REPUBLIC OF KENYA

Kenya Rural Roads Authority

IMPLEMENTATION OF AFD/EU/GOK ROADS 2000 CLIMATE PROOFED ARID AND SEMI–ARID (ASAL) RURAL ROADS PROGRAMME
AREA 2 (ISIOLO, MARSABIT AND SAMBURU COUNTIES)–BATCH 2

LABOUR BASED REHABILITATION AND IMPROVEMENT, AND PERFORMANCE BASED ROUTINE MAINTENANCE WORKS FOR GOTU-MERTI (C340 – 01E) ROAD – 10 KM

TENDER NO: AFD/EU/IS/GR/01E/22/2024-25

BOOK OF DRAWINGS

APRIL 2025

DIRECTOR (PLANNING, DESIGN & ENVIRONMENT) **KENYA RURAL ROADS AUTHORITY** **P.O. BOX 48151-00100** **NAIROBI**	**DIRECTOR GENERAL** **KENYA RURAL ROADS AUTHORITY** **P.O. BOX 48151-00100** **NAIROBI**

GOTU-MERTI

GRAVEL ROADS BOOK OF DRAWING

DRAWING No.	GENERAL DRAWINGS
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	MAJOR DRAINANGE STRUCTURES
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R2000-GM/RD/CBC/01	2CELL 4x2M BOX CULCERT GENERAL ARRANGEMENT $ SECTIONS KM 23+000
R2000-GM/RD/CBC/02	2CELL 4x2M BOX CULCERT REINFORCEMENT KM 23+000
R2000-GM/RD/CPMT/01	TYPICAL CONCRETE PAVEMENT
R2000-GM/RD/CPC/01	1 CELL 1200MM DIA PIPE CULVERT KM 38+410
R2000-GM/RD/DRT/01	TYPICAL NON-VENTED DRIFT
R2000-GM/RD/DRT/01	2 NO. 50M LONG DRIFT AND 50M CONCRETE PAVEMENT KM 48+300
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	STANDARD DRAWINGS
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R2000/GM/2025/GDR/01	MITRE DRAIN DETAILS
R2000/GM/2025/GDR/02	SCOUR CHECKS
R2000/GM/2025/GDR/03	SCOUR CHECKS
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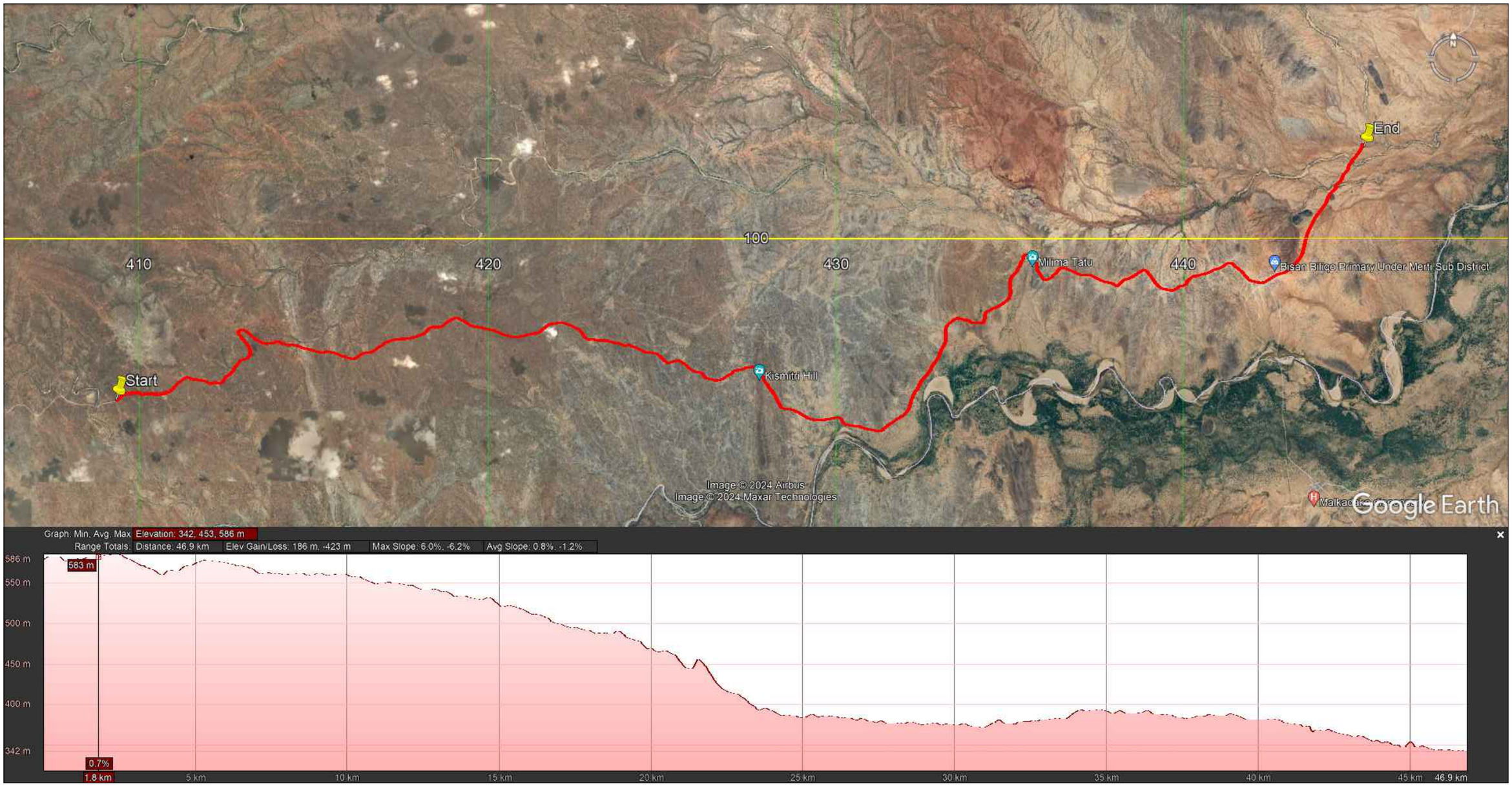
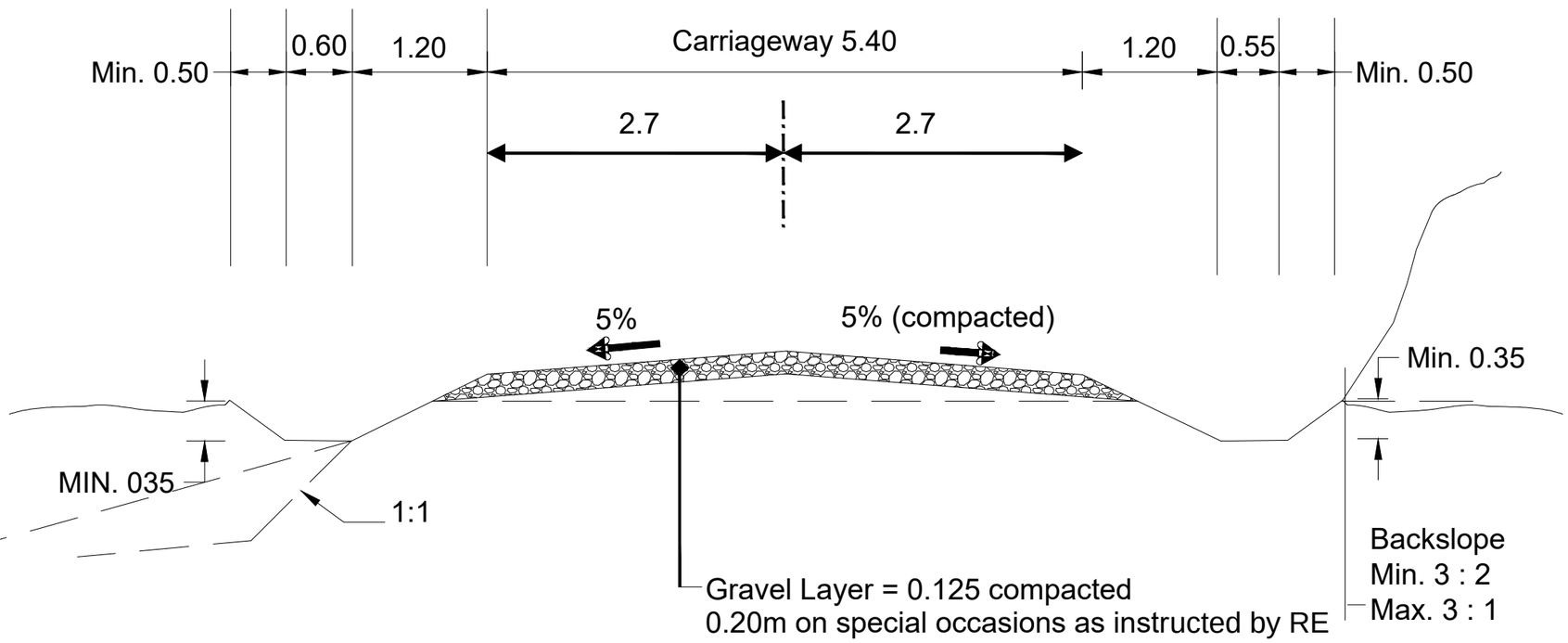
R2000/GM/2025/GDR/05	ACCESS DRIFTS
	TRAFFIC SIGNS
R2000/GM/2025/TS/01	STANDARD TRAFFIC SIGNS
	PUBLICITY SIGNBOARD
R2000/GM/2025/PSB/01	PUBLICITY SIGNBOARD DETAILS

LOCATION MAP


100
410
420
430
440
Start
End
Kismitri Hill
Milima Tatu
Bisan Biriqo Primary Under Merti Sub District
Image © 2024 Airbus
Image © 2024 Maxar Technologies
Google Earth
Graph: Min, Avg, Max Elevation: 342, 453, 586 m
Range Totals: Distance: 46.9 km Elev Gain/Loss: 186 m, -423 m Max Slope: 6.0%, -6.2% Avg Slope: 0.8%, -1.2%
586 m
550 m
500 m
450 m
400 m
342 m
583 m
0.7%
1.8 km
5 km
10 km
15 km
20 km
25 km
30 km
35 km
40 km
45 km
46.9 km

TYPICAL CROSS-SECTIONS

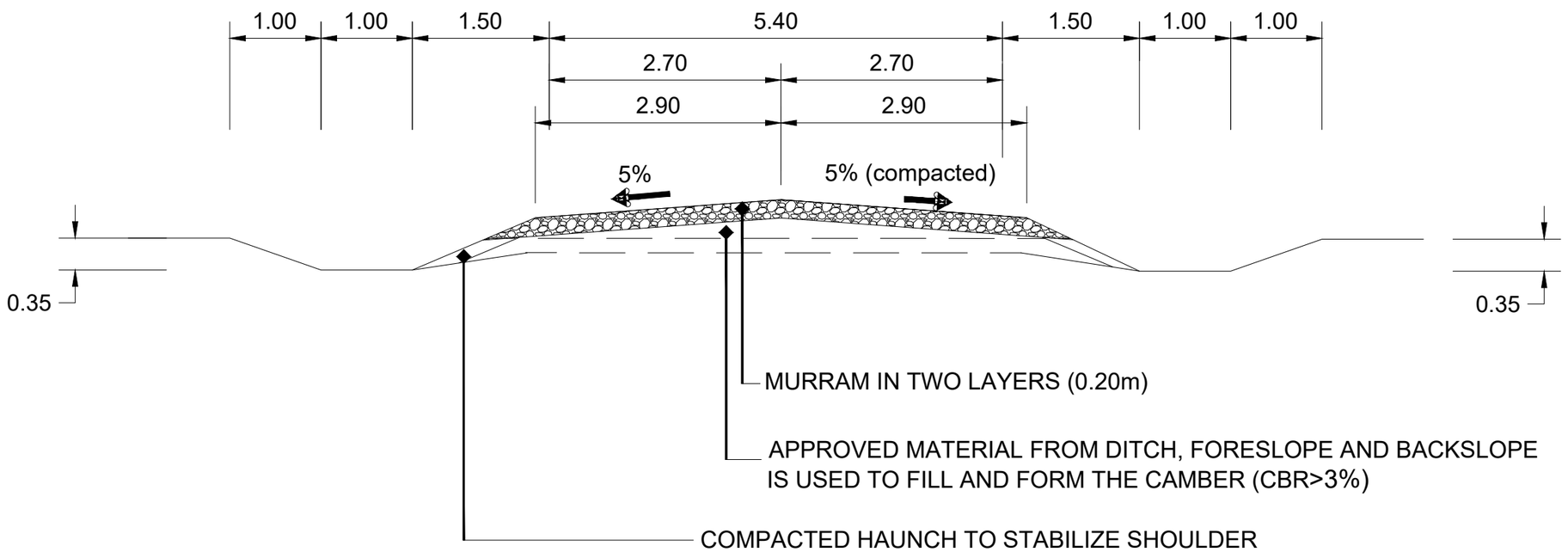
CROSS SECTION A (STANDARD CROSS-SECTION)



NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

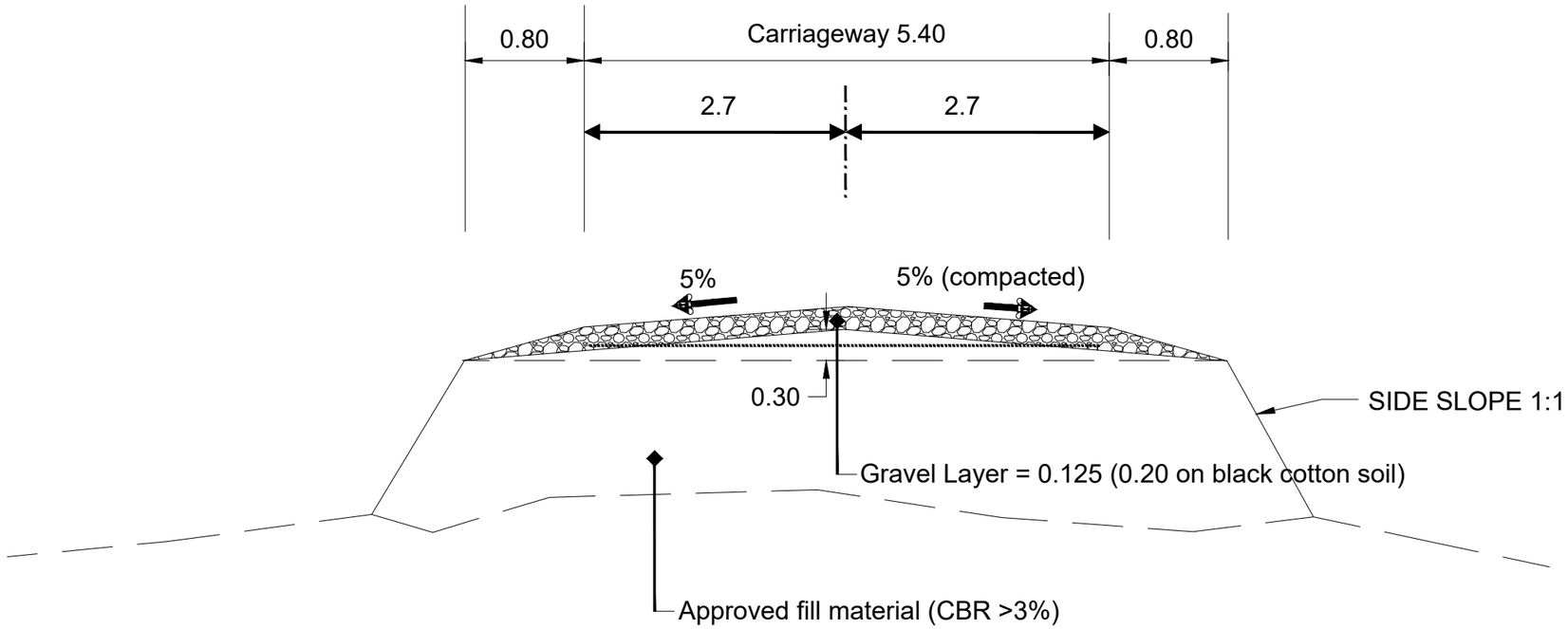
CROSS SECTION B (BLACK COTTON SOIL CROSS-SECTION)



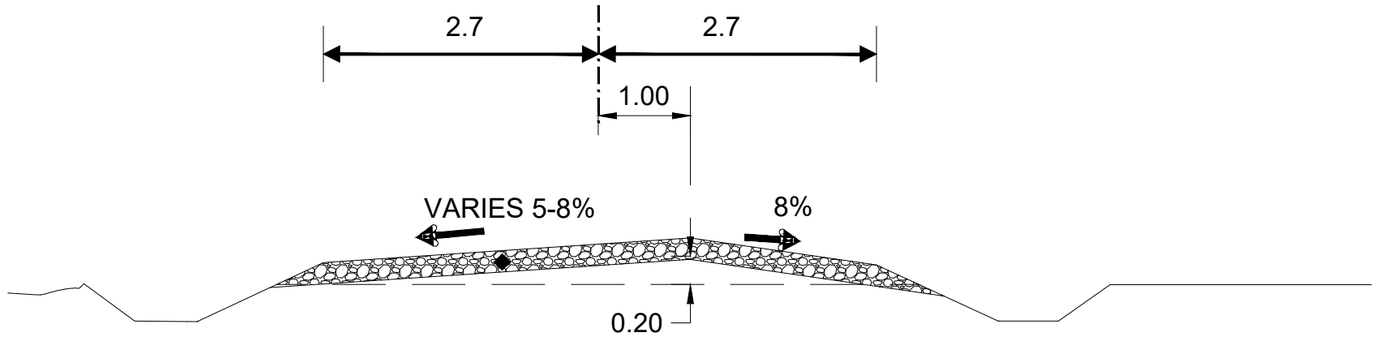
NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

CROSS SECTION D (EMBARKMENT CROSS-SECTION)



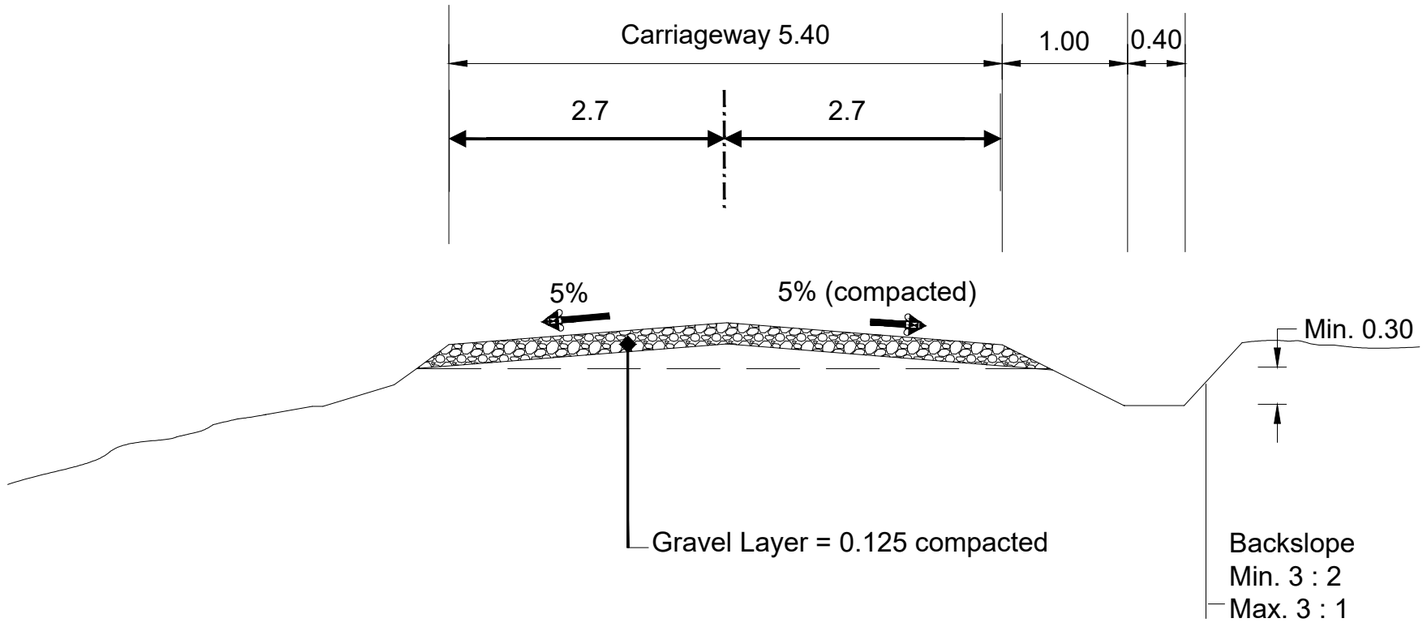
CROSS SECTION E (SUPERELEVATION CROSS-SECTION)



NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

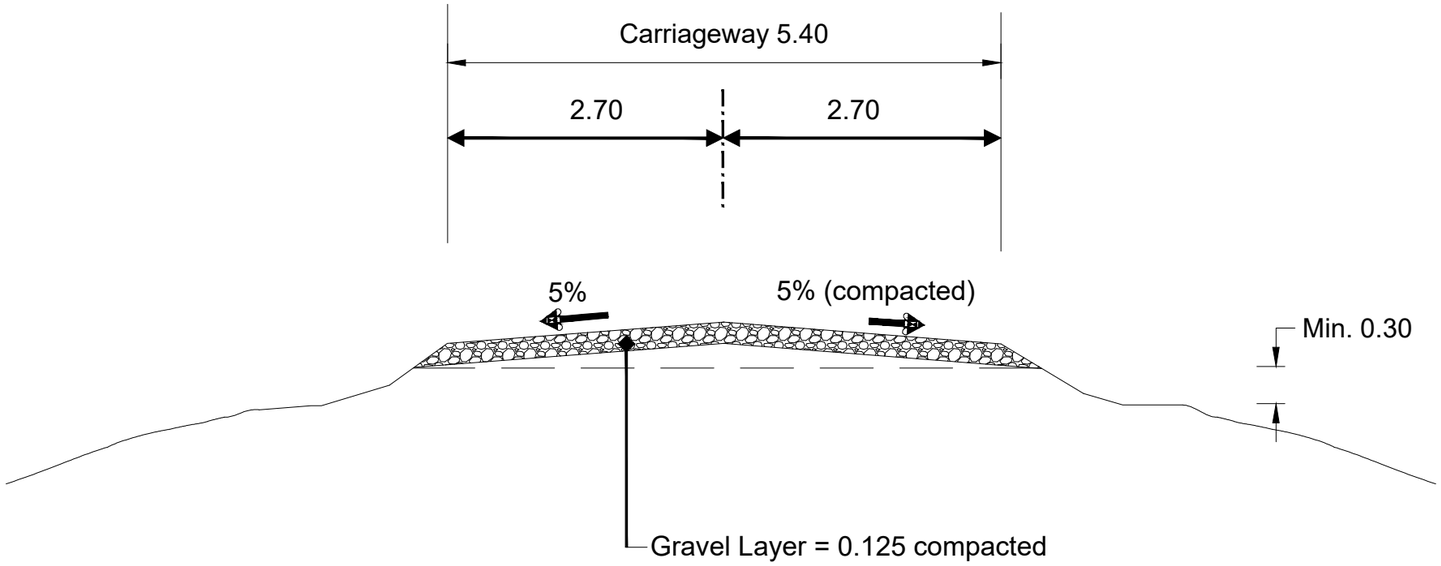
CROSS SECTION F (SIDELONG GROUND ONE SIDE)



NOTE:

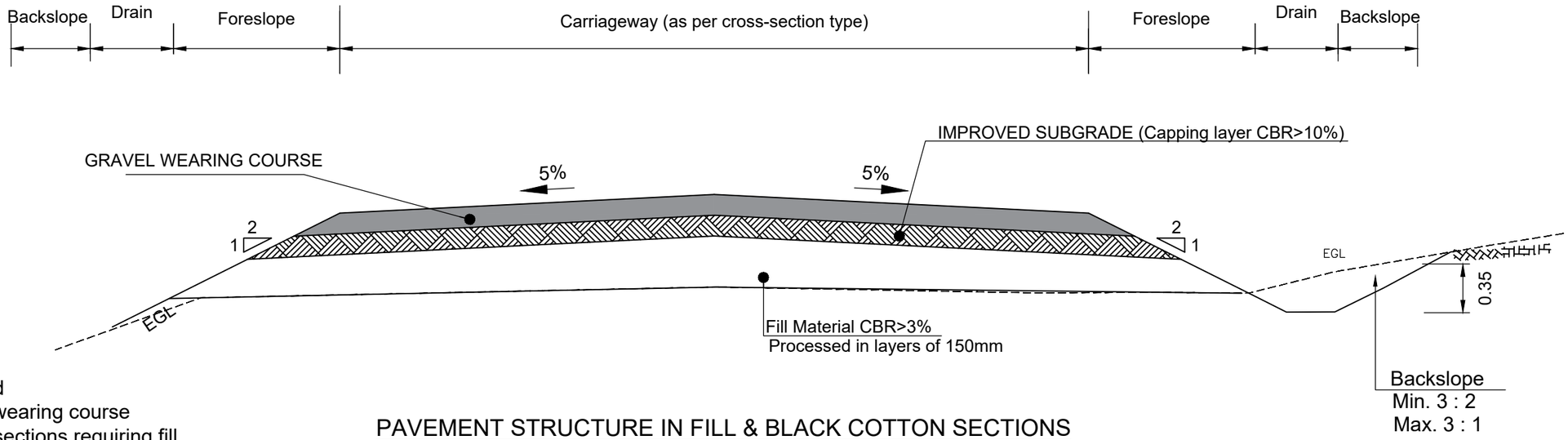
- ALL SPECIFIED DIMENSIONS IN m.

CROSS SECTION G (SIDE LONG GROUND BOTH SIDES)



NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

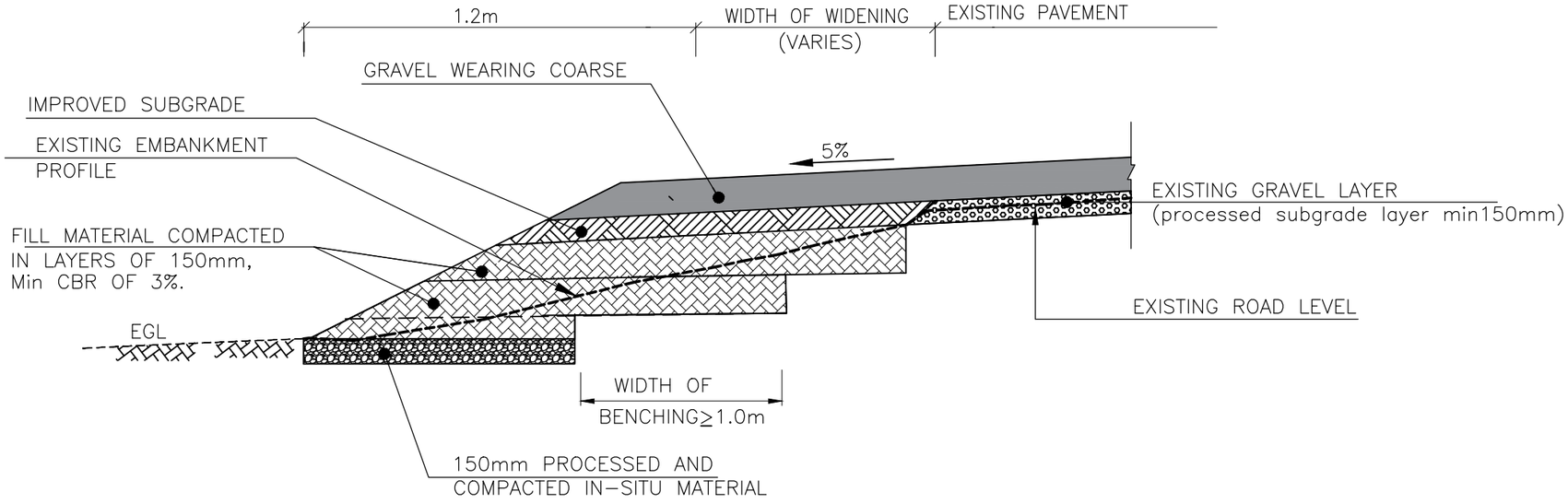


NOTE:

Stockpile and re-use good existing gravel as gravel wearing course or improved subgrade in sections requiring fill

PAVEMENT STRUCTURE IN FILL & BLACK COTTON SECTIONS

SCALE 1:20



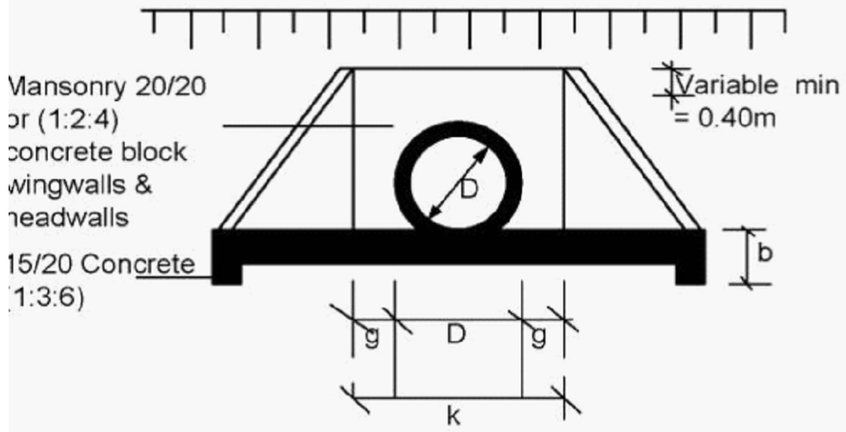
PAVEMENT WIDENING DETAILS :

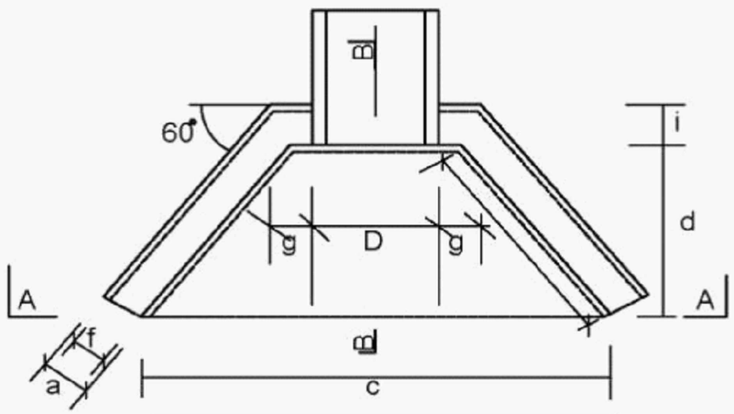
SCALE 1:20

PIPE CULVERTS

C8- HEADWALL TYPE 1 (HEAD AND WINGWALLS

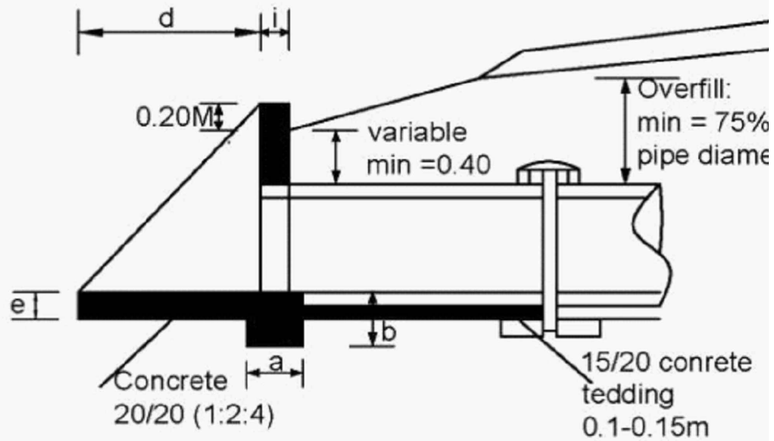
SECTION A-A





CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

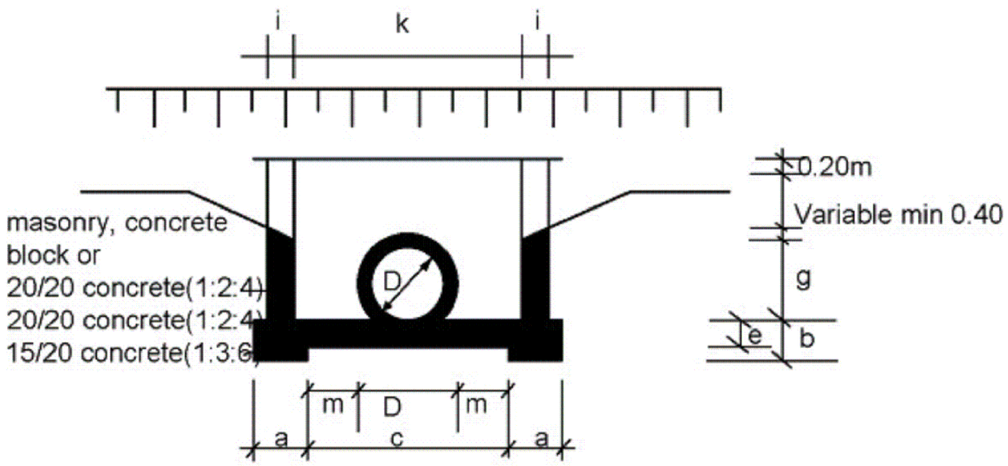
SECTION B-B



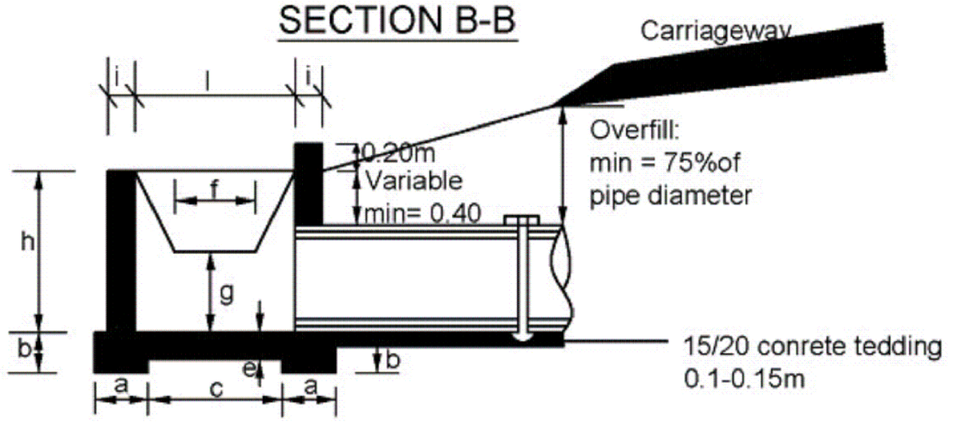
	PIPE DIAMETER IN M		TYPE A and C CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
	DIMENSION	UNIT						
a	FOUNDATION	m	0.30	0.30	0.30	0.40	0.40	0.60
b	FOUNDATION	m	0.30	0.30	0.40	0.30	0.30	0.40
c	FOUNDATION	m	2.20	2.35	2.89	2.20	2.35	2.89
d	APRON	m	1.00	1.00	1.20	1.00	1.00	1.20
e	APRON	m	0.20	0.20	0.20	0.20	0.20	0.20
f	WALL	m	0.20	0.20	0.20	0.40	0.40	0.40
g	WALL	m	0.30	0.30	0.30	0.30	0.30	0.30
h	WALL	m	1.15	1.15	1.39	1.15	1.15	1.39
i	WALL	m	0.20	0.20	0.20	0.40	0.40	0.40
k	APRON	m	1.05	1.20	1.50	1.05	1.20	1.50
	MATERIAL REQUIREMENT							
	FOUNDATION (concrete)	m3	0.30	0.32	0.51	0.40	0.42	1.03
	HEADWINGWALLS (Conrete/Masonry)	m3	0.42	0.49	0.70	0.84	0.96	1.40
	APRON (cocrete)	m3	0.33	0.36	0.53	0.33	0.36	0.53

C9-HEADWALL TYPE 2(DROP INLET)

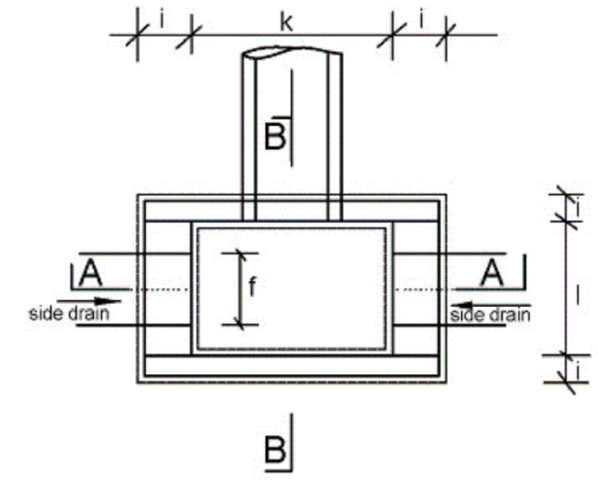
SECTION A-A



SECTION B-B



PLAN

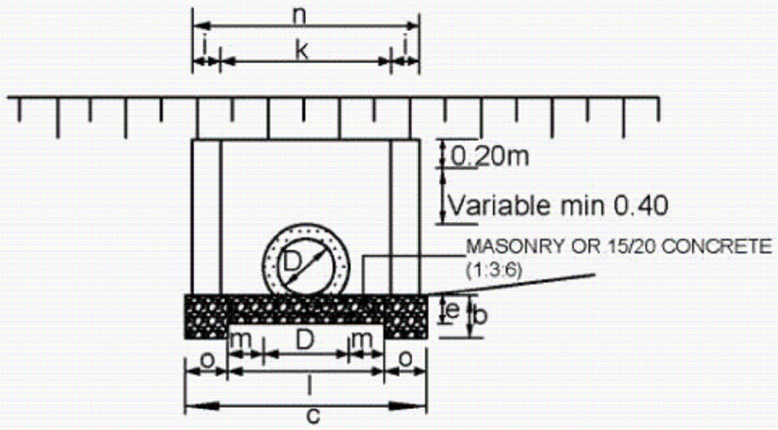


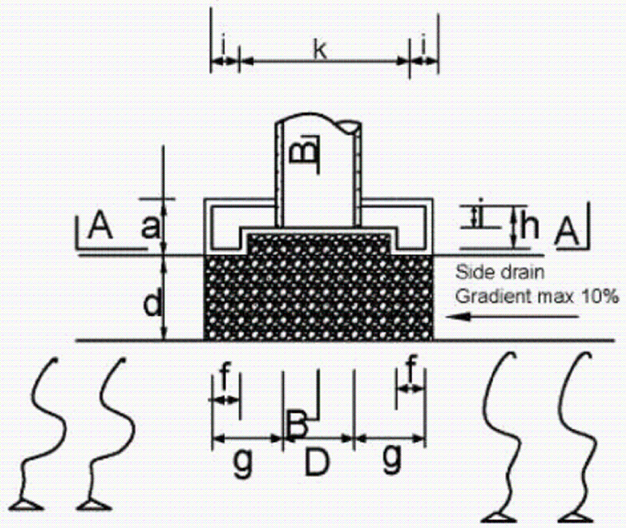
DIMENSIONS AND MATERIAL REQUIREMENTS

PIPE DIAMETER IN (M)			TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
DIMENSION		UNIT						
a	FOUNDATION	m	0.30	0.30	0.30	0.40	0.40	0.40
b	FOUNDATION	m	0.30	0.30	0.30	0.30	0.30	0.30
c	FOUNDATION	m	1.10	1.10	1.40	1.20	1.20	1.50
d	APRON	m	0.90	0.90	0.90	1.00	1.00	1.00
e	APRON	m	0.20	0.20	0.20	0.20	0.20	0.20
f	DROP INLET	m	0.60	0.60	0.60	0.60	0.60	0.60
g	DROP INLET	m	0.30	0.40	0.60	0.30	0.40	0.60
h	DROP INLET	m	0.60	0.80	1.20	0.60	0.80	1.20
i	DROP INLET	m	0.20	0.20	0.20	0.40	0.40	0.40
k	DROP INLET	m	1.20	1.20	1.50	1.20	1.20	1.50
l	DROP INLET	m	1.00	1.00	1.00	1.00	1.00	1.00
m	DROP INLET	m	0.38	0.30	0.30	0.38	0.30	0.30
MATERIAL REQUIREMENT								
FOUNDATION (concrete)		m3	0.47	0.47	0.52	0.72	0.72	0.79
HEADWINGWALLS (Conrete/Masonry)		m3	0.6	0.72	1.15	1.27	1.63	2.65
APRON (cocrete)		m3	0.24	0.24	0.30	0.24	0.24	0.30

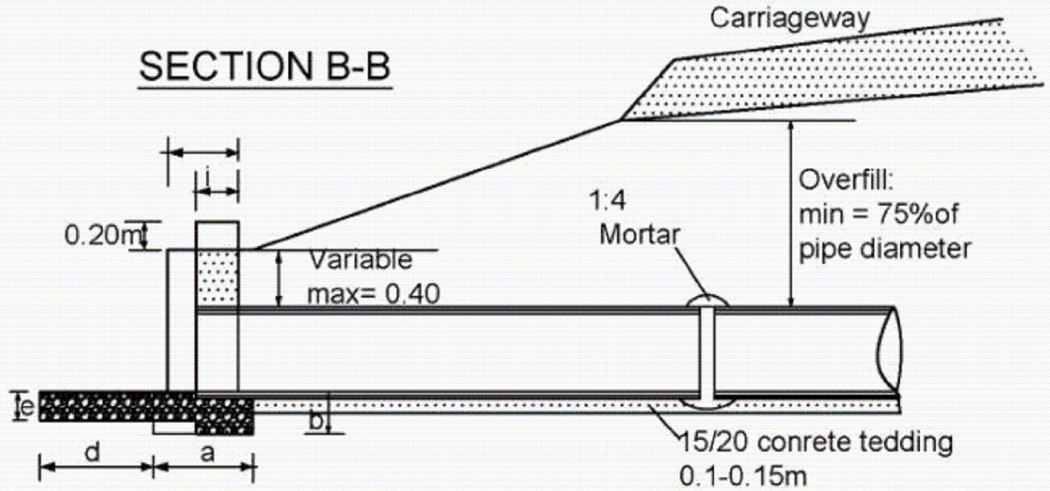
C.10-HEADWALL TYPE 3A (CONCRETE/ BLOCK HEADWALLS

SECTION A-A





SECTION B-B

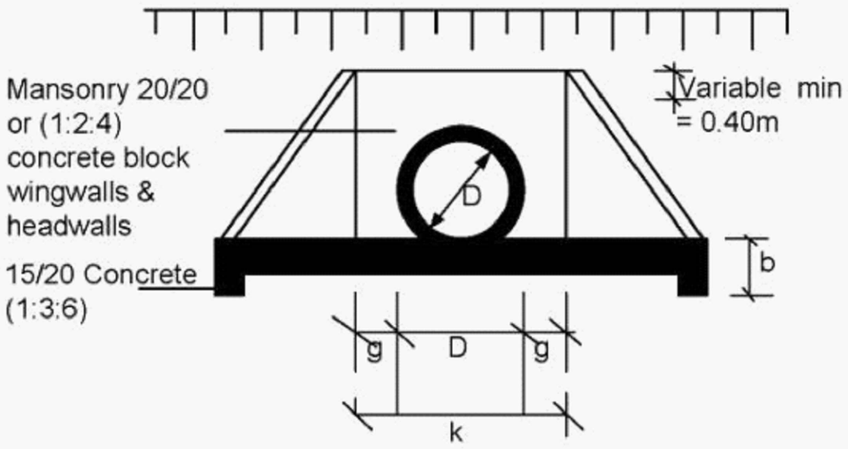


DIMENSIONS AND MATERIAL REQUIREMENTS

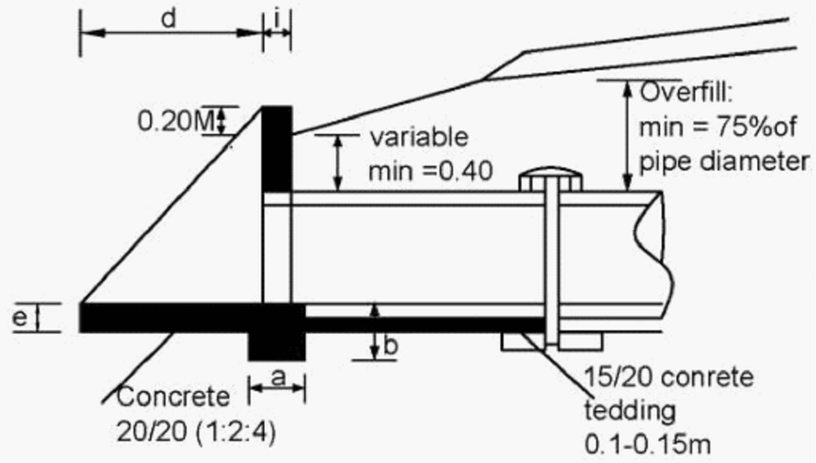
PIPE DIAMETER IN (M)			TYPE A and C CONCRETE BLOCKS 450	600	
DIMENSION		UNIT			
a	FOUNDATION	m	0.50	0.50	
b	FOUNDATION	m	0.30	0.30	
c	FOUNDATION	m	1.55	1.70	
d	APRON	m	0.60	0.60	
e	APRON	m	0.20	0.20	
f	HEADWALL	m	0.20	0.20	
g	HEADWALL	m	0.50	0.50	
h	HEADWALL	m	0.50	0.50	
i	HEADWALL	m	0.50	0.50	
k	HEADWALL	m	0.50	0.50	
l	FOUNDATION	m	0.50	0.50	
m	FOUNDATION	m	0.50	0.50	
n	HEADWALL	m	0.50	0.50	
o	FOUNDATION	m	0.50	0.50	
MATERIAL REQUIREMENT					
FOUNDATION (concrete)			0.23	0.19	
HEAD/WINGWALLS (Conrete/Masonry)			0.34	0.37	
APRON (cocrete)			0.95	0.99	

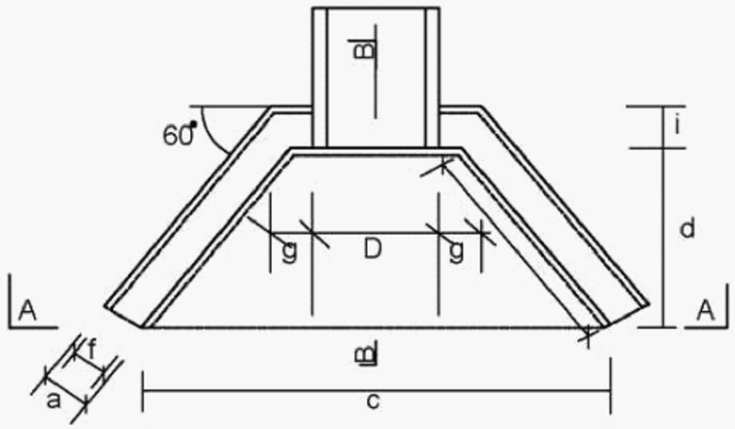
C12- HEADWALL TYPE 4 (FOR ACCESS CULVERTS

SECTION A-A



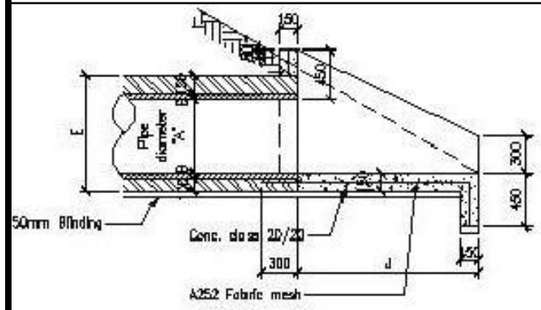
SECTION B-B



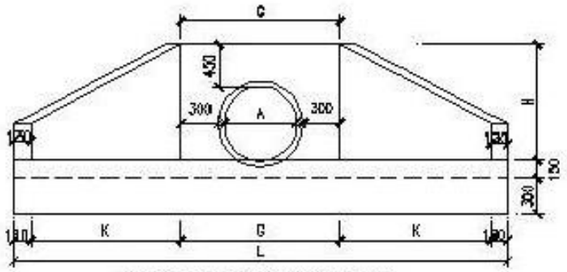


CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

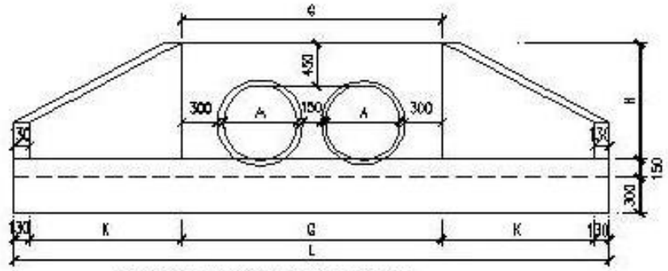
	PIPE DIAMETER IN M		TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
	DIMENSION	UNIT						
a	FOUNDATION	m	0.30	0.30		0.40	0.40	
b	FOUNDATION	m	0.30	0.30		0.30	0.30	
c	FOUNDATION	m	1.34	1.49		1.34	1.49	
d	APRON	m	0.6	0.6		0.60	0.60	
e	APRON	m	0.20	0.20		0.20	0.20	
f	WALL	m	0.20	0.20		0.40	0.40	
g	WALL	m	0.1	0.10		0.10	0.10	
h	WALL	m	0.69	0.69		0.69	0.69	
i	WALL	m	0.20	0.20		0.40	0.40	
k	APRON	m	0.4	0.40		1.05	1.20	
	MATERIAL REQUIREMENT							
	FOUNDATION (concrete)	m3	0.18	0.2		0.24	0.26	
	HEAD/WINGWALLS (Conrete/Masonry)	m3	0.28	0.32		0.53	0.61	
	APRON (cocrete)	m3	0.12	0.14		0.12	0.14	



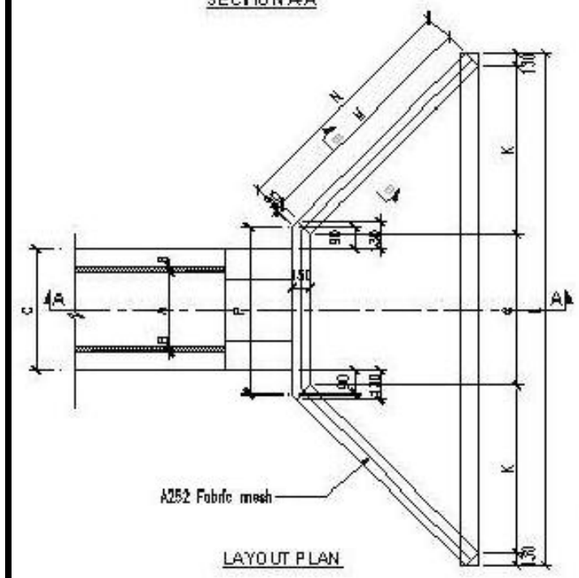
SECTION A-A



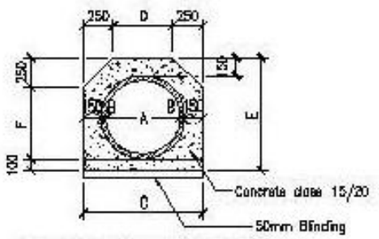
FRONT ELEVATION-SINGLE CELL



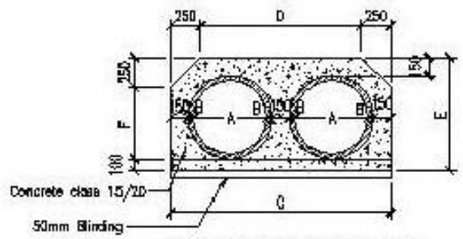
FRONT ELEVATION-MULTIPLE CELL



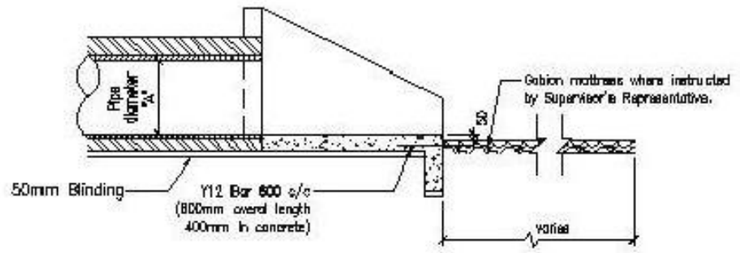
LAYOUT PLAN



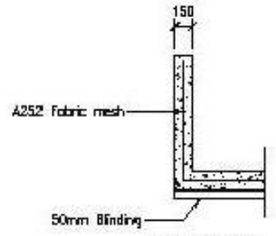
TYPICAL CONCRETE BED AND SURROUND - SINGLE CELL



TYPICAL CONCRETE BED AND SURROUND - MULTIPLE CELL



SECTION A-A (with gabion mattress shown)



SECTION B-B

TABLE A - 1-CELL CONCRETE PIPE CULVERTS

CULVERT	A (m)	B (m)	C (m)	D (m)	E (m)	F (m)	G (m)	H (m)	J (m)	K (m)	L (m)	M (m)	N (m)	P (m)	CONCRETE CLASS 20/20 Inlet & Outlet	CONCRETE CLASS 15/20 Surround & Bed per running m
Diameter 0.60m	0.60	0.05	1.00	0.50	0.95	0.60	1.20	0.95	1.25	0.72	3.00	1.44	1.53	1.18	1.58m^3	0.50m^3
Diameter 0.90m	0.90	0.09	1.38	0.88	1.33	0.98	1.50	1.25	2.25	1.30	4.54	2.60	2.69	1.56	4.07m^3	0.86m^3
Diameter 1.20m	1.20	0.10	1.80	1.30	1.70	1.35	1.80	1.55	2.85	1.65	5.56	3.29	3.38	1.88	5.92 m^3	1.46 m^3

TABLE B - 2-CELL CONCRETE PIPE CULVERTS

CULVERT	A (m)	B (m)	C (m)	D (m)	E (m)	F (m)	G (m)	H (m)	J (m)	K (m)	L (m)	M (m)	N (m)	P (m)	CONCRETE CLASS 20/20 Inlet & Outlet	CONCRETE CLASS 15/20 Surround & Bed per running m
Diameter 0.60m	0.60	0.05	1.85	1.35	0.95	0.60	2.15	0.95	1.25	0.72	3.85	1.44	1.53	2.03	2.22m^3	0.93m^3
Diameter 0.90m	0.90	0.09	2.61	2.11	1.33	0.98	2.91	1.25	2.25	1.30	5.77	2.60	2.69	2.79	4.89m^3	1.58m^3
Diameter 1.20m	1.20	0.10	3.25	2.75	1.70	1.35	3.55	1.55	2.85	1.65	7.11	3.29	3.38	3.43	7.24m^3	2.38m^3

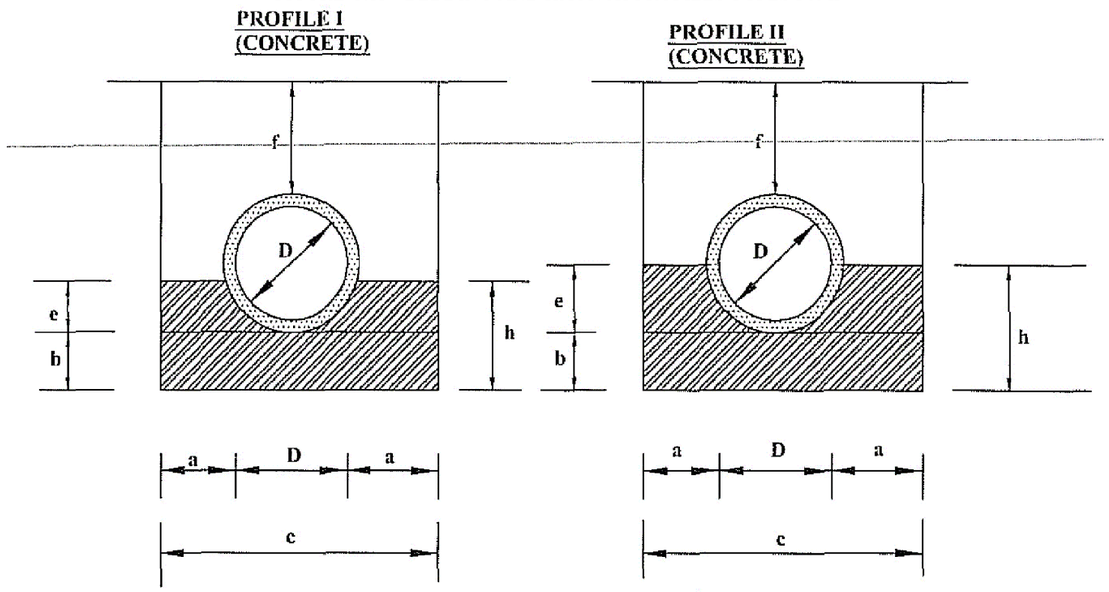
TABLE C - 3-CELL CONCRETE PIPE CULVERTS

CULVERTS	A (m)	B (m)	C (m)	D (m)	E (m)	F (m)	G (m)	H (m)	J (m)	K (m)	L (m)	M (m)	N (m)	P (m)	CONCRETE CLASS 20/20 Inlet & Outlet	CONCRETE CLASS 15/20 Surround & Bed per running m
Diameter 0.60m	0.60	0.05	2.70	2.20	0.95	0.60	3.00	0.95	1.25	0.72	4.70	1.44	1.53	2.88	2.66m^3	1.35m^3
Diameter 0.90m	0.90	0.09	3.84	3.34	1.33	0.98	4.14	1.25	2.25	1.30	7.00	2.60	2.69	4.02	5.86m^3	2.30m^3
Diameter 1.20m	1.20	0.10	4.80	4.30	1.70	1.35	5.10	1.55	2.85	1.65	8.88	3.29	3.38	4.98	8.73m^3	3.48m^3

NOTES:

1. All dimensions are in millimetres,unless otherwise indicated

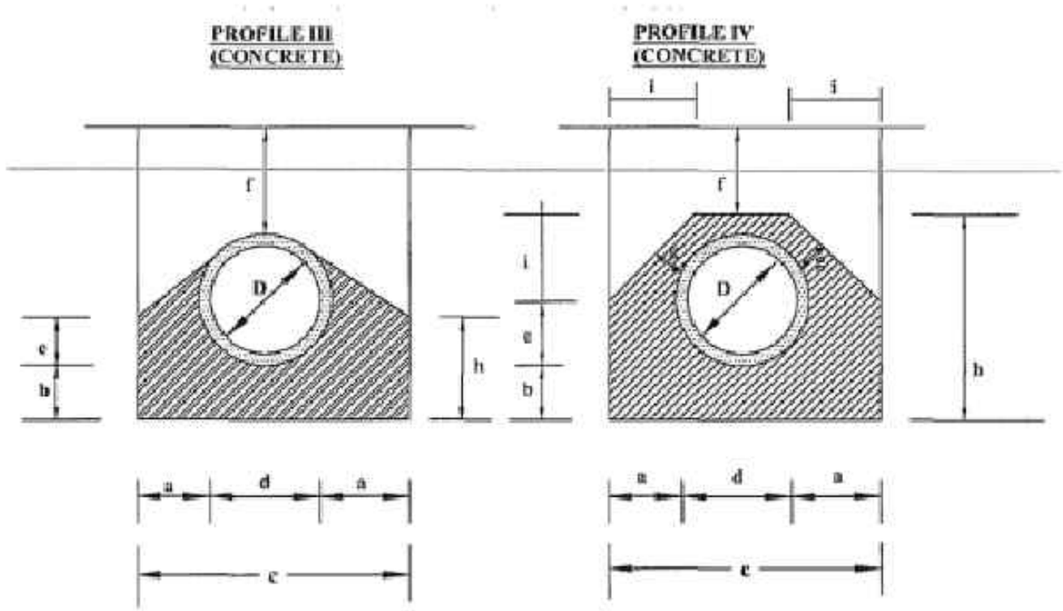
FIGURE C.13 - BEDDING AND HAUNCH PROFILES TYPES I & II



Diameter (D)	450 (mm)	600 (mm)	900 (mm)
a	0.15	0.20	0.20
b	0.10	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.14	0.18	0.27
f(min)	0.34	0.45	0.68
g	-	-	-
h	0.24	0.33	0.42
i	-	-	-
Concrete	Volume in (m3/m)		
Class 15/20	0.24	0.24	0.24
Application	-Fair subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Remarks	Material for back/overfill shall be approved by the Engineer		

450 (mm)	600 (mm)	900 (mm)
0.15	0.20	0.20
0.10	0.15	0.15
0.86	1.12	1.48
0.56	0.72	1.08
0.28	0.36	0.54
0.34	0.45	0.68
-	-	-
0.38	0.51	0.69
-	-	-
Volume in (m3/m)		
0.20	0.37	0.56
-Fair to poor subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Material for back/overfill shall be approved by the Engineer		

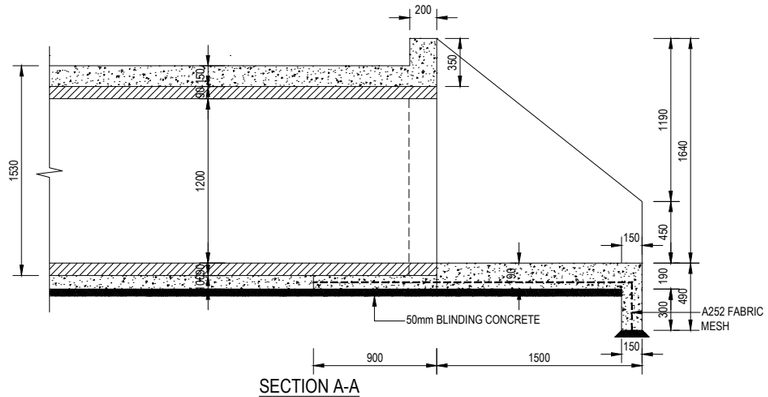
FIGURE C.14 - BEDDING AND HAUNCH PROFILES TYPES III & IV



Diameter (D)	450 (mm)	600 (mm)	900 (mm)
a	0.15	0.20	0.20
b	0.10	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.42	0.54	0.81
f(min)	0.23	0.3	0.45
g	-	-	-
h	0.52	0.69	0.96
i	-	-	-
Concrete	Volume in (m3/m)		
Class 15/20	0.26	0.47	0.71
Application	-Fair subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Remarks	Material for back/overfill shall be approved by the Engineer		

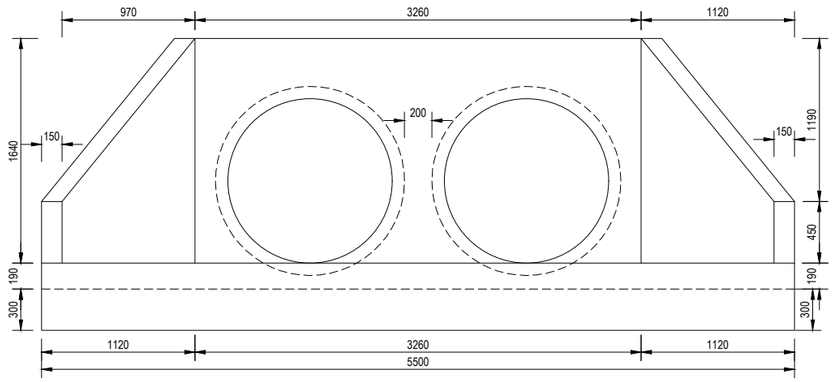
450 (mm)	600 (mm)	900 (mm)
0.15	0.20	0.20
0.10	0.15	0.15
0.86	1.12	1.48
0.56	0.72	1.08
0.46	0.52	0.78
0.15	0.15	0.15
0.15	0.15	0.15
0.81	1.02	1.38
0.28	0.35	0.45
Volume in (m3/m)		
0.37	0.61	0.92
-Fair to poor subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Material for back/overfill shall be approved by the Engineer		

MAJOR DRAINAGE STRUCTURES



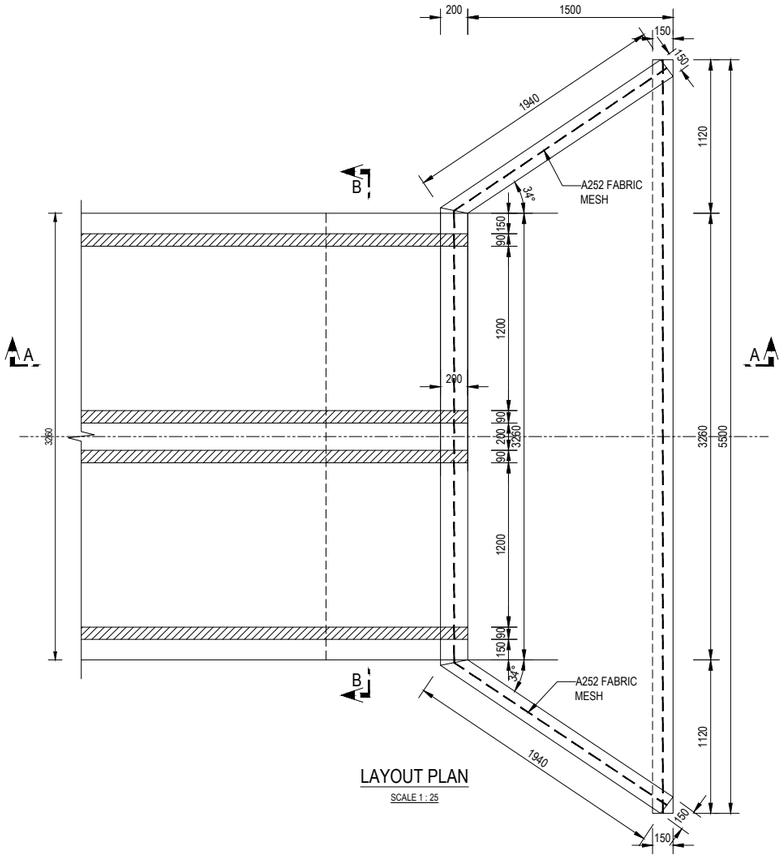
SECTION A-A

SCALE 1 : 25



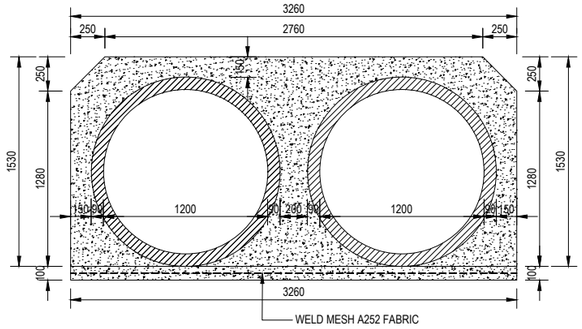
FRONT ELEVATION

SCALE 1 : 25



LAYOUT PLAN

SCALE 1 : 25

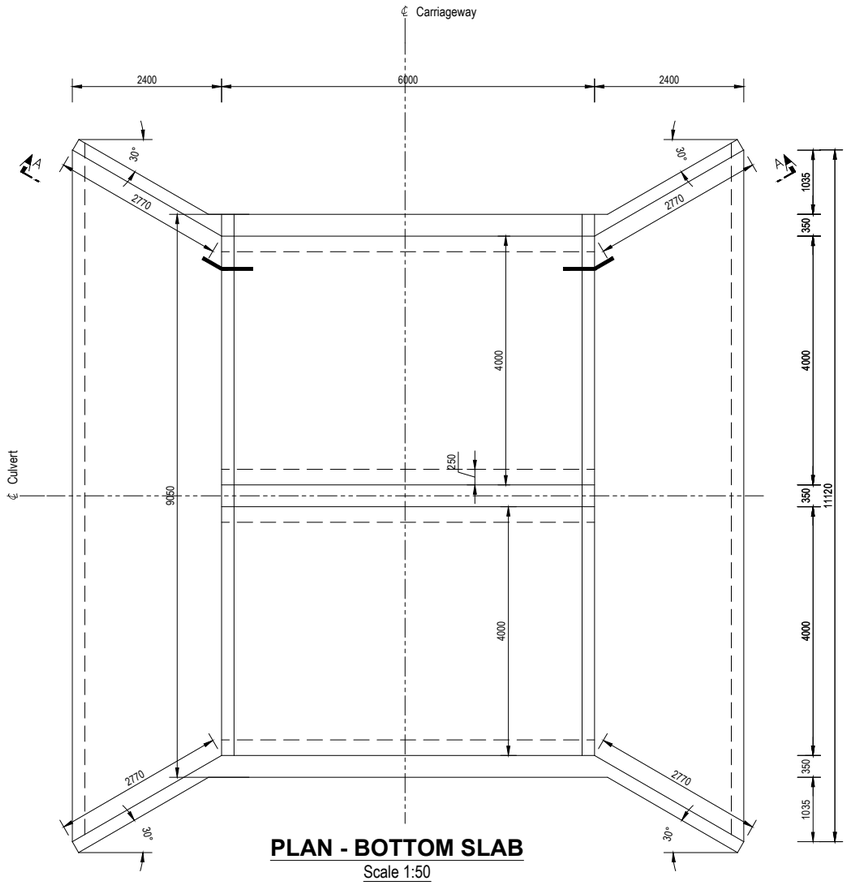


SECTION B-B

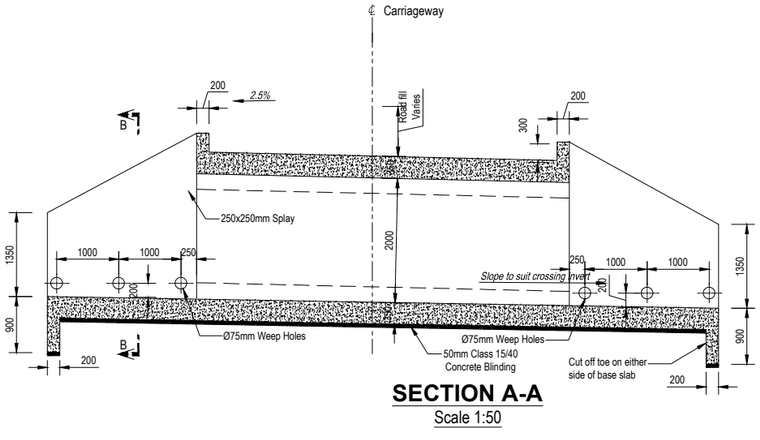
SCALE 1 : 25

NOTES

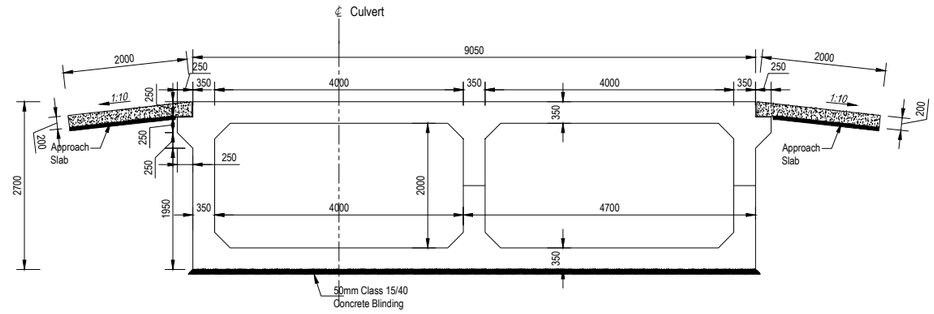
1. ALL FABRIC MESH REINFORCEMENT TO BE PLACED AS SHOWN
2. THE SLOPE OF THE PIPE SHALL BE DIRECTED BY THE ENGINEER'S REPRESENTATIVE.
3. ALL DIMENSIONS ARE IN MILLIMETERS
4. CONCRETE FOR HEADWALL, APRON, TOEWALL, BAFFLEWALL TO BE CLASS 25/20
5. CONCRETE FOR BLINDING AND SURROUND TO BE CLASS $\frac{15}{20}$
6. CONTRACTOR TO CHECK THE DRAWINGS FOR CORRECTNESS AND RAISE ANY QUERIES ON ANY NOTED DISCREPANCY BEFORE COMMENCEMENT OF WORK.



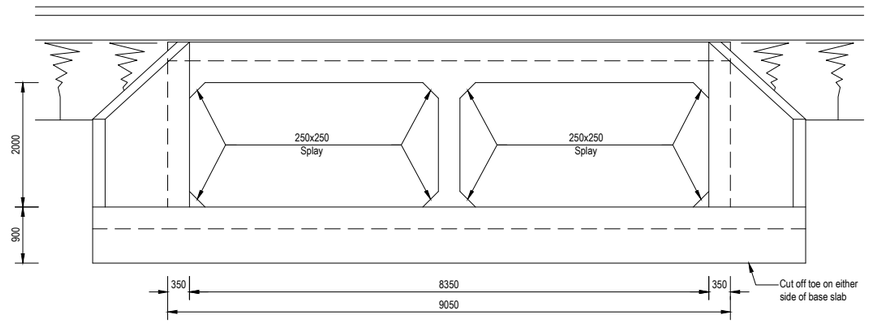
PLAN - BOTTOM SLAB
Scale 1:50



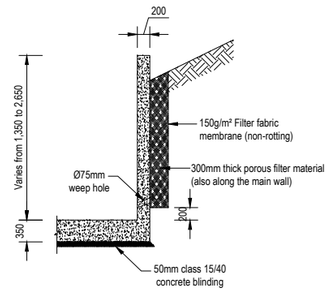
SECTION A-A
Scale 1:50



1 CELL 2x2m CULVERT CROSS SECTION
Scale 1:50



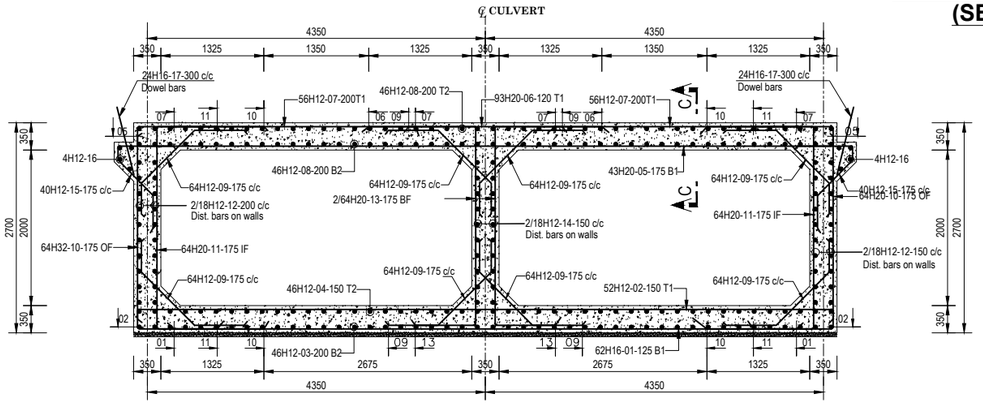
END ELEVATION
Scale 1:50



SECTION B-B
Scale 1:50

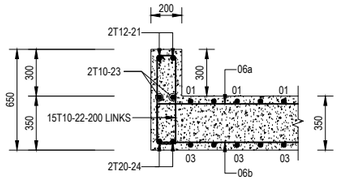
NOTES:

1. FINAL CULVERT DIMENSIONS, FORMATION LEVELS & INVERT LEVELS TO BE CONFIRMED ON SITE AT THE TIME OF CONSTRUCTION.
2. A TRAFFIC DIVERSION ROUTE WILL BE REQUIRED DURING CONSTRUCTION.
3. THE MINIMUM HEIGHT OF FILL ABOVE CULVERT TO BE 600MM.
4. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.



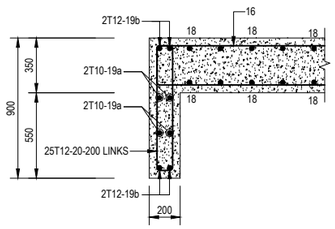
2 CELL 4.0x2.0M CULVERT SECTION X-X RC DETAILS

SCALE 1:40



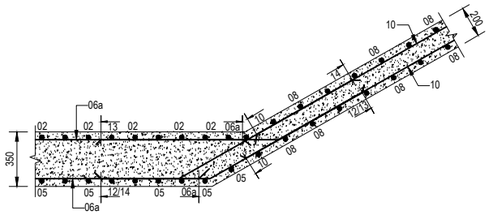
HEAD WALL RC DETAILS (SECTION D-D)

Scale 1:20



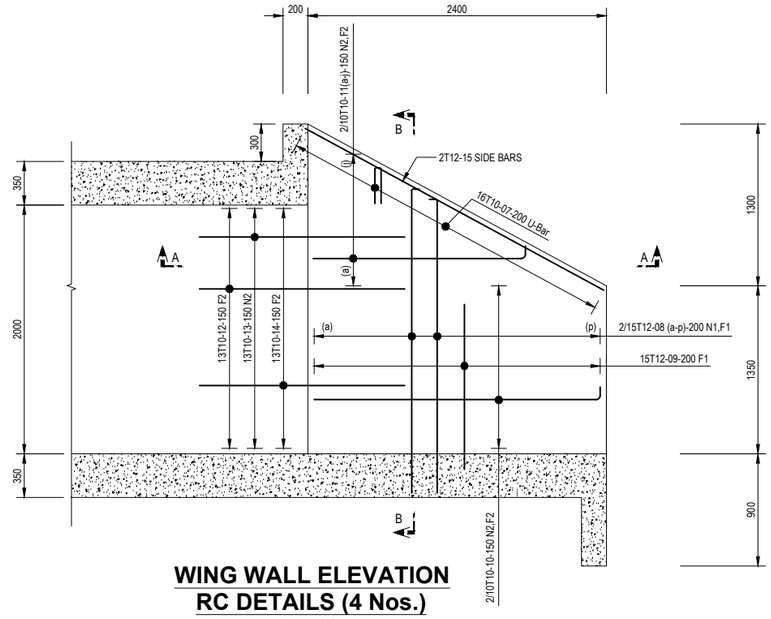
CUT OFF WALL RC DETAILS (SECTION C-C) [2 Nos.]

Scale 1:20



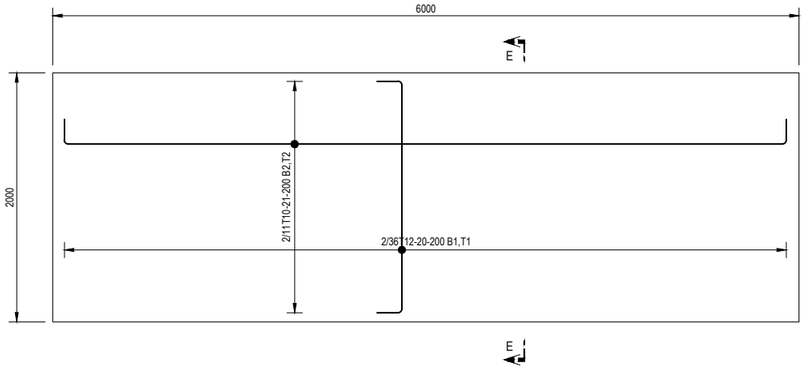
WING WALL CORNER RC DETAILS (SECTION A-A)

Scale 1:20



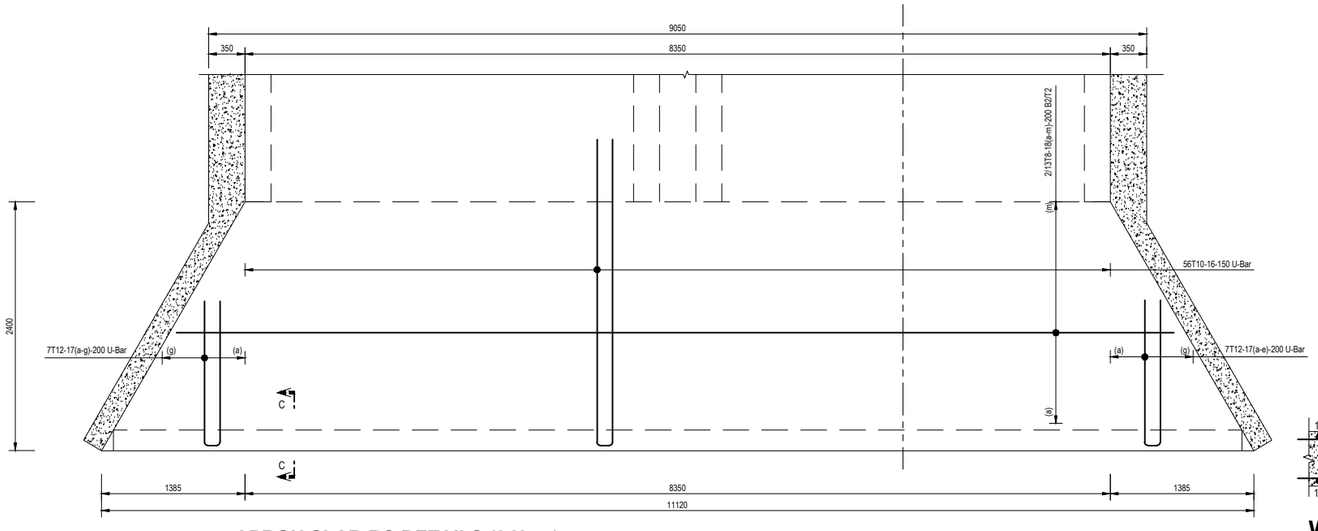
WING WALL ELEVATION RC DETAILS (4 Nos.)

Scale 1:25



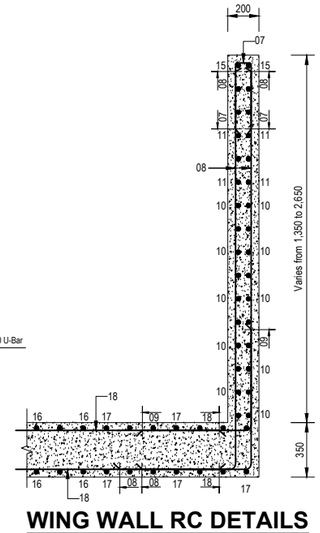
APPROACH SLAB RC DETAILS (2 Nos.)

Scale 1:25



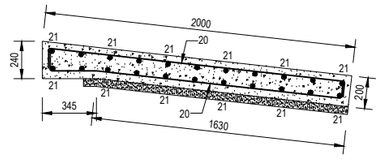
APRON SLAB RC DETAILS (2 Nos.)

Scale 1:25



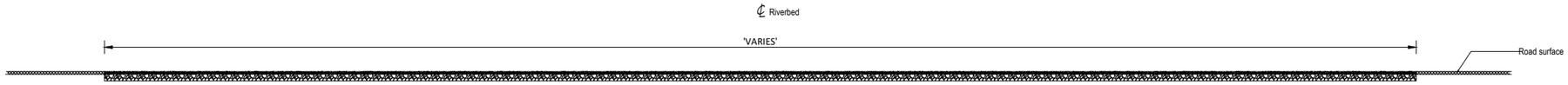
WING WALL RC DETAILS (SECTION B-B)

Scale 1:20

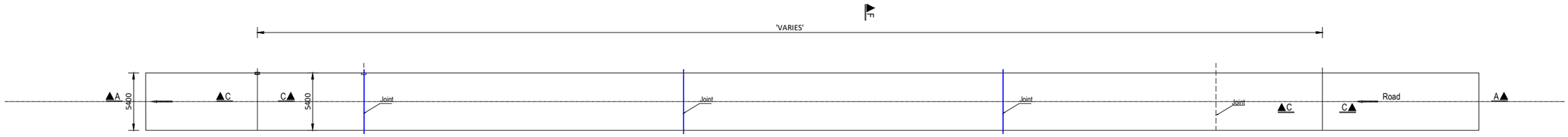


APPROACH SLAB RC DETAILS (SECTION E-E)

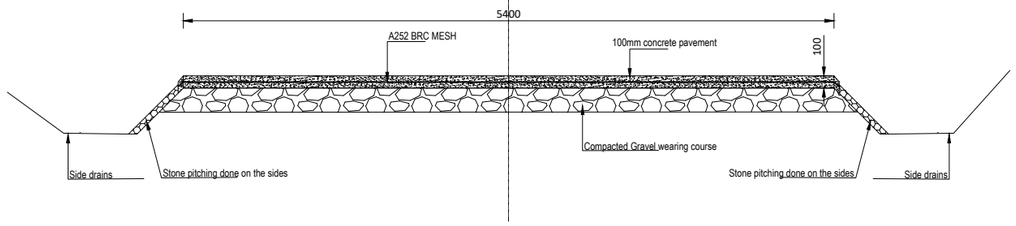
Scale 1:20



SECTION A-A
SCALE 1:200



PLAN VIEW
SCALE 1:200



SECTION F-F
SCALE 1:25

NOTES

1. Subgrade

Improved sub grade under concrete pavement is required when;

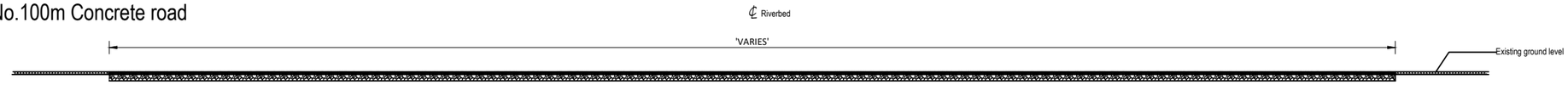
Subgrade soil		Improved Subgrade
Class	CBR range	
S 1	2 - 5	325mm
S 2	5 - 10	200mm
S 3 or higher	7 - 13	0

Soils of class S4 (CBR range 10-19) should be used for Improvement.

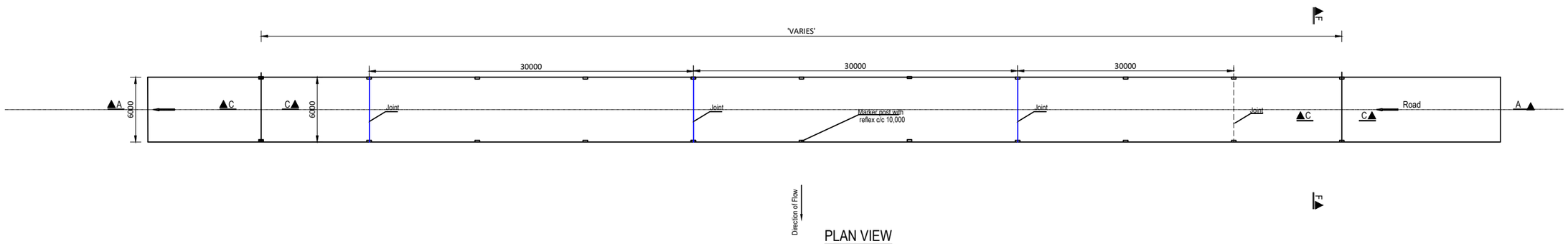
2 Concrete strength to be;
Class 30/20 for the concrete pavement
Class 15/35 for blinding

APPLIES TO CHAINAGE:

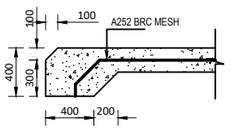
- KM 48+150 - 200m
- KM 48+300 - 100m
- KM 48+800 - 2No.100m Concrete road



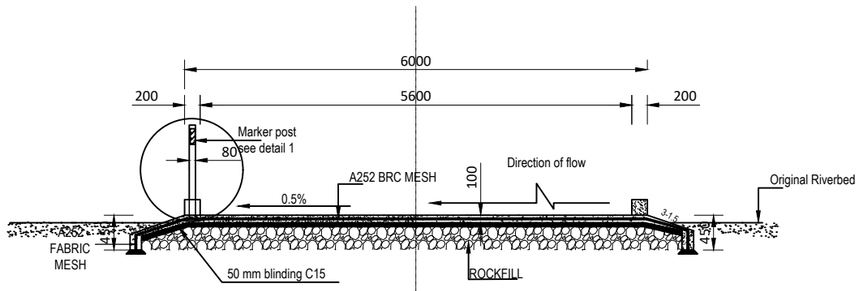
SECTION A-A
SCALE 1:200



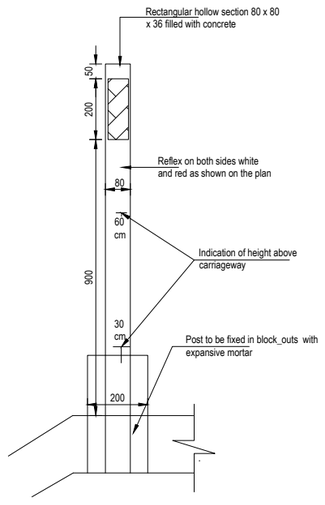
PLAN VIEW
SCALE 1:200



SECTION C-C
SCALE 1:25



SECTION F-F
SCALE 1:50



Detail 1
SCALE 1:10

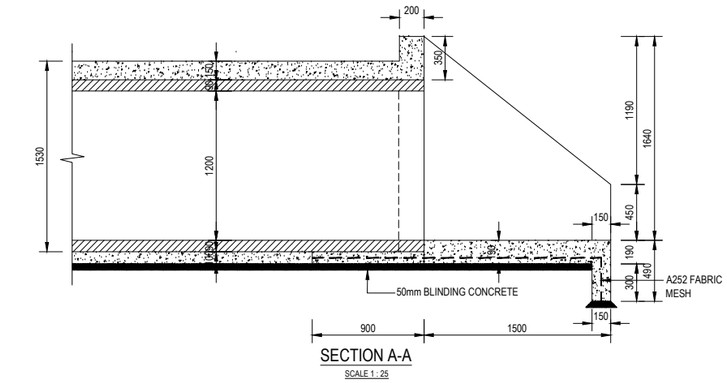
NOTES

1. Subgrade
Improved sub grade under concrete pavement is required when;

Subgrade soil		Improved Subgrade
Class	CBR range	
S 1	2 - 5	325mm
S 2	5 - 10	200mm
S 3 or higher	7 - 13	0

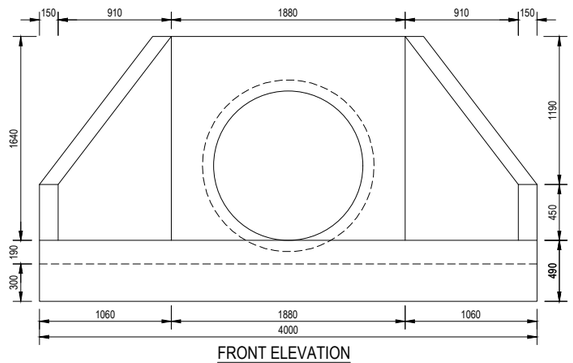
Soils of class S4 (CBR range 10-19) should be used for Improvement.

2 Concrete strength to be;
Class 30/20 for the concrete pavement
Class 15/35 for blinding



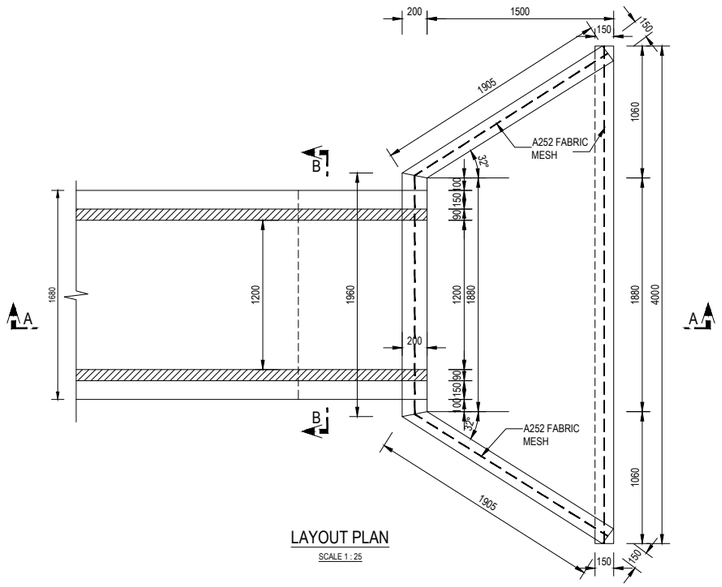
SECTION A-A

SCALE 1 : 25



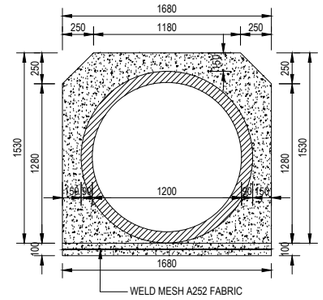
FRONT ELEVATION

SCALE 1 : 25



LAYOUT PLAN

SCALE 1 : 25



SECTION B-B

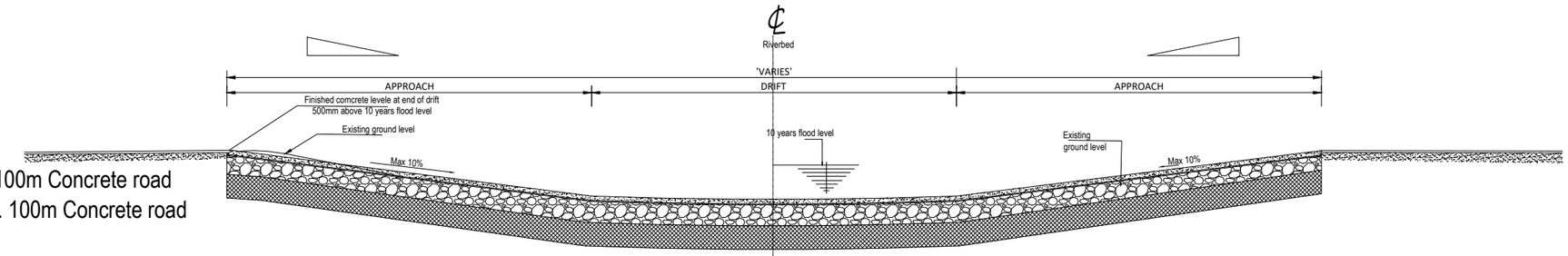
SCALE 1 : 25

NOTES

1. ALL FABRIC MESH REINFORCEMENT TO BE PLACED AS SHOWN
2. THE SLOPE OF THE PIPE SHALL BE DIRECTED BY THE ENGINEER'S REPRESENTATIVE.
3. ALL DIMENSIONS ARE IN MILLIMETERS
4. CONCRETE FOR HEADWALL, APRON, TOEWALL, BAFFLEWALL TO BE CLASS 25/20
5. CONCRETE FOR BLINDING AND SURROUND TO BE CLASS $\frac{15}{20}$
6. CONTRACTOR TO CHECK THE DRAWINGS FOR CORRECTNESS AND RAISE ANY QUERIES ON ANY NOTED DISCREPANCY BEFORE COMMENCEMENT OF WORK.

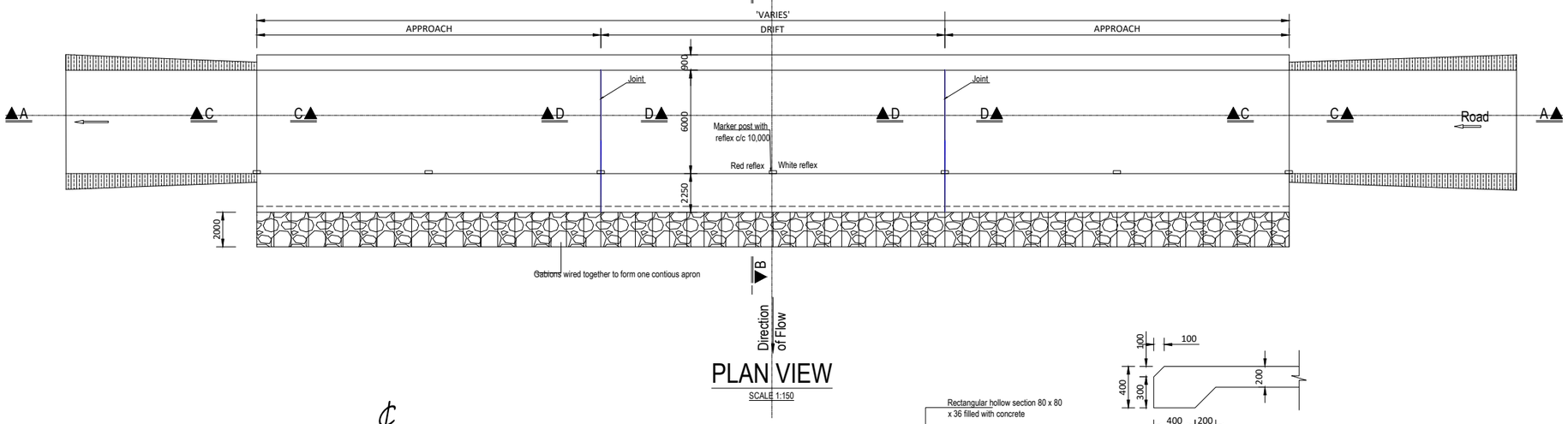
APPLIES TO CHAINAGE:

- KM 48+020 - 35m
- KM 48+150 - 30m
- KM 48+220 - 30m
- KM 48+300 - 2No. 50m +100m Concrete road
- KM 48+800 - 100m + 2No. 100m Concrete road



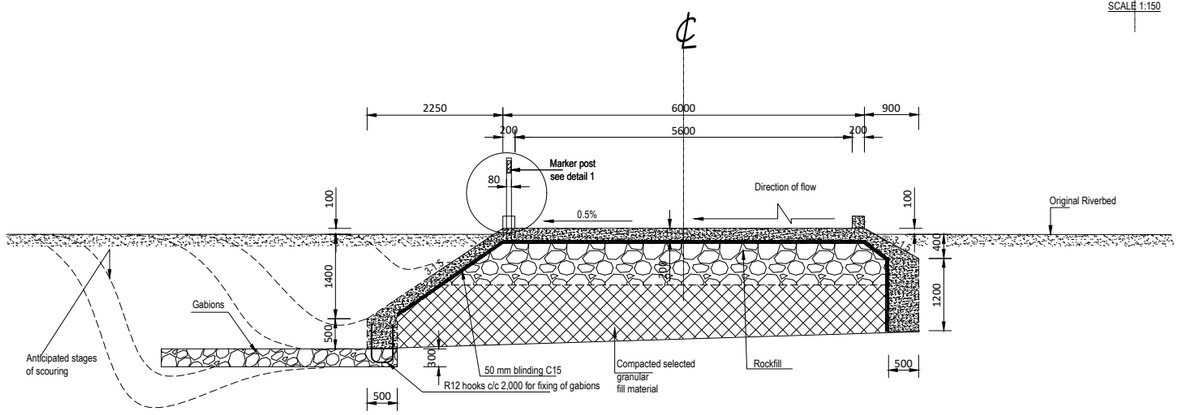
SECTION A-A

SCALE 1:150



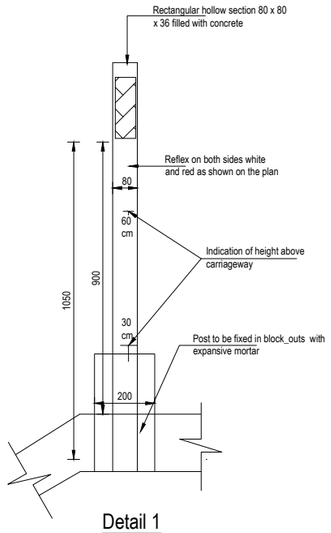
PLAN VIEW

SCALE 1:150



SECTION B-B

SCALE 1:50



Detail 1

SCALE 1:10

SECTION C-C

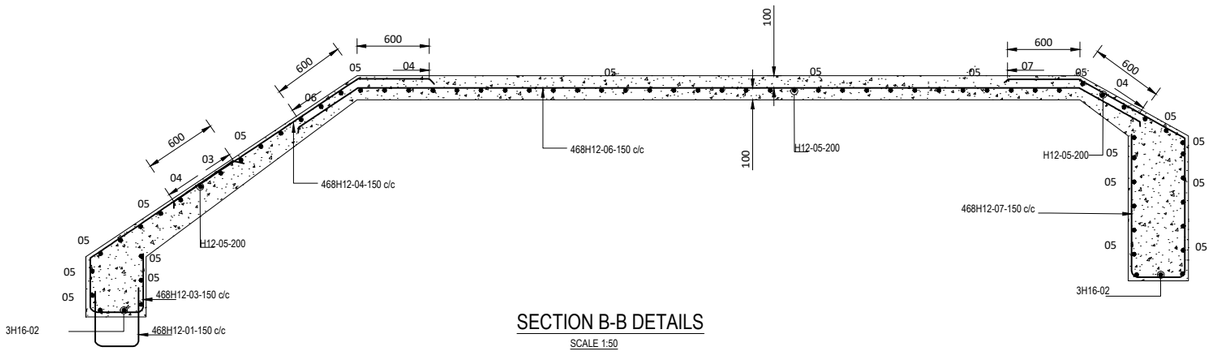
SCALE 1:25

NOTES

1. Subgrade
   Improved subgrade under drift us required when;

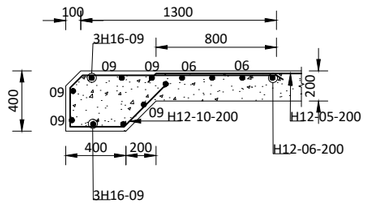
Subgrade soil		Improved Subgrade
Class	CBR range	
S 1	2 - 5	325mm
S 2	5 - 10	200mm
S 3 or higher	7 - 13	0

   Soils of class S4 (CBR range 10-19) should be used for Improvement.
2. Concrete strength to be ;
   Class 30/20 for drift
   Class 15/35 for blinding



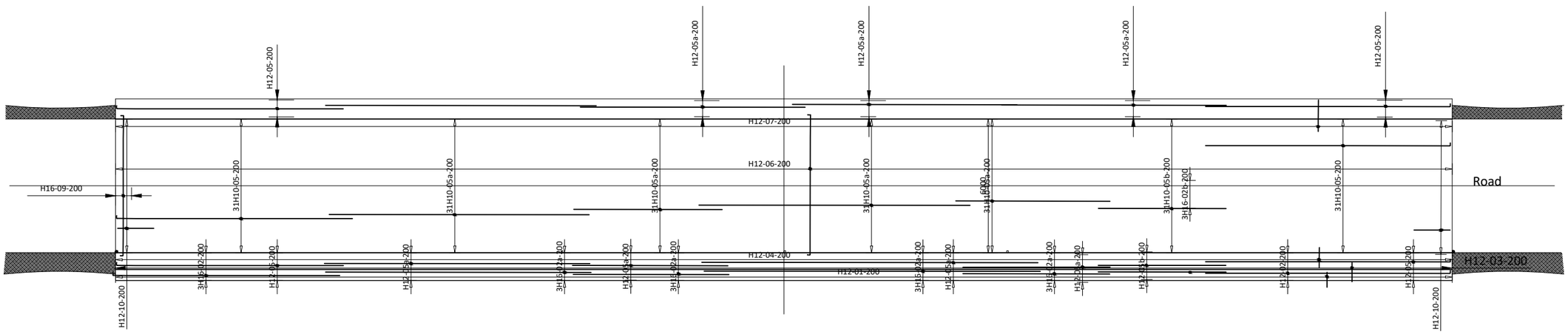
SECTION B-B DETAILS

SCALE 1:50



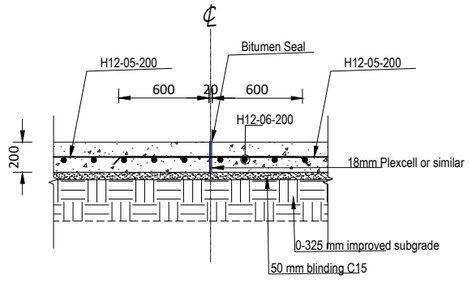
SECTION C-C DETAILS

SCALE 1:20



DRIFT DETAILS

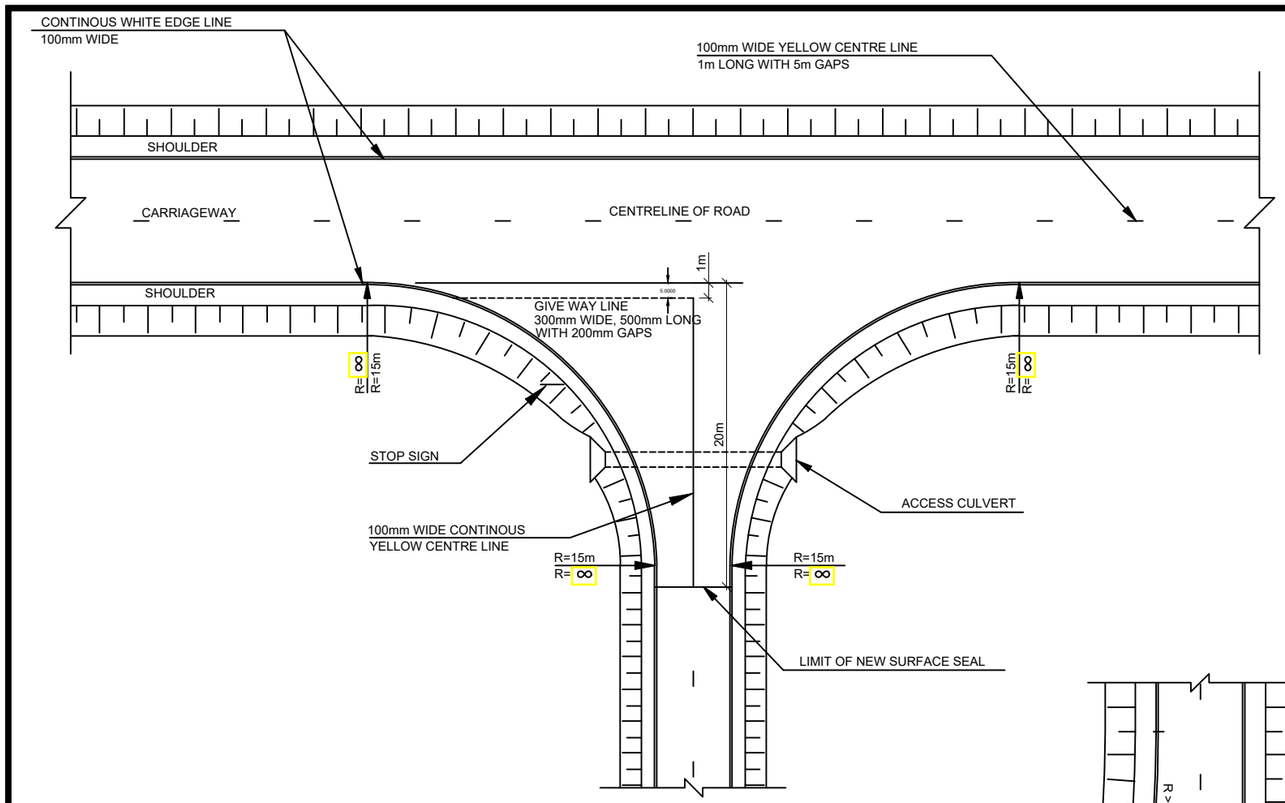
SCALE 1:100



SECTION D-D

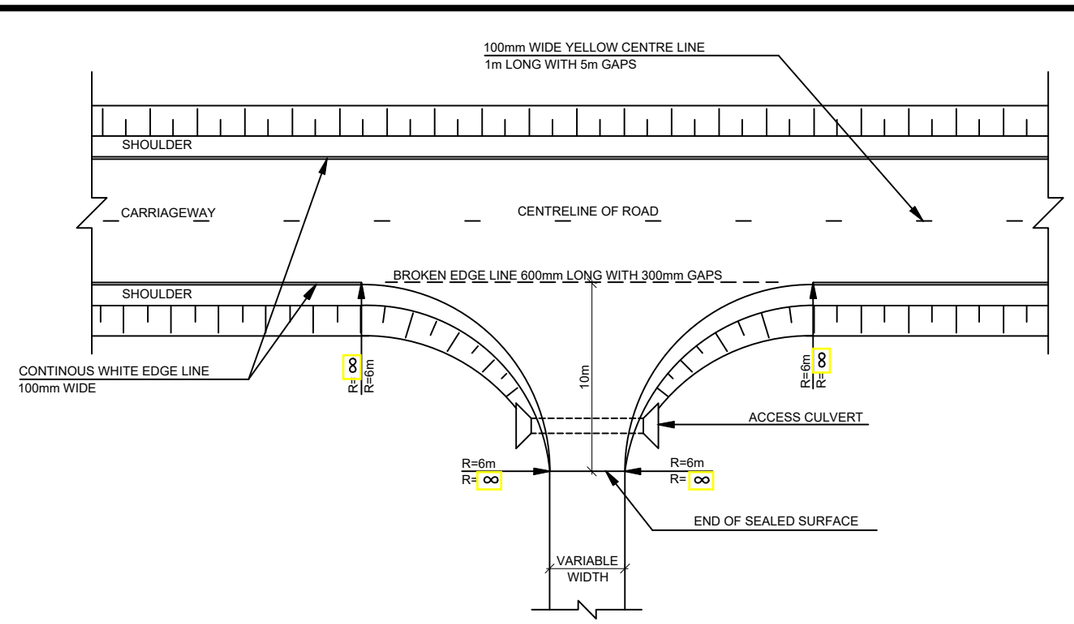
SCALE 1:20

STANDARD DRAWINGS



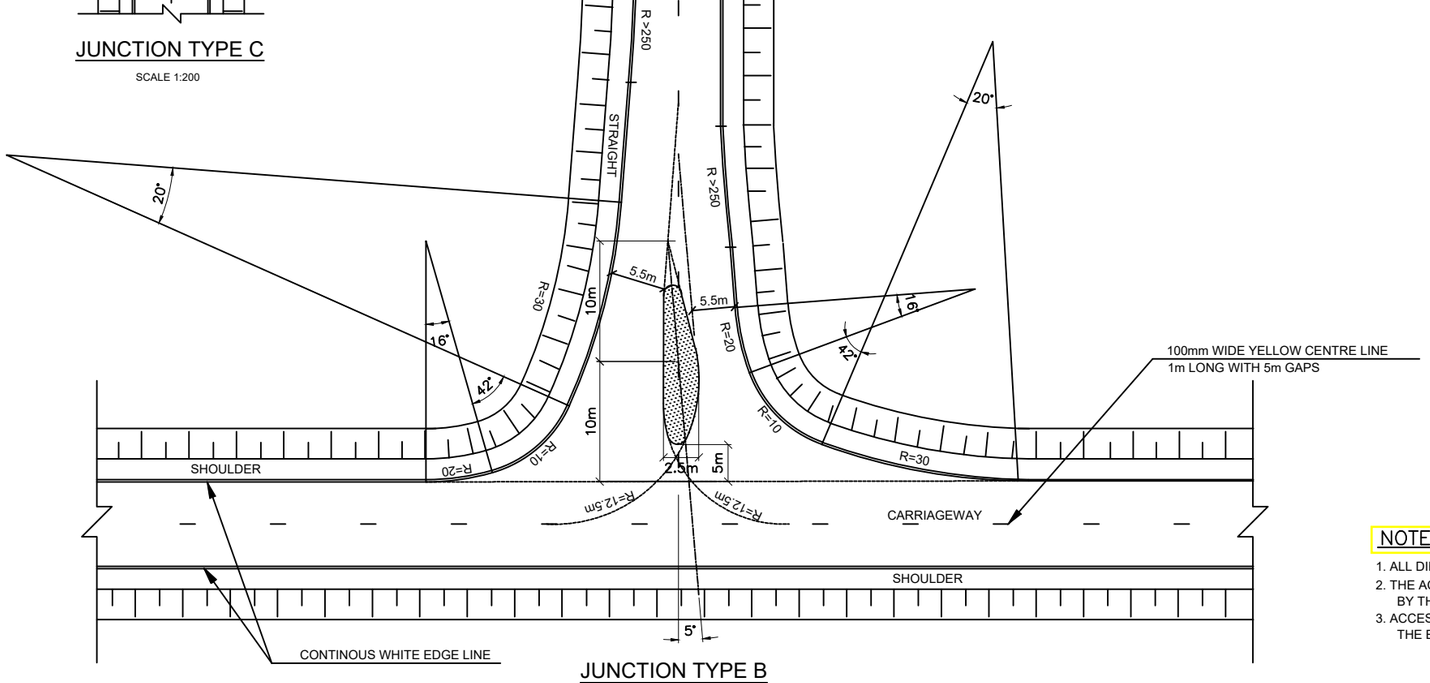
JUNCTION TYPE C

SCALE 1:200



JUNCTION TYPE D : MINOR ACCESSES

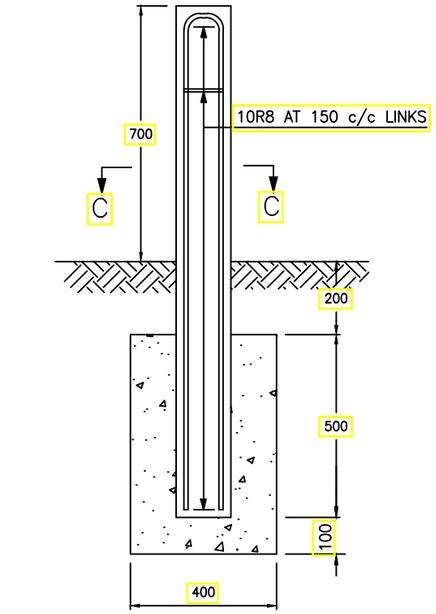
SCALE 1:200



JUNCTION TYPE B

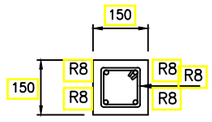
NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. THE ACTUAL LOCATION OF PRIVATE ACCESS TO BE AS DIRECTED BY THE ENGINEER ON SITE.
3. ACCESS CULVERTS, AS REQUIRED, SHALL BE AS DIRECTED BY THE ENGINEER.



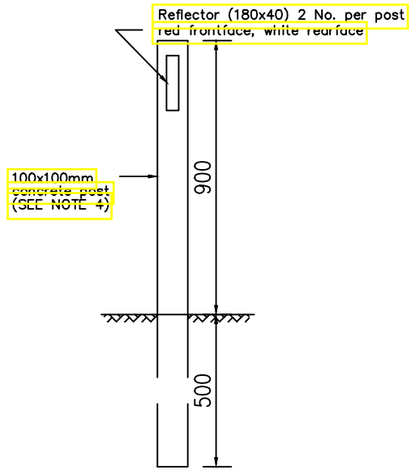
CULVERT/SERVICE DUCT MARKER POST

SCALE 1:10



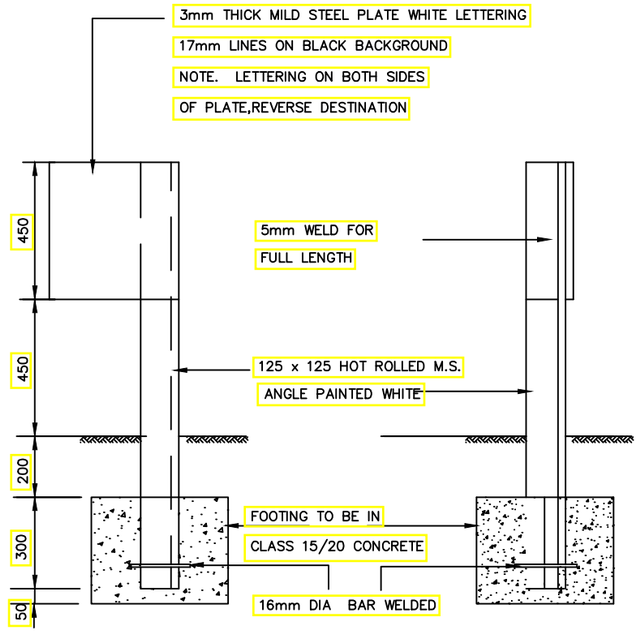
SECTION C–C

SCALE 1:10



EDGE MARKER POST

SCALE 1 : 20

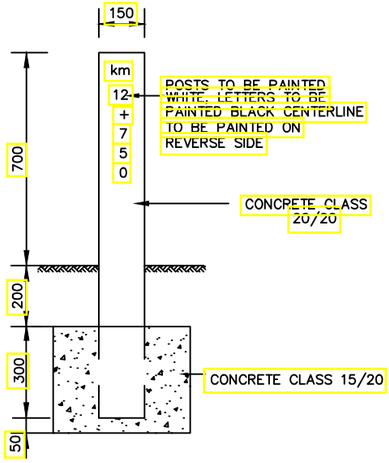


FRONT ELEVATION

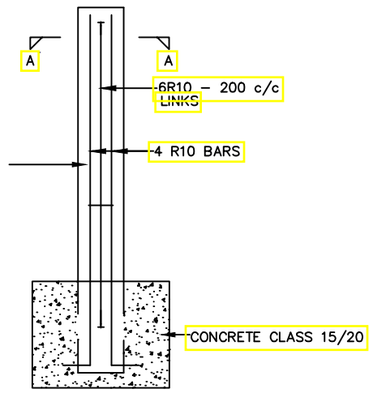
SIDE ELEVATION

KILOMETER MARKER POST

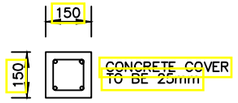
SCALE 1 : 20



FRONT ELEVATION



REINFORCED DETAILS



SECTION A – A

ROAD RESERVE BOUNDARY POST

SCALE 1: 20

NOTES

1. Edge marker posts

To be provided both sides of carriageway in the following cases:–

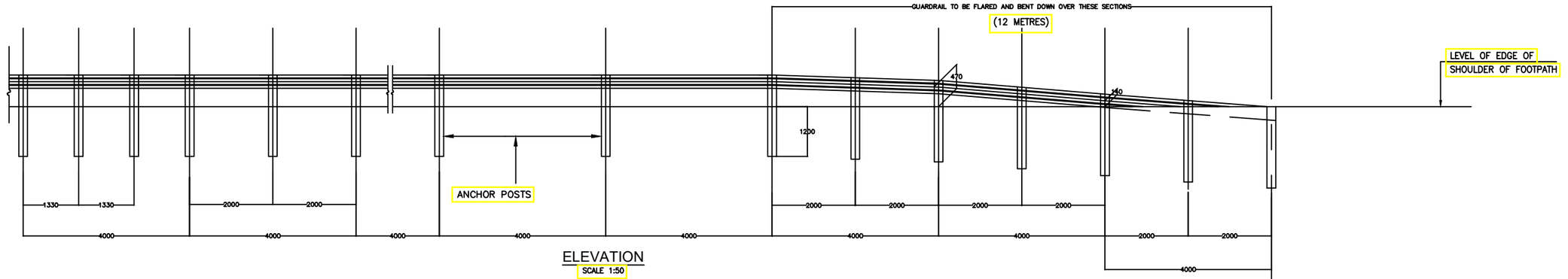
a). Embankments of height 2m or above where guardrail is not provided

b). As shown in the contract dwgs or directed by the Engineer.

3. Alternative edge marker post design can be submitted to Engineer for approval

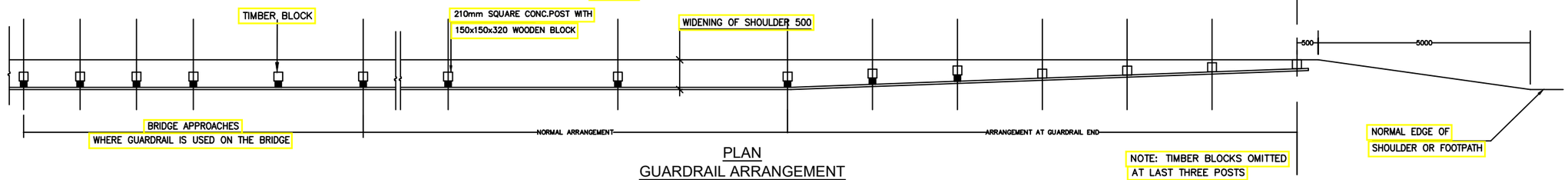
4. The distance between edge marker posts to be 50m. On curves, the distance to be reduced to 25m. On hills, distance to be 25m. Where there is limited sight distance, this distance must be reduced so that at least 5 posts are visible.

5. All dimensions in MM



ELEVATION

SCALE 1:50

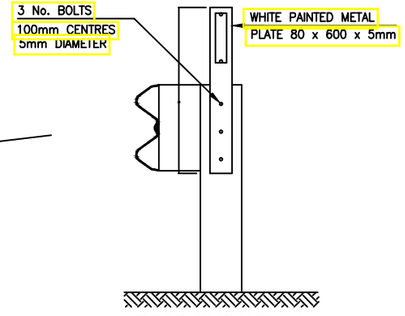


PLAN
GUARDRAIL ARRANGEMENT

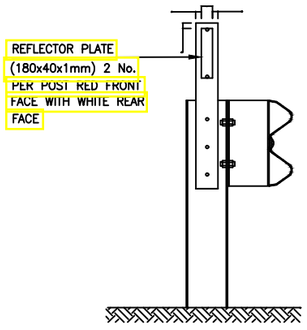
PLAN

SECTION A-A

SCALE 1:10



REAR ELEVATION

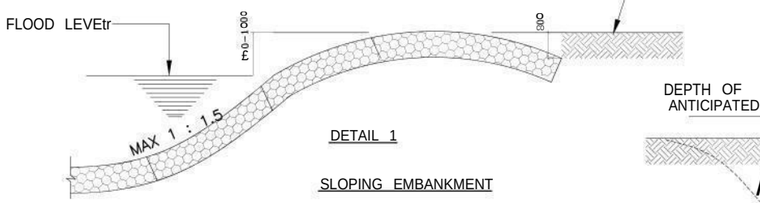


FRONT ELEVATION

FLEX-BEAM
JOINTS

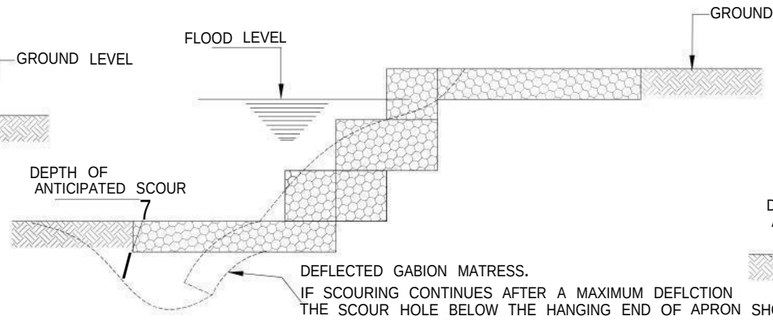
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
2. LAP GUARDRAIL SECTIONS IN DIRECTION OF TRAFFIC FLOW.
3. ALL BOLTS SHALL BE BUTTON-HEADED AND GALVANISED.
4. THE GUARDRAIL SHALL BE GALVANISED.
5. START AND END OF GUARDRAIL SECTION TO BE IDENTICAL.
6. COMPACTION AROUND POSTS TO BE THE SAME AS SURROUNDING EARTHWORKS.
7. NORMAL SHOULDER WIDTH TO BE INCREASED BY 0.5M AS SHOWN WHERE GUARDRAIL IS REQUIRED.
8. ALL NUTS TO BE SPOT WELDED TO THE BOLT.
9. STANDARD UNITS ALSO TO BE USED ON THE END SECTIONS.
10. THE POST SHALL BE DUG INTO THE FILL BY METHOD APPROVED BY BY THE ENGINEER.
11. GUARDRAIL TO BE LOCATED AS DIRECTED BY THE ENGINEER.
12. THE THICKNESS OF THE GUARDRAIL SHALL BE 3.0mm.
13. STRUCTURAL STEEL TO BE BS 4360 GRADE 43, PAINTED WITH 2 COATS OF RED OXIDE AND 2 COATS OF BITUMINOUS ALUMINIUM PAINT



DETAIL 1

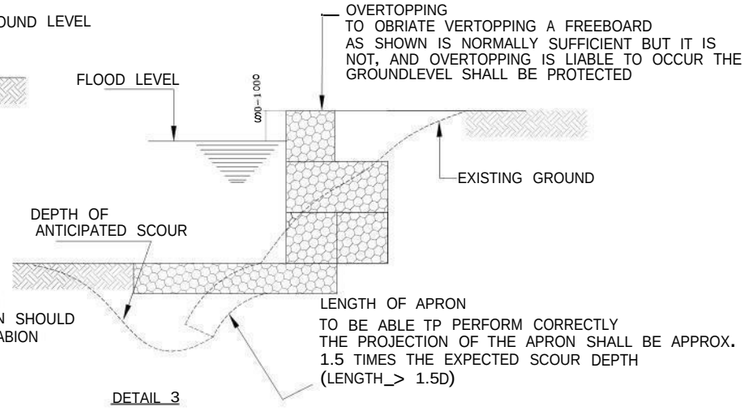
SLOPING EMBANKMENT



DEFLECTED GABION MATRESS.
IF SCOURING CONTINUES AFTER A MAXIMUM DEFLCTION THE SCOUR HOLE BELOW THE HANGING END OF APRON SHOULD BE FILLED WITH LOOSE STONES AND AN ADDITIONAL GABION MATTRESS ATTACHED SECURELY TO THE OLD ONE

DETAIL 2

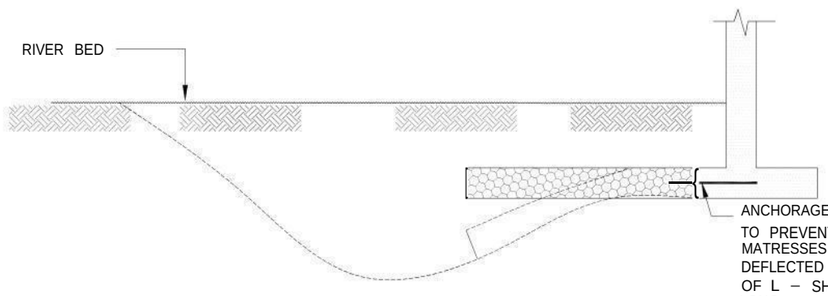
STEPPED EMBANKMENT



LENGTH OF APRON
TO BE ABLE TP PERFORM CORRECTLY
THE PROJECTION OF THE APRON SHALL BE APPROX. 1.5 TIMES THE EXPECTED SCOUR DEPTH
(LENGTH_> 1.5D)

DETAIL 3

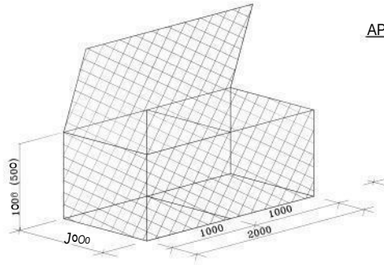
VERTICAL EMBANKMENT



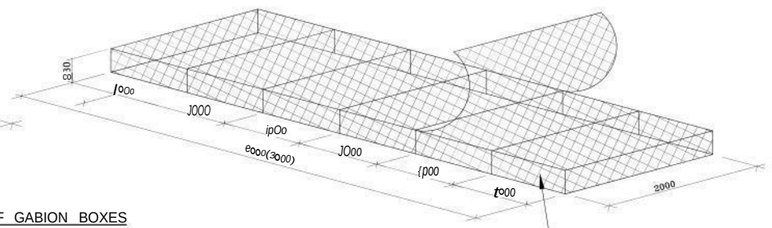
ANCHORAGE OF APRON
TO PREVENT THE APRON OF GABION MATRESSES TO SLIP AWAY AFTER IT HAS DEFLECTED IT SHALL BE SECURED BY MEANS OF L – SHAPED 0. 12mm BARS 1000 – 1200mm LONG, FIXED TO THE STRUCTURE AT APPROX. 2.00m AS SHOWN. LONGITUDINAL BAR INSIDE THE GABIONS SHOULD ALSO BE INCLUDED.

DETAIL 4

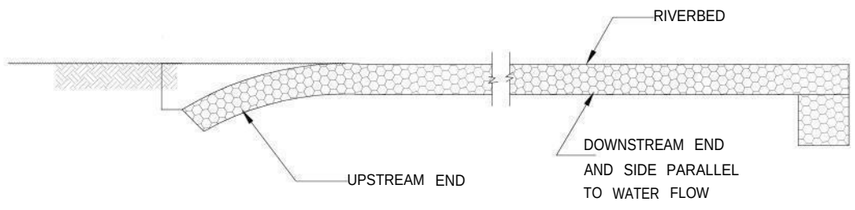
APRON



SIZES AND TYPES OF GABION BOXES



THE MATTRESS MAY BE CUT TO FIT THE STRUCTURE BEING BUILT



DETAIL 5

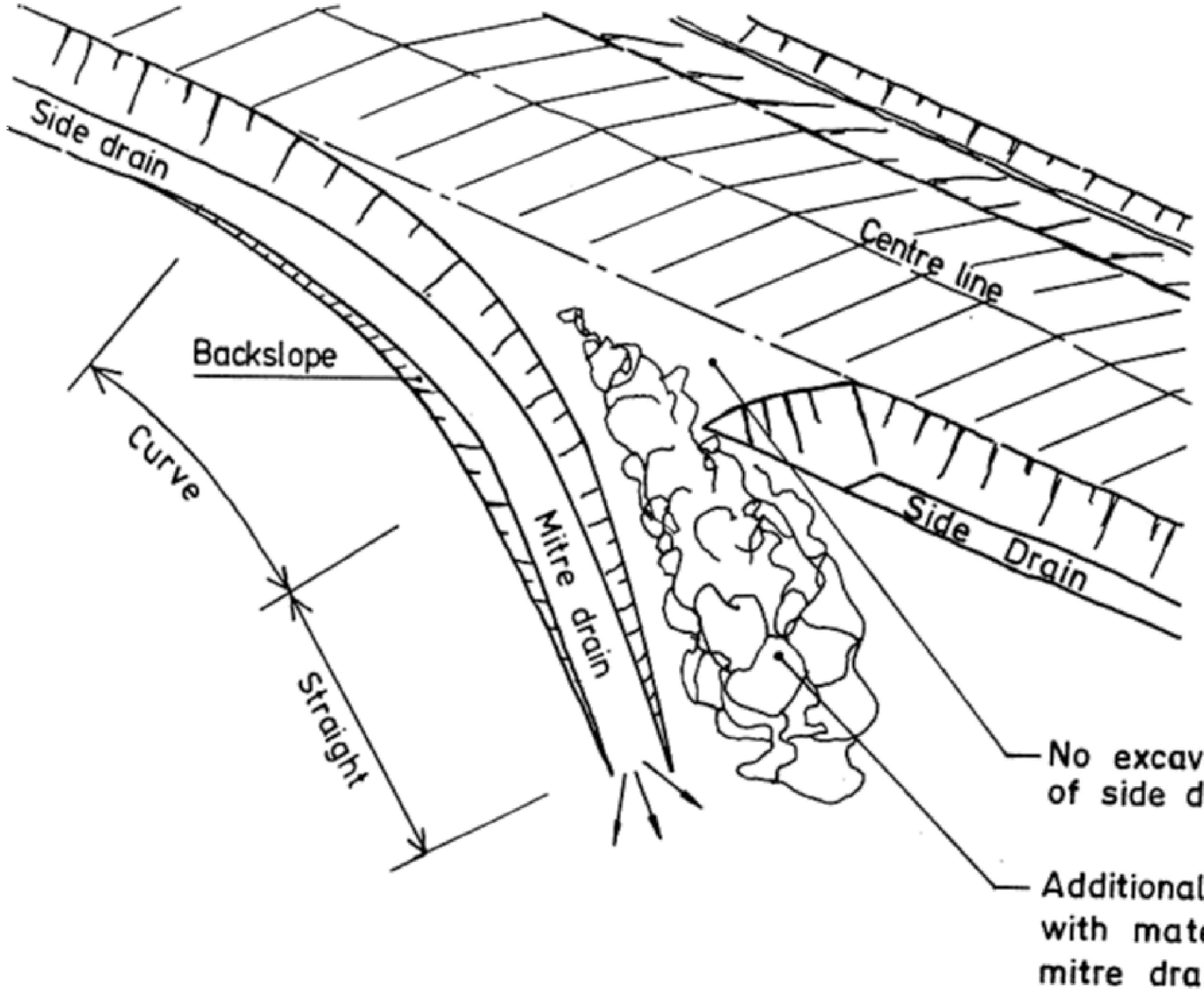
EDGE TREATMENT OF APRONS

NOTES.

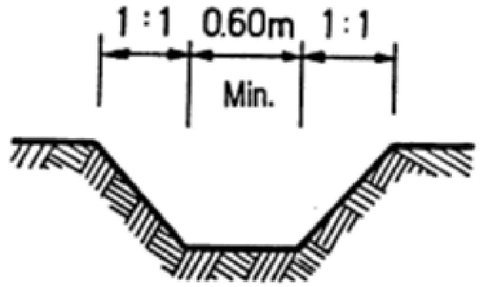
1. GENERAL NOTES
2. GABIONS SHALL BE MADE FROM GALVANISED STEEL WIRE MESH THE WIRE SHALL BE AT LEAST 25mm. 0 AND DOUBLE TWISTED TO FORM AN 80 x 100mm. NOMINOL SIZE MESH. THE GALVANIZING SHALL COMPLY WITH B.S. 443.
3. ASSEMBLY OF GABION BOXES AND MATTRESSES SHALL BE DNE ACCORDING TO THE MANUFACTURERS INSTRUCTIONS. GABION BOX ELEMENTS SHALL BE EDGED WITH A 4mm 0 WIRE SELVIDGE TO GIVE THE BOX STABILITY. ALL WIRING SHALL BE DONE AS A CONTINUOUS LACING OPERATION, NOT WITH INDIVIDUAL TWISTS AT INTERVALS. TIGHTNESS OF MESH AND WIRING IS ESSENTIAL AT ALL TIMES.
4. THE GABION STRUCTURE SHALL BE FORMED BY WIRING THE GABION BOXES AND/OR MATTRESSES TOGETHER, USING EXACTLY THE SAME METHOD AS FOR ASSEMBLING SINGLE GABIONS (SEE NOTE 3.) GABIONS SHALL BE PLACED AND WIRED EMPTY – IT IS DIFFICULT TO WIRE GABIONS TOGETHER WHEN ONE IS FULL OF STONES.
5. THE FILL SHALL BE A HARD DURABLE STONE, IN SIZE BETWEEN 75mm TO 200mm FILL THE GABIONS BY HAND AND MAKE SURE THE STONE IS TIGHTLY PACKED AND HAS AMINIMUM OF VOIDS AFTER FILLING SLIGHTLY OVERFULL, TO ALLOW FOR SETTLEMENT, STRECH THE LIDS TIGHTLY OVER THE FILLING AND WIRE THEM DOWN.
6. THE ENDS OF A GABION STRUCTURE SHALL NEVER PROJECT INTO THE FLOW BUT SHALL TAPER SMOOTHLY INTO THE BANK. WHERE BOTH A VERTICAL WALL AND A LINING ARE REQUIRED NEXT TO EACH OTHER A TRANSITION FROM ONE FORM OF STRUCTURE TO THE OTHER SHALL BE DONE IN STAGES. ONE EXAMPLE IS A CULVERT WHICH HAS VERTICAL WINGWALL FACES, WHILE THE CHANNEL UP – DOWNSTREAM HAS ATRAPEZOIDAL CROSS SECTION. THE GABION WALL NEXT TO HE WINGWALL SHALL BE VERTICAL (DETAIL 3) BUT AS IT PROCEEDS AWAY FROM THE WINGWALL STEPS BETWEEN THE COURSES OF GABION BOXES SHALL BE FORMED AND GRADUALLY INCREASED IN WIDTHS UNTIL A SLOPE OF SAY 1 : 1 IS OBTAINED (DETAIL 2) AT THIS POINT THE RETAINING WALL SECTION CHANGES TO A STEPPED REVERMENT. THE REVERTMENT IS CONTINUED WITH THE WIDTH OF ITS STEPS INCREASING. UNTIL A SLOPE OF 1 : 1.5 IS REACHED AT WHICH POINT THE BANK IS FACED WITH A SMOOTH MATTRESS LINING. (DETAIL 1)

GENERAL DRAINAGE

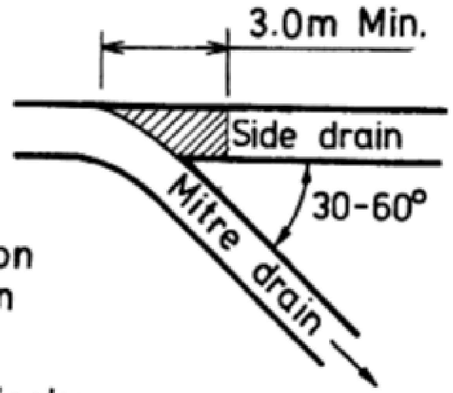
MITRE DRAIN



Cross section:

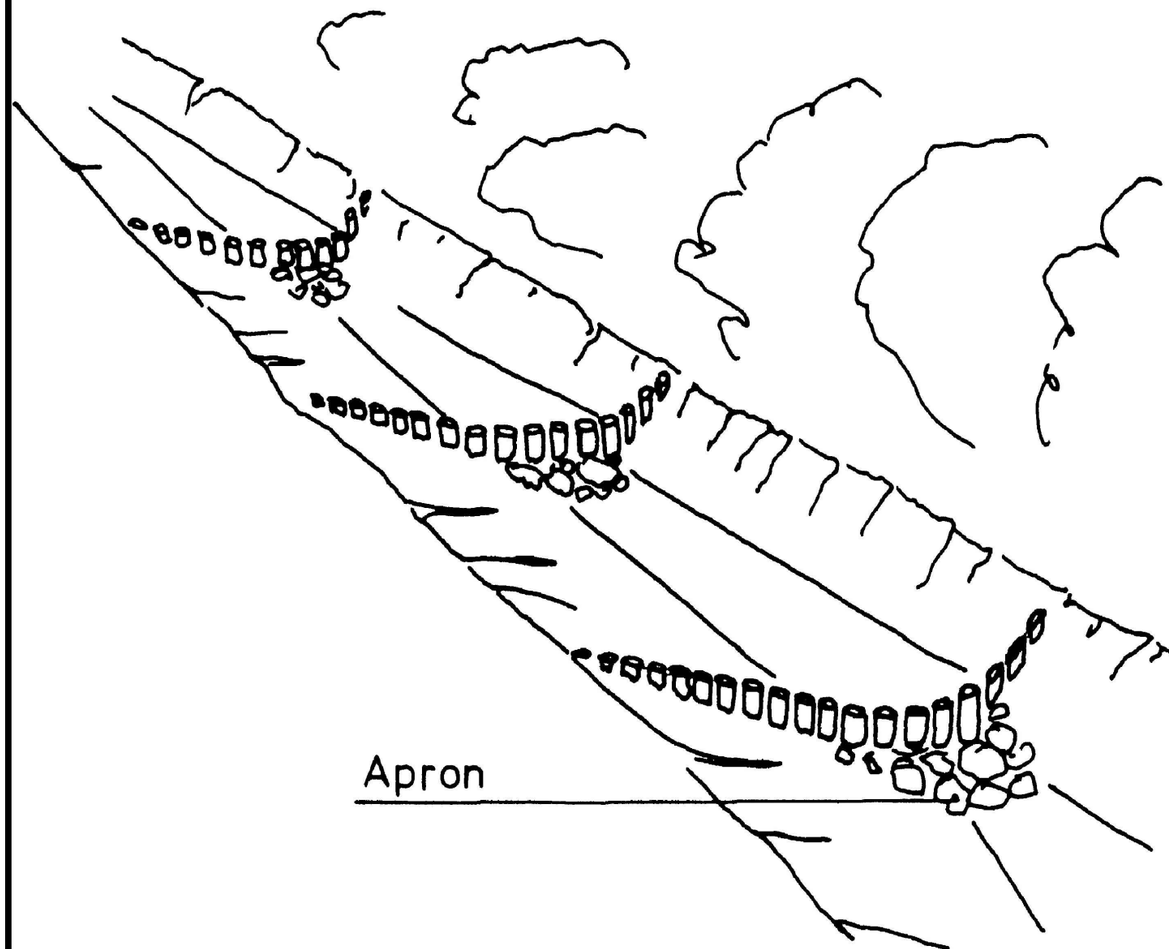


Plan:

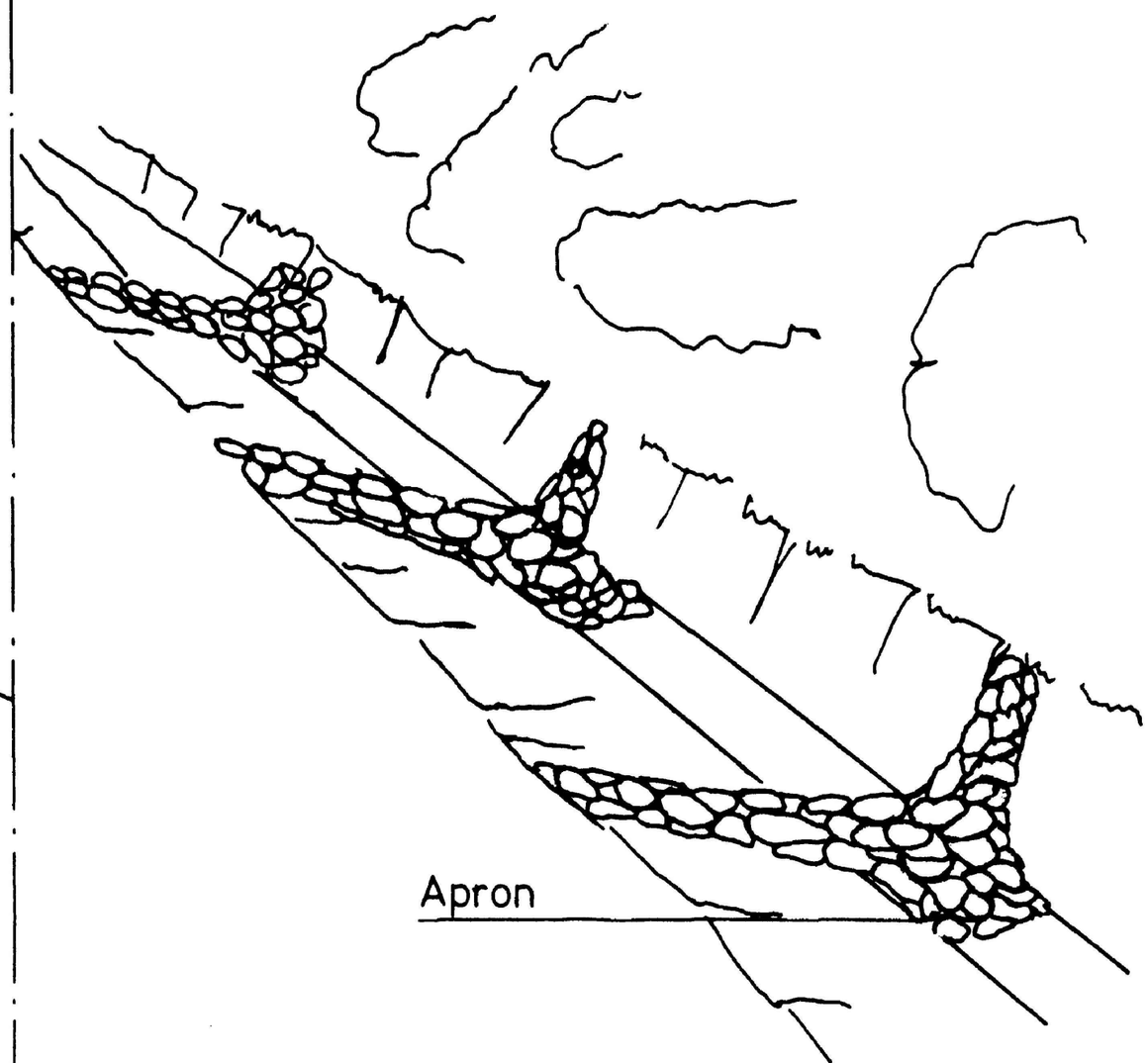


SCOUR CHECKS

Scour checks made of wooden stakes:

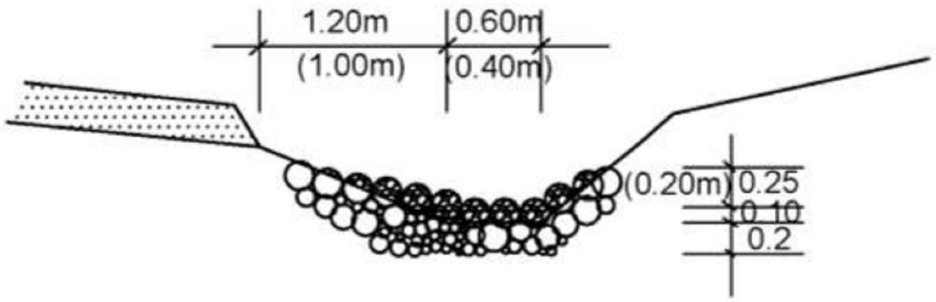


Scour checks made of stones:

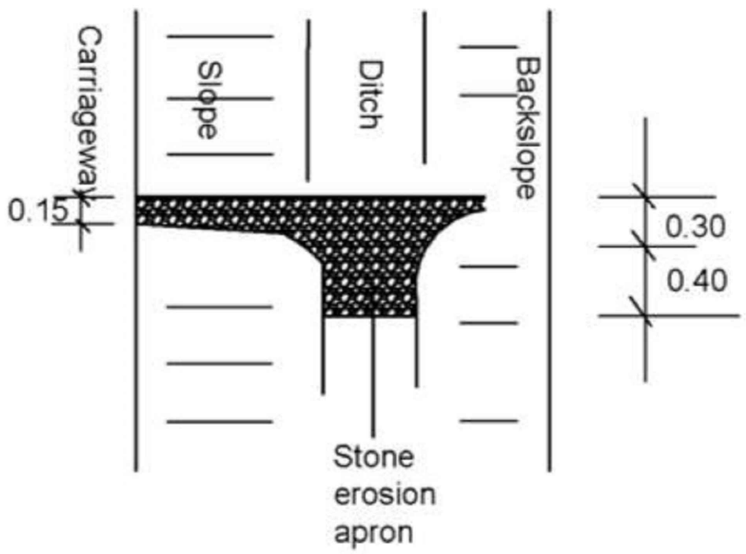


Scour checks made of stones

Cross section

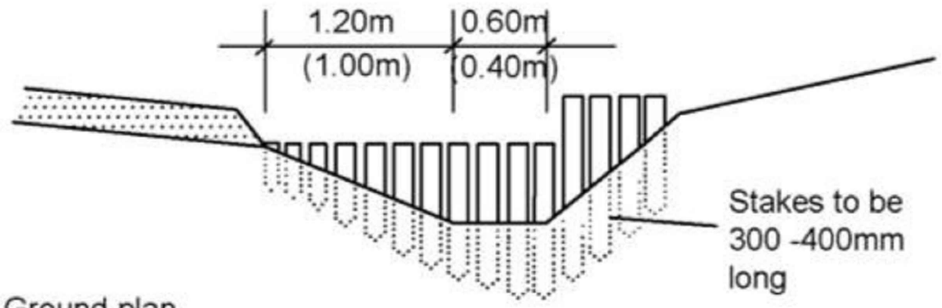


Ground plan

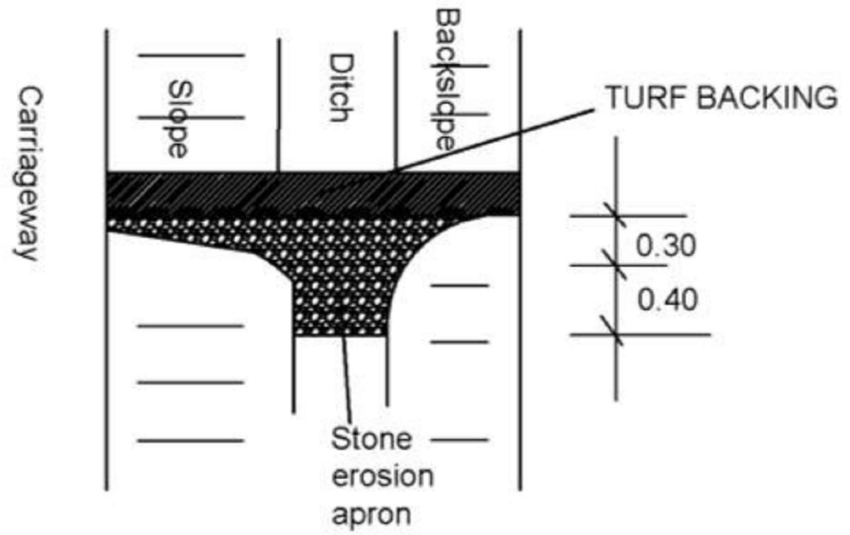


Scour checks made of wooden stakes

Cross section



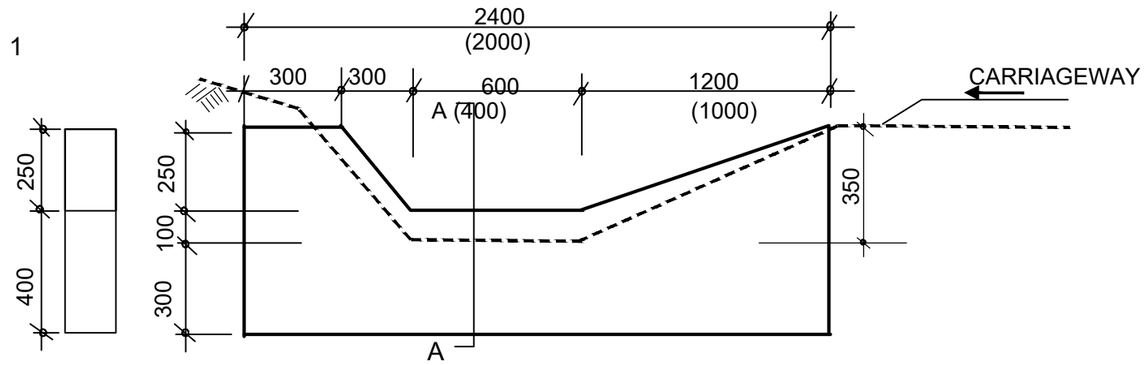
Ground plan



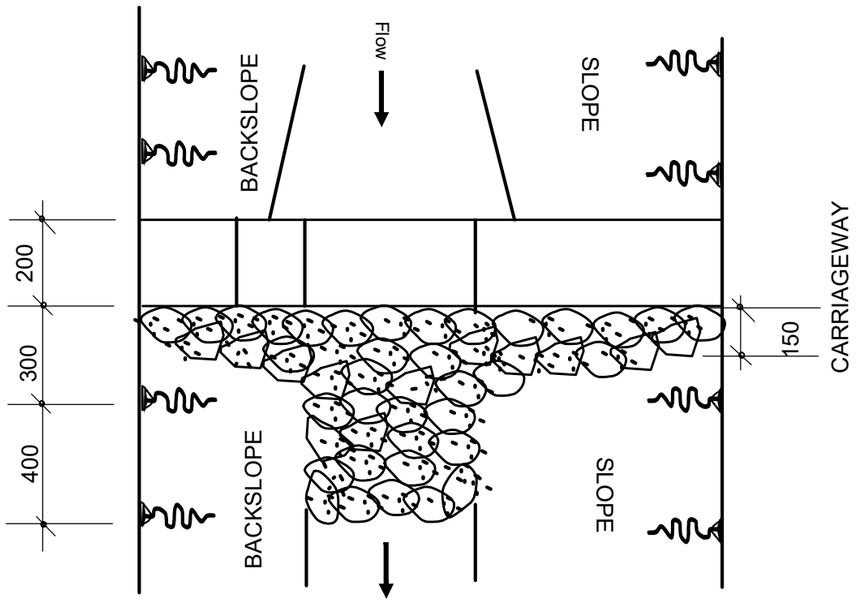
STONE WEIGHT:MIN 10KG
STAKE DIAMETER: MIN. 0.10m

NOTE
1Dimensions in metres

- MASONRY SCOUR CHECKS



A SECTION OF MASONRY SCOUR CHECKS

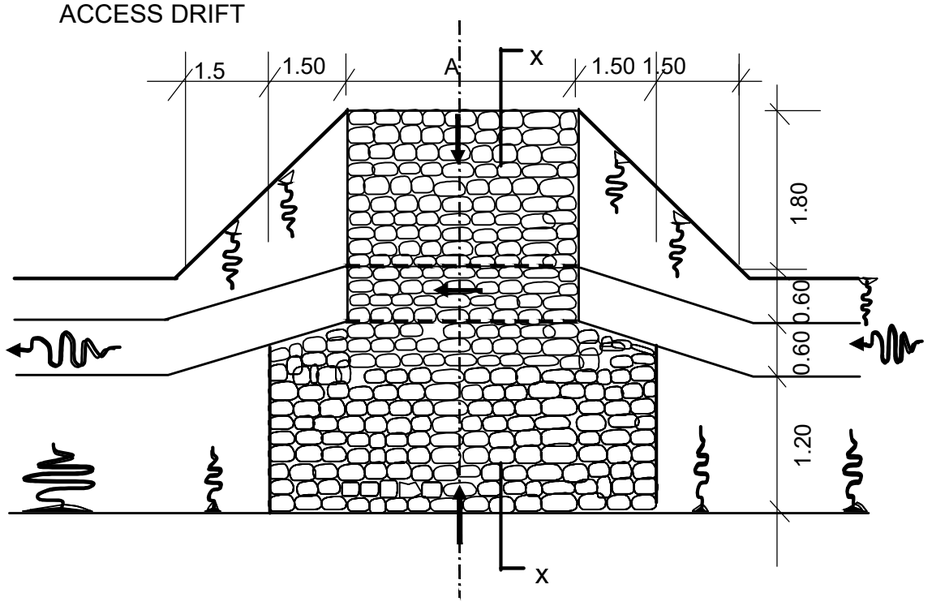


PLAN OF DRAIN WITH EROSION CHECKS

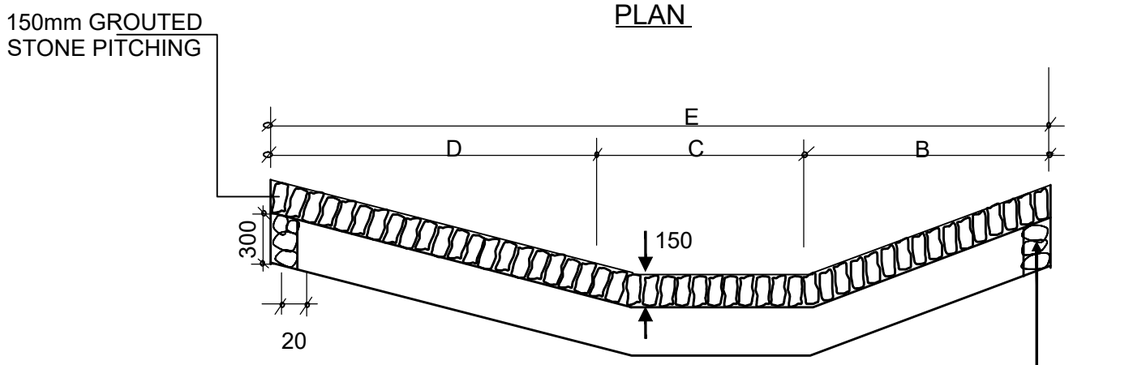
QUANTITIES TABLE

Cross-Section	Sizes in mm			Excav. (m3)	Stone masonry (m3)	Apron stone pitching (m3)
	Length	Width	Depth			
A	2400	200	550	0.22	0.25	0.18
B	2000	200	500	0.18	0.2	0.14

ACCESS DRIFT



PLAN



X-SECTION X-X

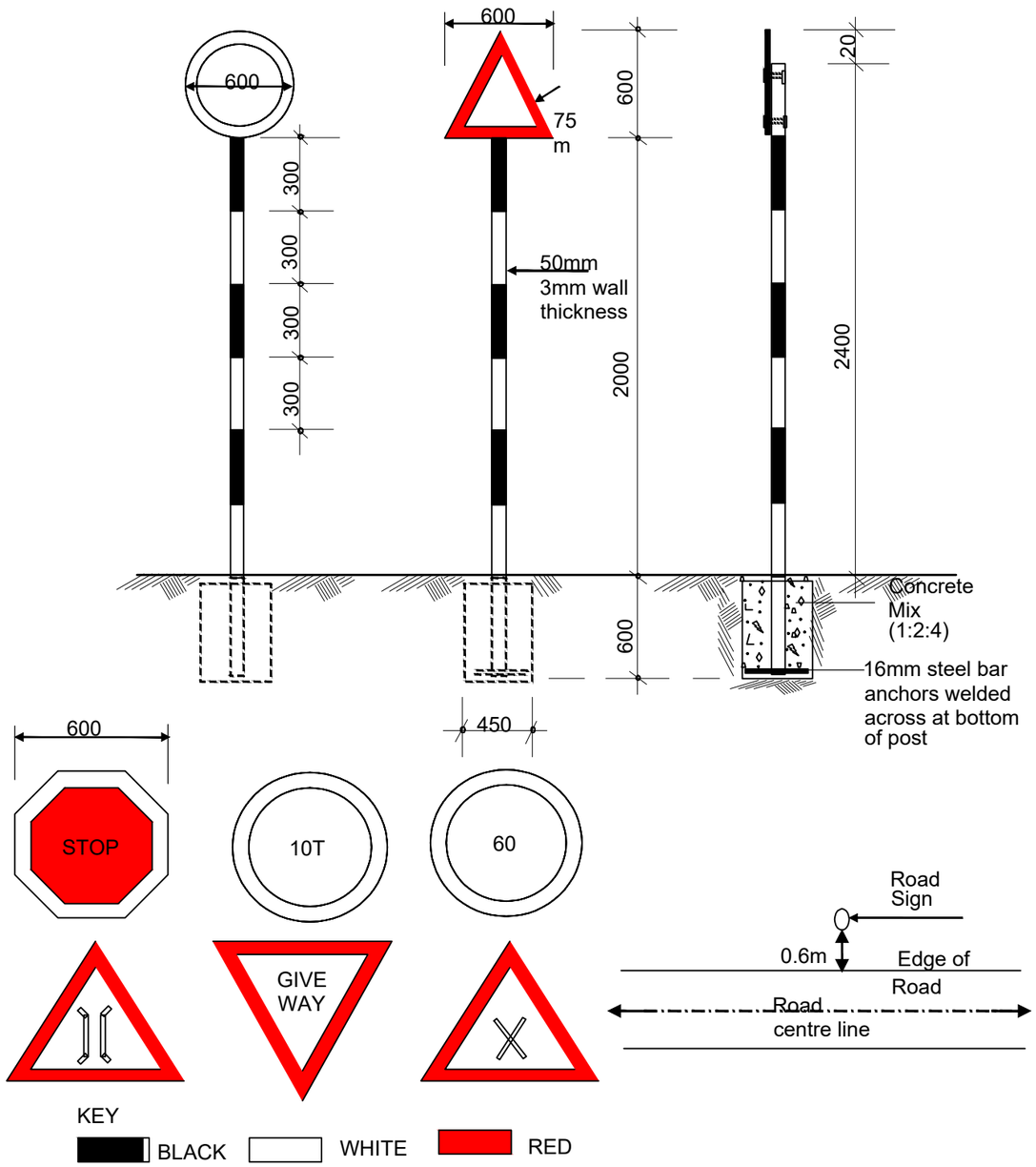
STONE MASONRY TOES
ON FOUR SIDES OF
STRUCTURE (200X300mm)

QUANTITIES TABLE

Cross section	DIMENSIONS					Excavation (m3)	Stone masonry (m3)	150mm Grouted stone pitching (m3)
	A	B	C	D	E			
A	4000	1800	600	1800	4200	7.50	1.30	21.75
	6000	1800	600	1800	4200	10.00	1.60	30.15
B	4000	1400	400	1800	3600	7.00	1.20	18.30
	6000	1400	400	1800	3600	9.00	1.50	25.50

TRAFFIC SIGNS

TRAFFIC SIGNS



1. The type of sign required and their location shall be as shown on the improvement plan and as directed by the Engineer
2. Sign plate to be 2 mm thick mild steel plate
3. Sign post to be 50 mm internal diameter steel pipe with wall thickness of 3 mm.
4. Sign plate to fixed to steel tube by 4 Nos M10 bolts and 2 Nos 50 mm f fixing clamps/brackets.
5. Sign paints shall be reflective.
6. The sign plate and post shall be treated by applying two coats of lead red oxide paint before applying priming and two finish coats of approved paints . Paints used shall have a hard, durable and glossy finish.

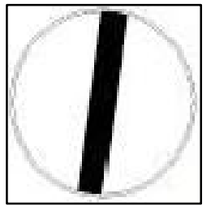
TEMPORARY SIGNS

"Men Working"

"Road narrows on Right Ahead"(sign may be reversed)

"Turn Left" (direction of arrow may be reversed)

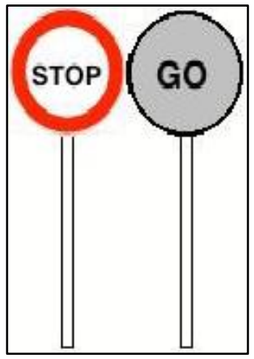
"Keep Left" (direction of Arrow may be reversed)



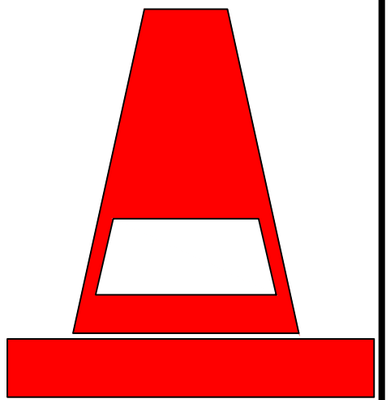
"Road Clear"

"Speed Limit"

"No Overtaking"

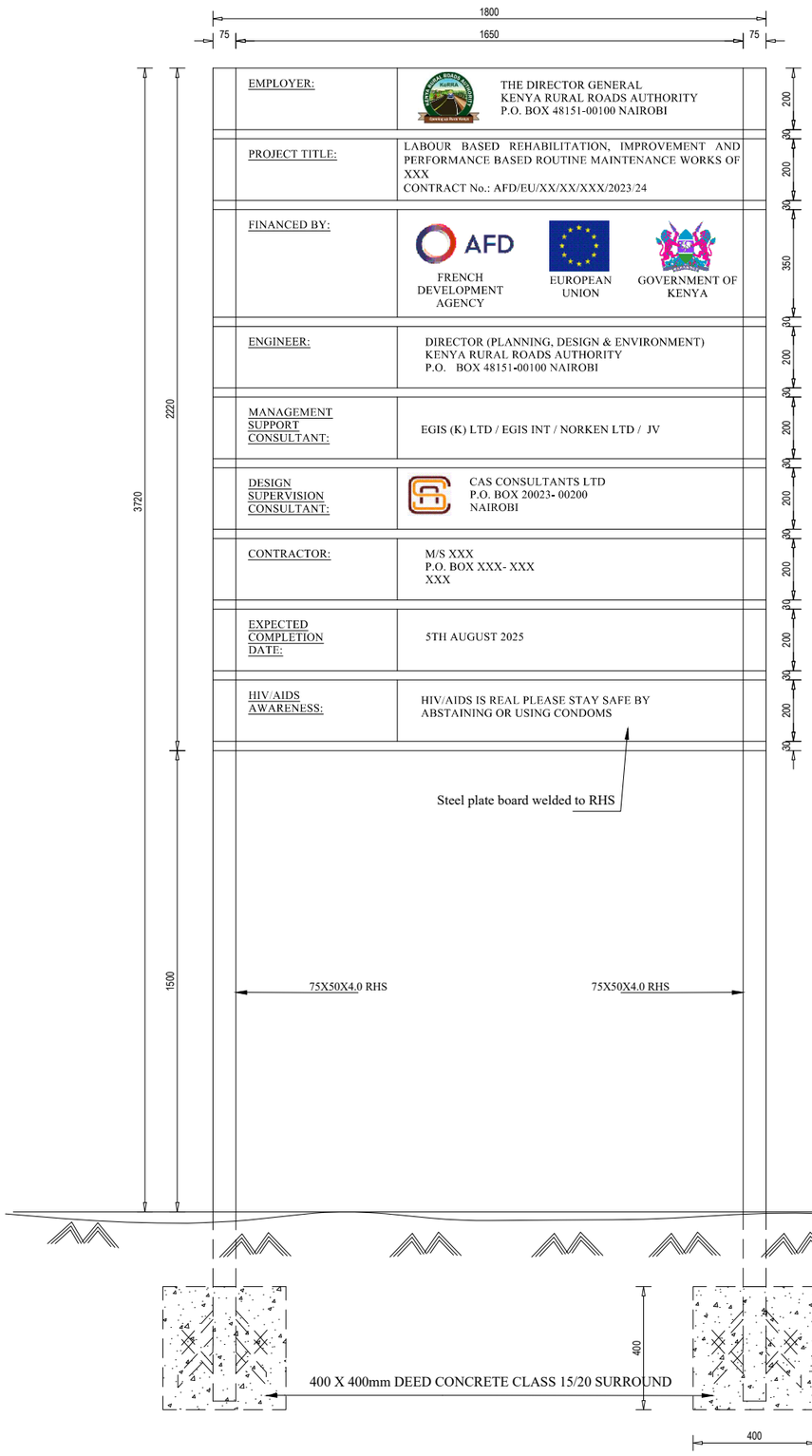


Reversible stop/go signs



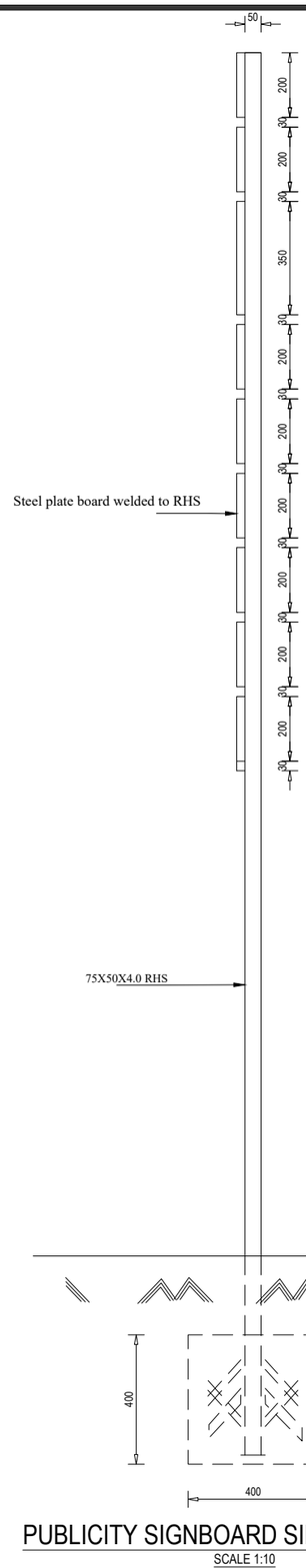
Traffic cones

PUBLICITY SIGNBOARD



PUBLICITY SIGNBOARD FRONT ELEVATION

SCALE 1:10



PUBLICITY SIGNBOARD SIDE ELEVATION

SCALE 1:10

NOTES:

1.BLACK LETTERING ON WHITE BACKGROUND
2.WRITTING MUST BE LEGIBLE FROM 20m
3.LOGOS SHALL BE IN COLOUR
4.ALL HEADINGS ARE 55mm HIGH
5.ALL SUB HEADINGS ARE 50mm HIGH
6.CLEAR HEIGHT FROM LEVEL GROUND SURFACE TO FIRST PANEL IS 1500mm.