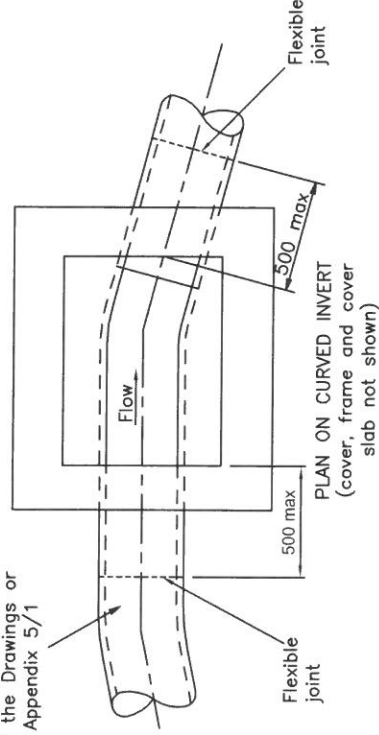
PERMITTED ALTERNATIVE COVER
DETAIL FOR SUB-TYPE 9a

CHAMBER SUB-TYPE				
Sub-Type	No. of Branches	Length L	Width W	Max. Pipe DN
9a	0	450	450	150
9b	0	450	600	300
9c	1	1000	600	150
9d	1	1000	750	300
9e	2	1000	750	150
				Reinforcement T20 bars at 50 c/c
				Nil
				4 No. 800 long
				10 No. 950 long
				4 No. 1350 long
				10 No. 1100 long
				6 No. 1350 long



PLAN ON STRAIGHT INVERT
(cover and frame not shown)

One or more pipe bends (if required) as shown on the Drawings or in Appendix 5/1



PLAN ON CURVED INVERT
(cover, frame and cover slab not shown)

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. Chamber walls 225 thick to be constructed in class B clay engineering bricks to SHW Series 2400 in designation (i) mortar or in-situ ST4 concrete to SHW, Clause 2602.
3. For details of pipe size(s), invert level(s) and type of cover and frame, see Drawings and Appendix 5/1.
4. See SHW, sub-Clause 507.7 regarding backfilling/surround to chamber.
5. Benching width to be 300 for branch connection.

FOR PIPES 300 MAX. DIAMETER
MAX. DEPTH TO INVERT 1200
UP TO SINGLE BRANCH NOT EXCEEDING 225

TYPE 9 CHAMBER
(BRICK OR IN-SITU CONCRETE
SHALLOW INSPECTION CHAMBER)

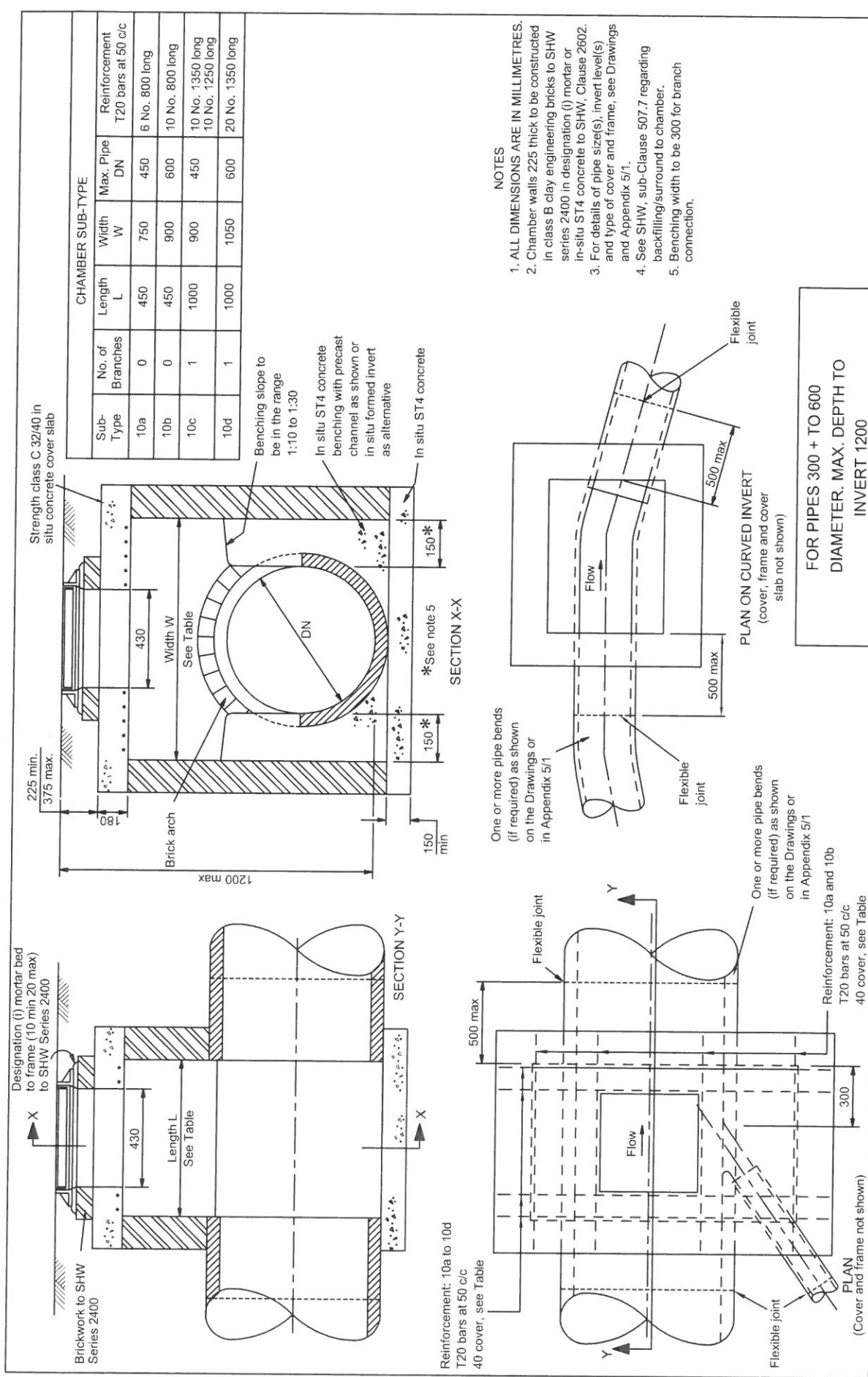
HIGHWAY CONSTRUCTION DETAILS

DRAINAGE

C	MAY 06
B	NOV 03
A	MAY 01
Issue	Date

Drawing No.

F25



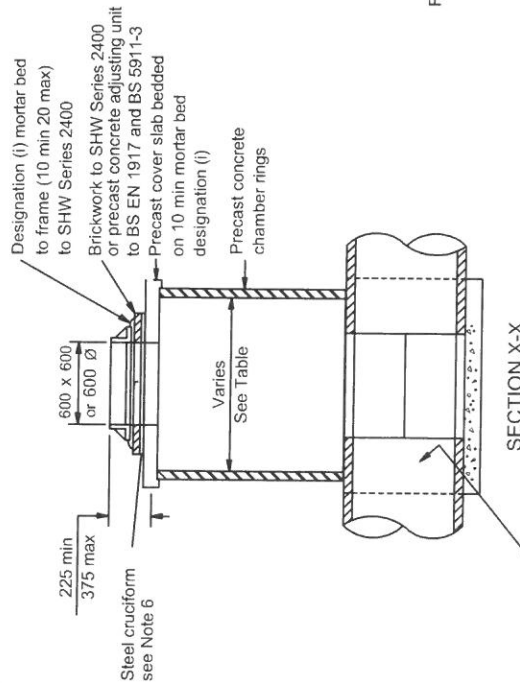
CHAMBER SUB-TYPE					
Sub-Type	No. of Branches	Length L	Width W	Max. Pipe DN	Reinforcement T20 bars at 50 c/c
10a	0	450	750	450	6 No. 800 long
10b	0	450	900	600	10 No. 800 long
10c	1	1000	900	450	10 No. 1350 long 10 No. 1250 long
10d	1	1000	1050	600	20 No. 1350 long

- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Chamber walls 225 thick to be constructed in class B clay engineering bricks to SHW series 2400 in designation (i) mortar or in-situ ST4 concrete to SHW, Clause 2602.
 3. For details of pipe size(s), invert level(s) and type of cover and frame, see Drawings and Appendix 5/1.
 4. See SHW, sub-Clause 507.7 regarding backfilling/surround to chamber.
 5. Benching width to be 300 for branch connection.

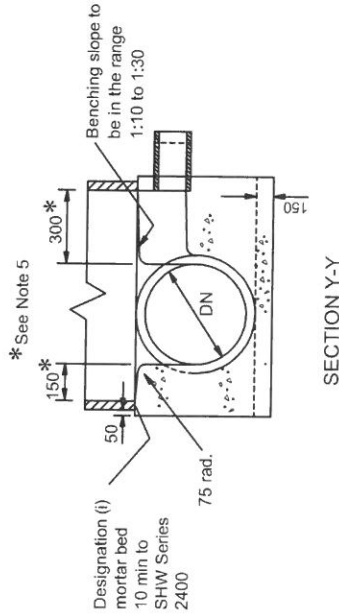
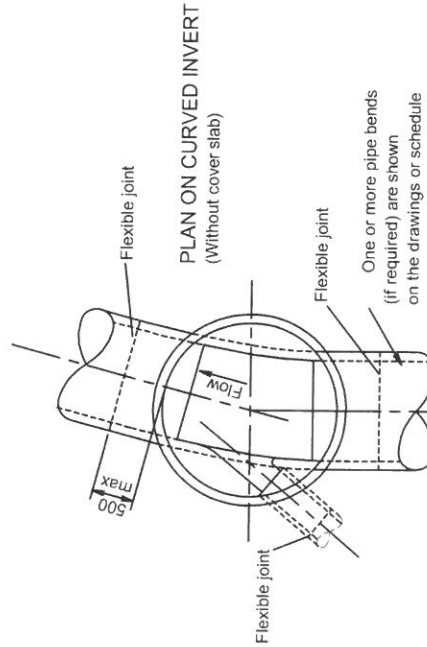
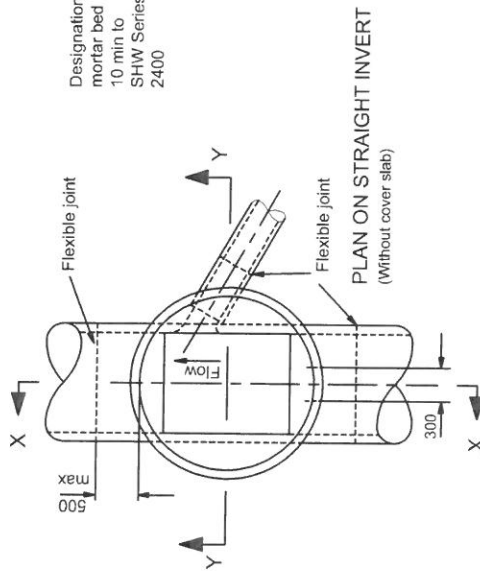
HIGHWAY CONSTRUCTION DETAILS		DRAINAGE		TYPE 10 CHAMBER (BRICK OR IN SITU CONCRETE SHALLOW INSPECTION CHAMBER)		Drawing No.
						F26

C	MAY 06
B	NOV 03
A	MAY 01
Issue	Date

CHAMBER SUB-TYPE			
Sub-Type	No. of Branches	Chamber ring dia.	Max. Pipe DN
11a	1	900	450
11b	1	1050	600
11c	1	1200	750
11d	1	1500	900



Integral in-situ ST4 concrete base walls benching & base slab with precast channel as shown or in-situ formed invert as alternative. Walls to extend 50 beyond outer faces of chamber ring. Alternatively precast concrete chamber rings may be bedded in mortar on an in-situ ST4 concrete base slab 300 greater in diameter than internal diameter of chamber rings.



- NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRES.
 2. Chamber walls and cover slab to be constructed in precast concrete to BS EN 1917 and BS 5911-3.
 3. For details of pipe size(s), invert level(s) and type of cover and frame, see cover and frame, see Drawings and Appendix 5/1.
 4. See SHW regarding backfilling/surround to chamber.
 5. Benching width to be 300 for branch connection.
 6. Cruciform comprising 2 No. 76 x 51 x 6 angle to BS 970 - 1 700 long and protected by hot dip galvanising in accordance with SHW Clause 1909. Cruciform built into brickwork across centre of access hole to prevent man entry.
 7. Inspection chambers are intended for use where maintenance is to be carried out using remotely operated equipment only. Deep inspection chambers impose limitations on these techniques and therefore should not be used in highways or other high use areas where excavation for repairs would be unacceptable.
 8. All ST concrete shall be to SHW, Clause 2602.

FOR PIPES 900 MAX DIAMETER

TYPE 11 CHAMBER
(PRECAST CONCRETE DEEP
INSPECTION CHAMBER)

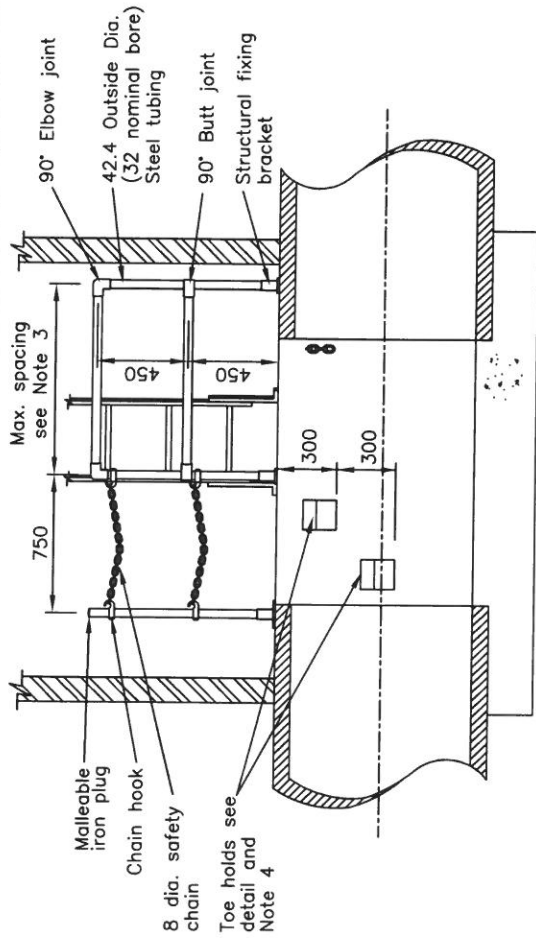
D	MAY 06	Issue	Date
C	NOV 04		
B	NOV 03		
A	MAY 01		

HIGHWAY CONSTRUCTION DETAILS

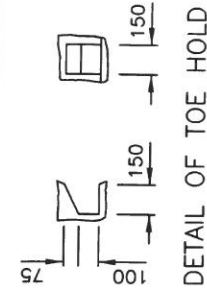
DRAINAGE

Drawing No.

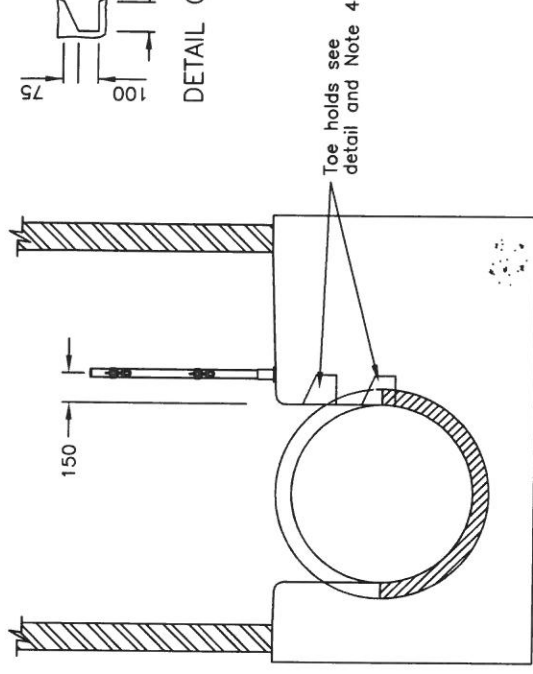
F27



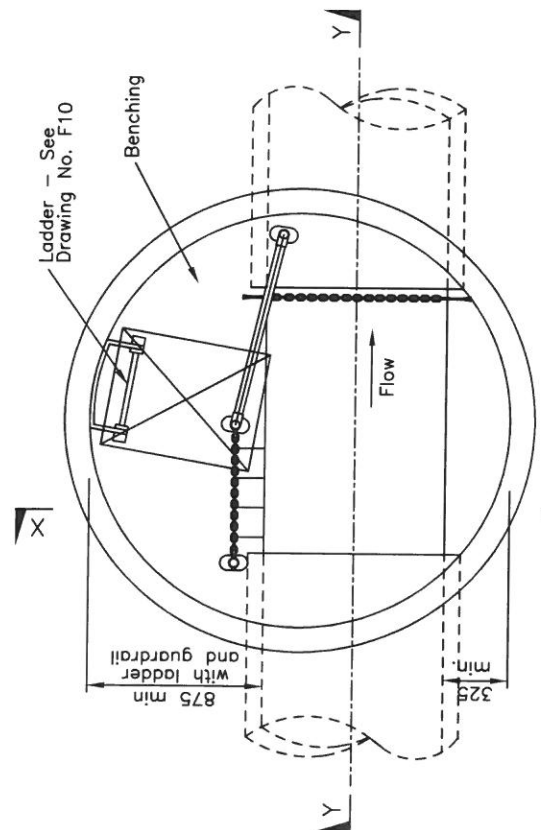
SECTION Y-Y



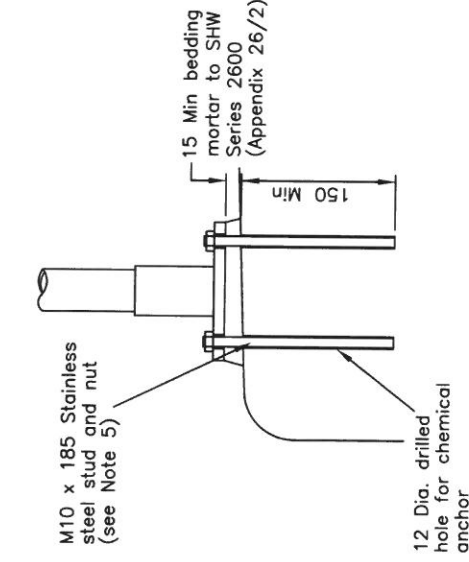
DETAIL OF TOE HOLD



SECTION X-X



TYPICAL LAYOUT



DETAIL OF BASE FIXING

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES
2. All steelwork for guardrails, posts, safety chains and hooks to be fabricated from steel to BS 970: Part 1 and to be protected by hot dip galvanising in accordance with SHW Clause 1909.
3. Maximum spacing of guardrail posts to be 1550
Maximum gap between chamber wall and posts to be 225
4. Toe hold detail shown for 900 pipe.
5. Stainless steel studs and nuts shall be to BS EN 10088-1, designation 1.4401. Isolating washers shall be used between stainless steel fixing stud and galvanised guardrail.

HIGHWAY CONSTRUCTION DETAILS

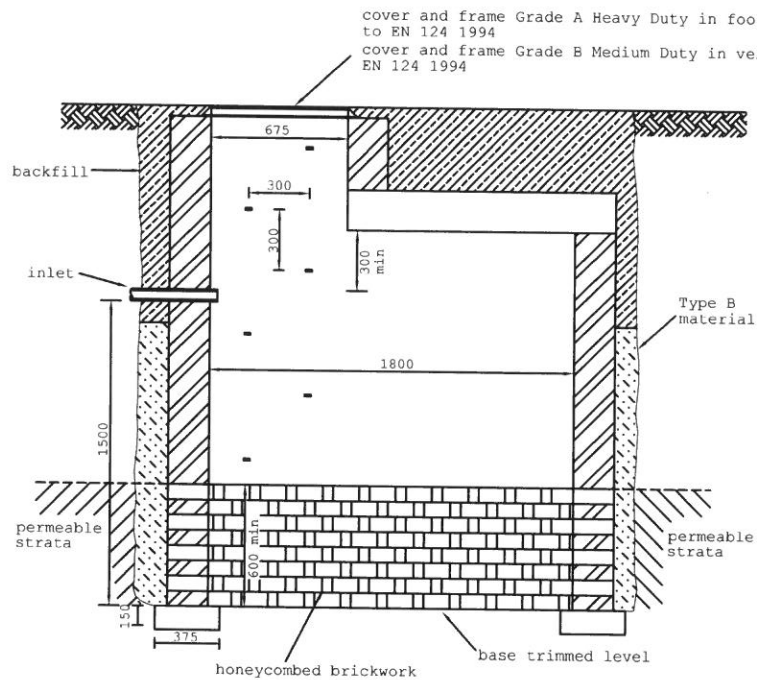
DRAINAGE

CHAMBER FITTINGS - GUARDRAIL

Drawing No.

F28

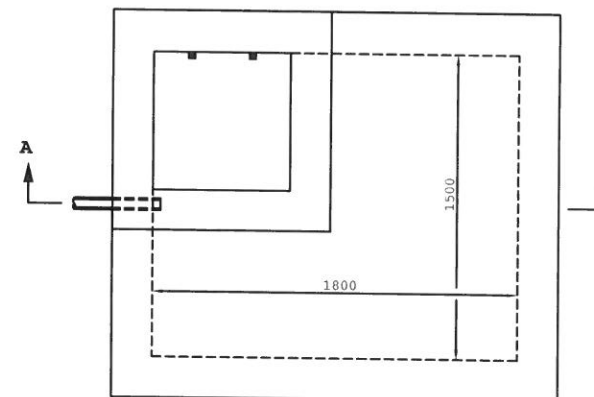
Issue	Date
B	NOV 03
A	MAY 01



CROSS-SECTION A-A

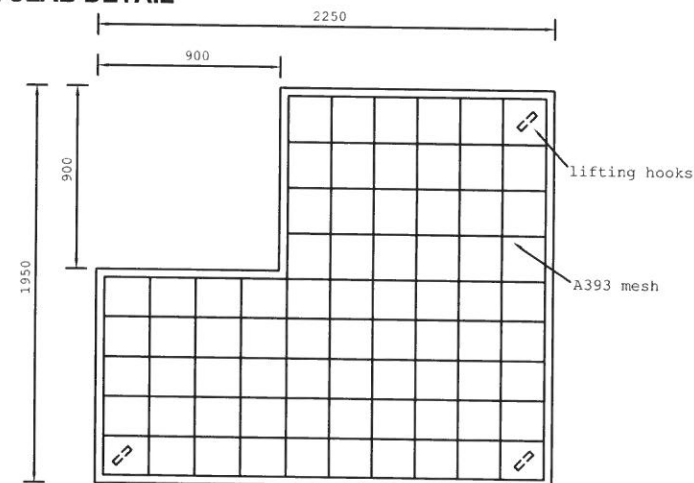
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. MAXIMUM DRAINED IMPERMEABLE AREA TO BE 500 sq.m.

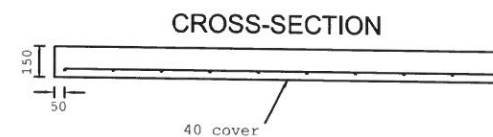


PLAN

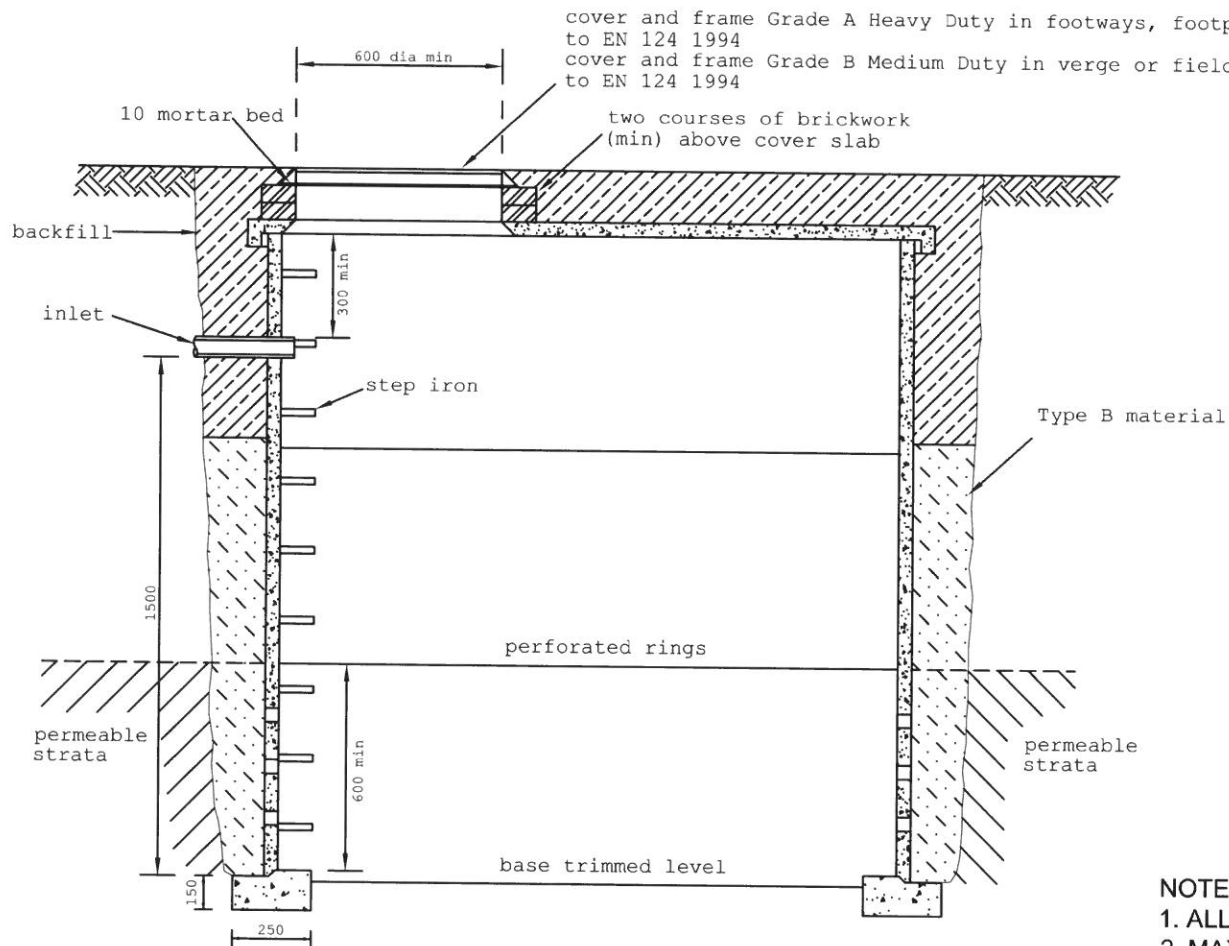
COVER SLAB DETAIL



PLAN

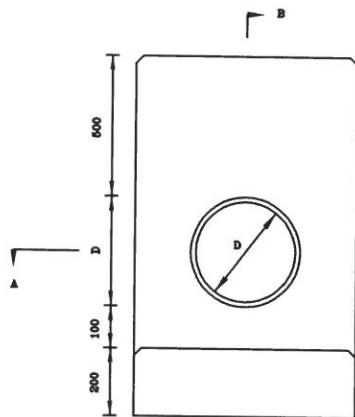


CROSS-SECTION

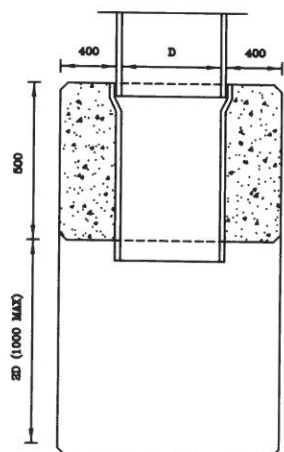


NOTES

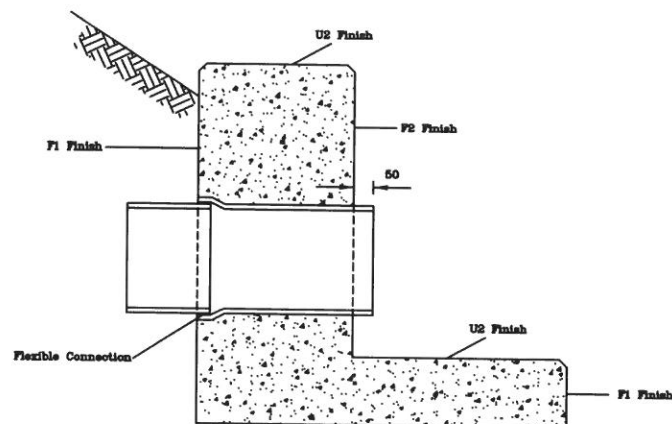
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. MAXIMUM DRAINED IMPERMEABLE AREA TO BE 500 sq.m.



FRONT ELEVATION



SECTION A - A



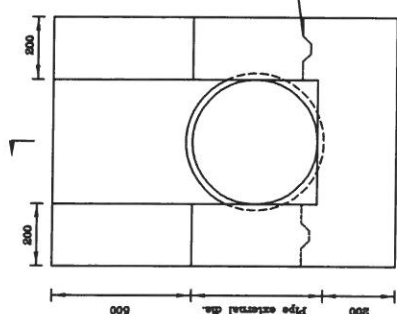
SECTION B - B

TABLE OF QUANTITIES

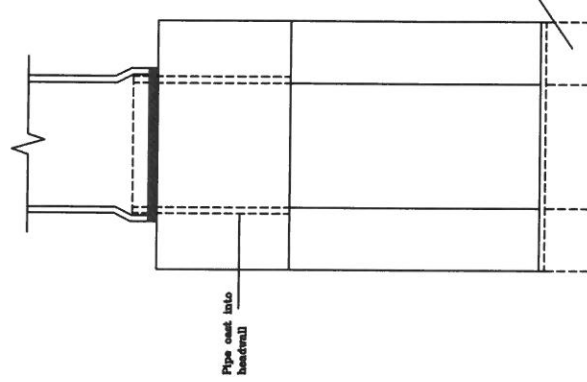
Pipe Diameter	90° - 90° Formwork over 500 wide (m²)	Formwork less than 500 wide (m²)	Concrete (m³)
150	2.09	0.31	0.51
225	2.41	0.38	0.62
300	2.75	0.46	0.74
375	3.11	0.54	0.87
450	3.40	0.61	1.01
525	3.81	0.66	1.16
600	4.34	0.76	1.38

Notes:

1. All dimensions in millimetres.
2. Concrete to be Class S74.
3. All exposed surfaces to be F2 or U2 finish.
4. All external arrises to have 25 x 25 chamfer.
5. Pipes are only to be cut with a disc or similar to give a clean cut.
6. Apron size to be adjusted to fit revetment bed as directed by Engineer.
7. Headwall to be used only for pipe outfall into a Type A revetment or a watercourse.
8. All materials and construction shall be to specification for Highway Works 1998 or any amendments or revision thereof.

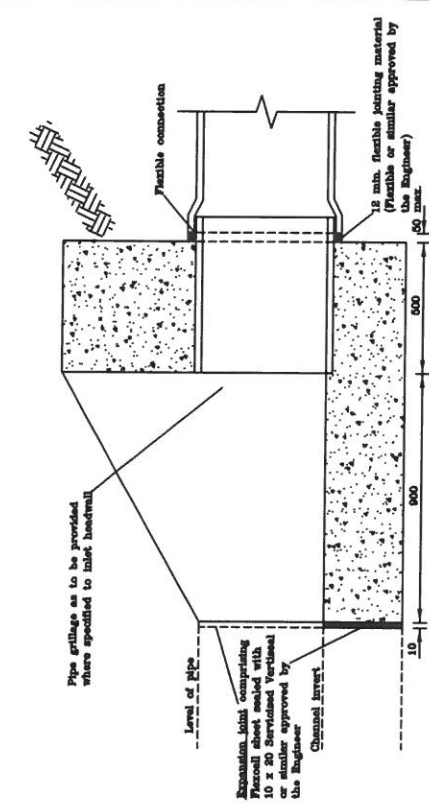


FRONT ELEVATION

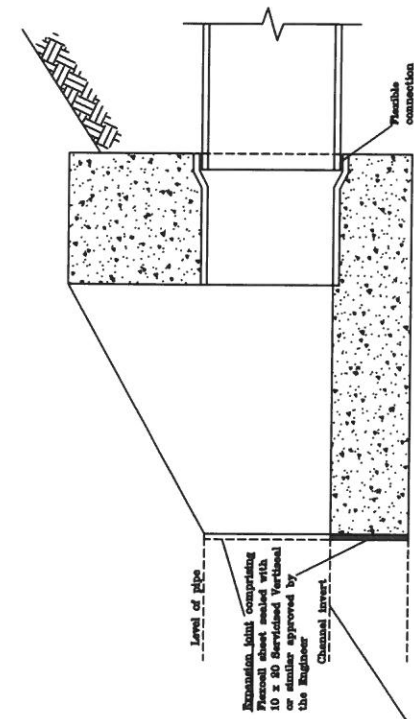


INLET HEADWALL PLAN

Outlet headwall similar except for pipe connection



INLET HEADWALL SECTION A - A



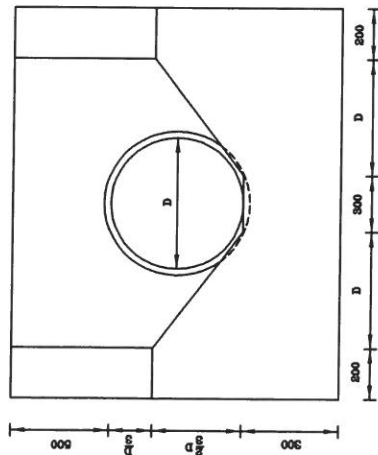
OUTLET HEADWALL SECTION A - A

TABLE OF QUANTITIES

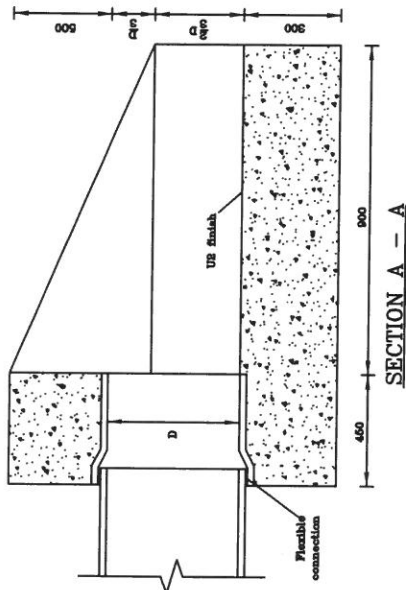
Pipe Diameter	80° - 90° Formwork over 300 wide (m ²)	Formwork less than 300 wide (m ²)	Concrete (m ³)
200	3.80	0.60	0.60
300	4.80	0.70	0.70
375	5.40	0.80	0.80
450	6.10	0.90	1.00
600	6.70	0.90	1.10

- Notes**
- All dimensions in millimetres.
 - Concrete to be Class SP4.
 - All exposed surfaces to be P2 or U2 finish.
 - All external surfaces to have 25 x 25 chamfer.
 - Pipes are only to be cut with a disc or similar to give a clean cut.
 - Headwall for use with channel Type B or Type C and the joint made with 10 Pierced or similar approved by the Engineer.
 - All materials and construction shall be to specification for Highway Works 1998 or any amendments or revisions thereof.

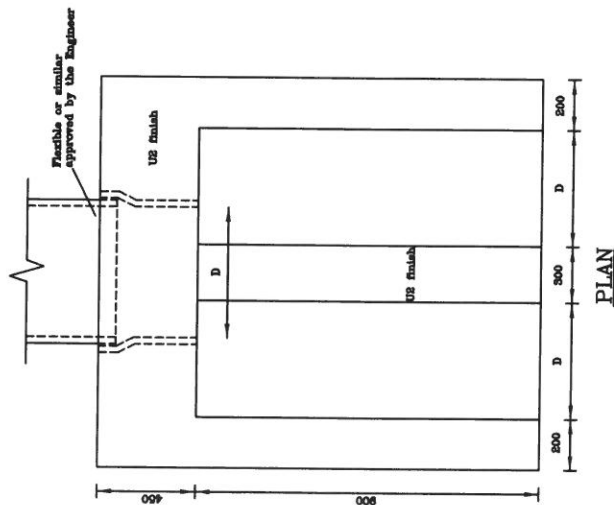
A



FRONT ELEVATION



SECTION A - A



PLAN

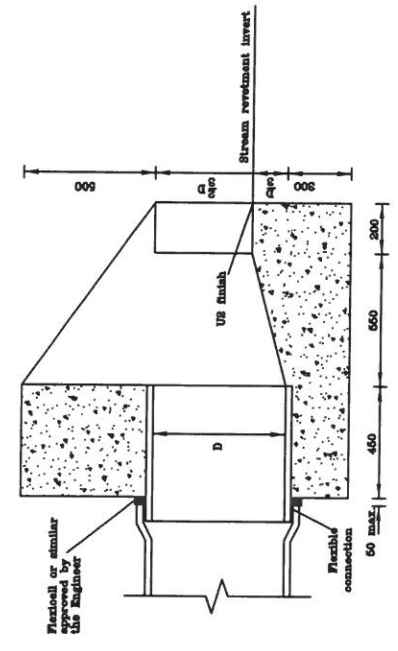
TABLE OF QUANTITIES

Pipe Diameter	80° - 90° Formwork over 300 wide (m ²)	5° - 80° Formwork over 300 wide (m ²)	Formwork 300 wide or less (m)	Concrete (m ³)
300	5.6	0.6	0.4	1.2
375	6.3	0.6	0.4	1.4
450	7.1	1.0	0.4	1.7
525	8.0	1.1	0.5	1.8
600	8.9	1.4	0.5	2.0
675	9.7	1.6	0.5	2.2
750	10.7	1.6	0.5	2.4
825	11.7	1.6	0.5	2.7
900	12.8	1.9	0.5	3.0

Notes:

- All dimensions in millimetres.
- Concrete to be Class 374.
- All exposed surfaces to be F2 finish if not shown otherwise.
- All external surfaces to have 25 x 25 chamfer.
- Pipes to be clean cut with disc or similar only.
- Invert level of stream revetment to be same as headwall invert level.
- Gradient of headwall invert to be the same as the pipe gradient.
- Headwall for use as outlet into and of stream revetment Type A or similar.
- All materials and construction shall be to specification for Highway Works 1998 or any amendments or revision thereof.

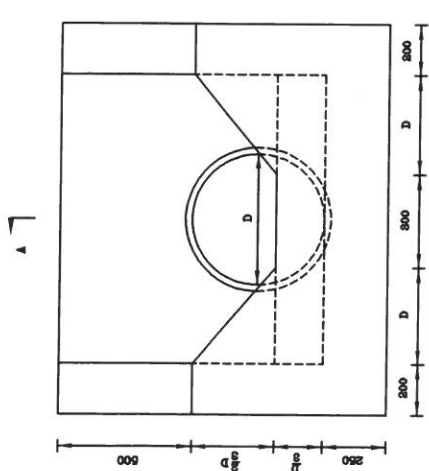
- Notes:**
1. All dimensions in millimetres.
 2. Concrete to be Class 37/4.
 3. All exposed surfaces to be F2 or U2 finish unless shown otherwise.
 4. All external arrises to have 25 x 25 chamfer.
 5. Pipes to be clean cut with disc or similar.
 6. Headwall for use as inlet from end of stream.
 7. Pipe grillage as to be provided to headwall where specified.
 8. All materials and construction shall be to specification for Highway Works 1988 or any amendments or revision thereof.



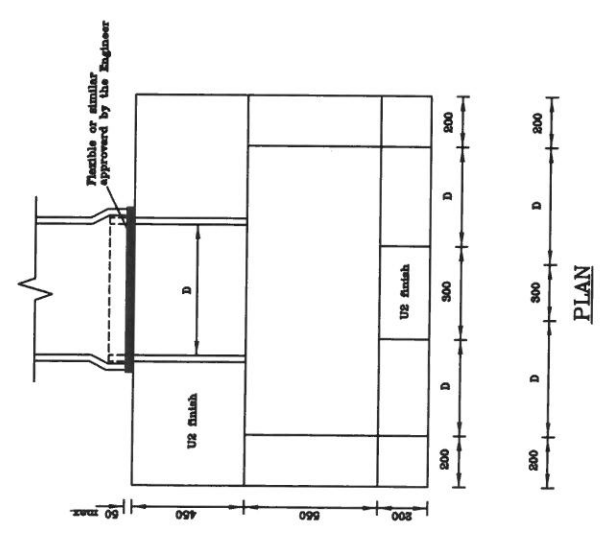
SECTION A - A

TABLE OF QUANTITIES

Pipe Diameter	60" - 80" Formwork over 300 wide (m ²)	8" - 80" Formwork over 300 wide (m ²)	Formwork 300 wide or less (m ²)	Concrete (m ³)
300	6.0	0.6	0.6	0.9
375	5.7	0.7	0.6	1.0
450	5.4	0.7	0.6	1.1
525	5.1	0.8	0.6	1.2
600	4.8	0.9	0.6	1.3
675	4.5	1.0	0.7	1.4
750	4.2	1.1	0.7	1.5
825	3.9	1.2	0.7	1.6
900	3.6	1.3	0.8	1.8



FRONT ELEVATION



PLAN

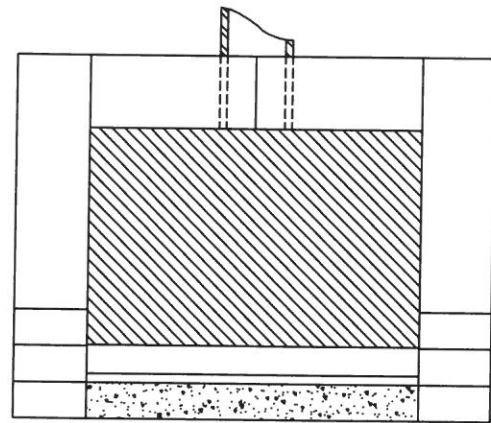
STANDARD DETAIL DRAWING -
INLET HEADWALL TYPE E

Drawing No.
F44

DRAINAGE

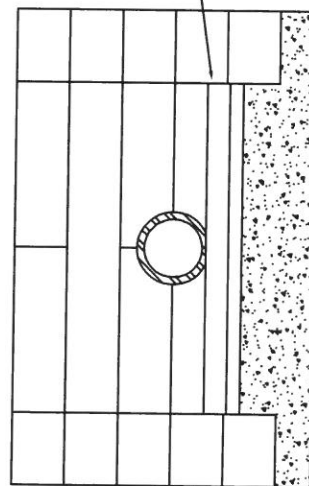
Date: April 2002
 Drawn By: RH
 Checked By: BO
 Scale: (Not to Scale)

PLAN



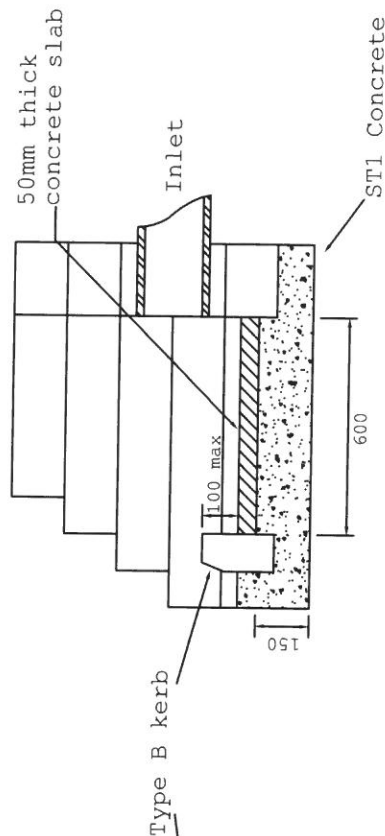
- NOTES
1. ALL MEASUREMENTS ARE IN MILLIMETRES.
 2. Exact measurements are to be taken on site by the Contractor.
 3. For typical grillage detail see drawing F47.

FRONT ELEVATION



as per item 565, 566 Headwalls and Outfalls varies

CROSS SECTION THROUGH CENTER



HEADWALLS

Date:	April 2002
Drawn By:	R/H
Checked By:	DG/L
Scale:	(Not to Scale)

TYPICAL DETAILS - KERB HEADWALL

Drawing No.

F46

Exact measurements to be taken
from site by the Contractor

