



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 A2 -MANYATTA JILLO - GORORUKESA - CENTRAL CHIEF' S
OFFICE (G41188 - 03B) ROAD – 8.4KM**

TENDER NO: AFD/EU/MA/GR/03B/6/2024-25

BOOK OF DRAWINGS

APRIL 2025

DIRECTOR (PLANNING, DESIGN & ENVIRONMENT)

KENYA RURAL ROADS AUTHORITY

P.O. BOX 48151-00100

NAIROBI

DIRECTOR GENERAL

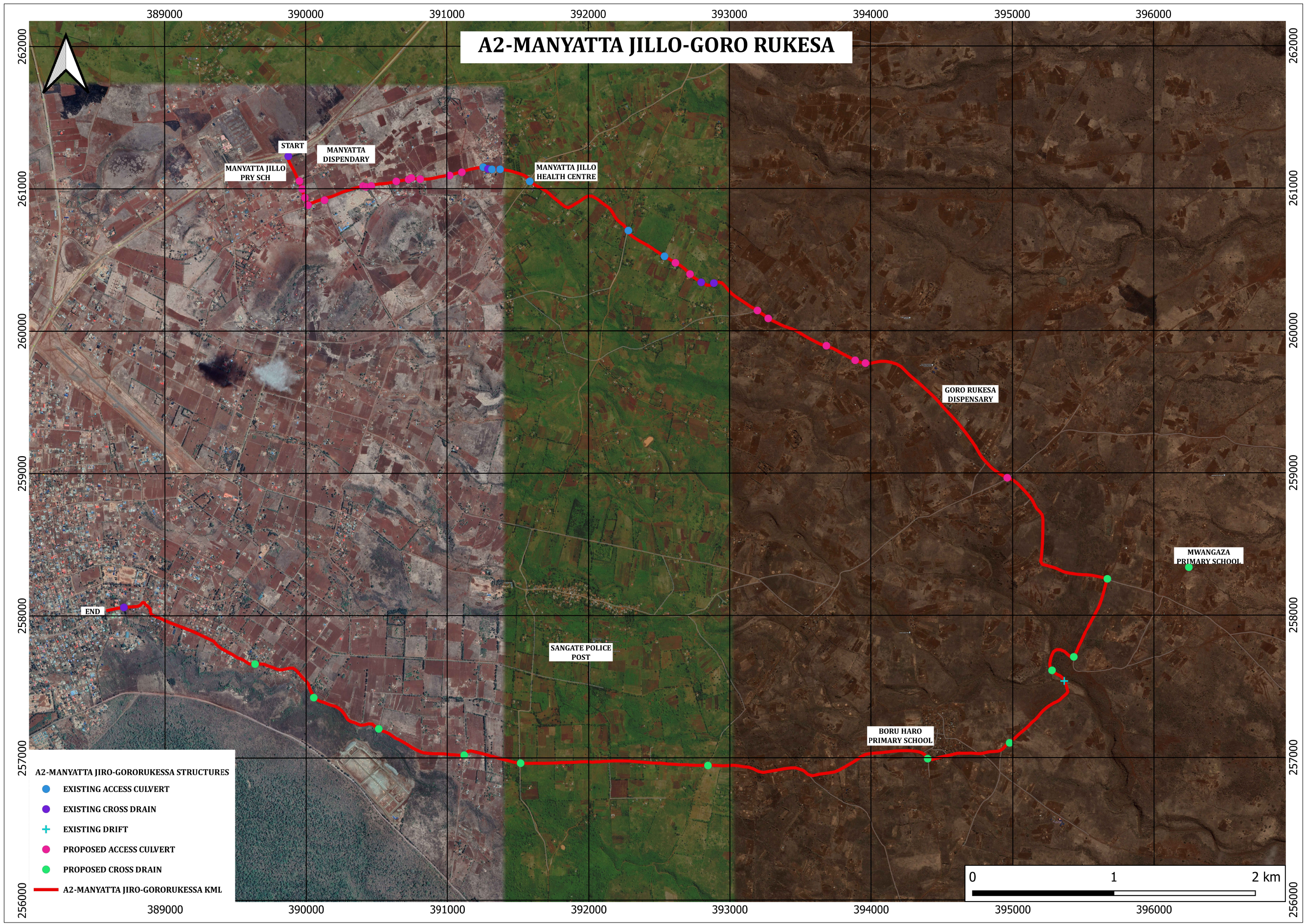
KENYA RURAL ROADS AUTHORITY

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NAIROBI

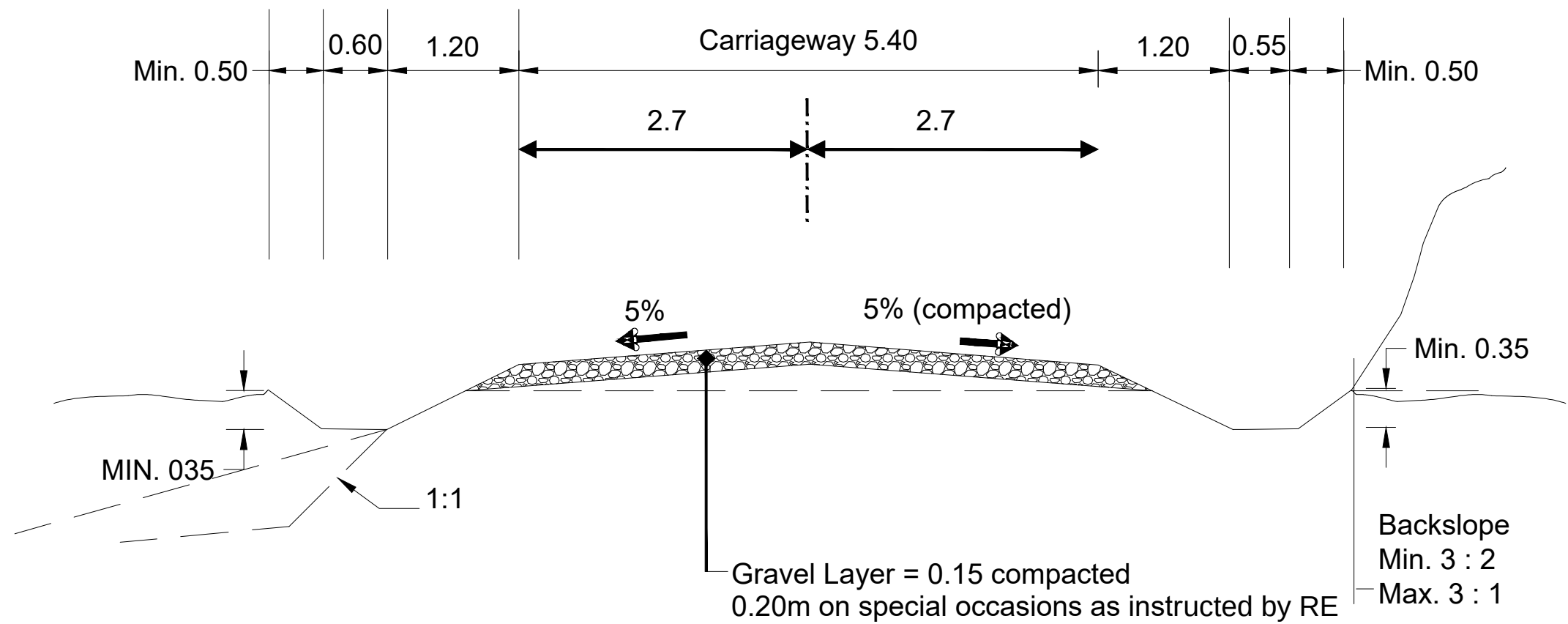
A2-MANYATTA JILLO	
GRAVEL ROADS BOOK OF DRAWING	
DRAWING No.	GENERAL DRAWINGS
R2000/NHD/2024/GEN/01.	DRAWING INDEX
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R2000/NHD/2024/TCS/02	CROSS-SECTION B (BLACK COTTON SOIL CROSS-SECTION)
R2000/NHD/2024/TCS/03	CROSS-SECTION C (REDUCED CROSS-SECTION)
R2000/NHD/2024/TCS/04	CROSS-SECTION D (EMBARKMENT CROSS-SECTION)
R2000/NHD/2024/TCS/05	CROSS-SECTION E (SUPERELEVATION CROSS-SECTION)
R2000/NHD/2024/TCS/06	CROSS-SECTION F (RURAL ACCESS ROAD CROSS-SECTION)
R2000/NHD/2024/TCS/07	CROSS-SECTION G (RURAL ACCESS ROAD CROSS-SECTION)
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R2000/NHD/2024/PC/02	HEAD WALL TYPE 2
R2000/NHD/2024/PC/03	HEAD WALL TYPE 3
R2000/NHD/2024/PC/04	HEAD WALL TYPE 4
R2000/NHD/2024/PC/05	PIPE CULVERT DETAILS
R2000/NHD/2024/PC/06	BEDDING AND HAUNCH
STANDARD DRAWINGS	
R2000/NHD/2024/SD/01	STANDARD JUNCTION AND ACCESS DETAILS
R2000/NHD/2024/SD/02	STANDARD BUSBAY AND KERB DETAILS
R2000/NHD/2024/SD/03	STANDARD MARKER POST DETAILS
R2000/NHD/2024/SD/04	STANDARD GUARD RAIL DETAILS
GENERAL DRAINAGE	
R2000/NHD/2024/GDR/01	MITRE DRAIN DETAILS
R2000/NHD/2024/GDR/02	SCOUR CHECKS
R2000/NHD/2024/GDR/03	SCOUR CHECKS
R2000/NHD/2024/GDR/04	SCOUR CHECKS
R2000/NHD/2024/GDR/05	ACCESS DRIFTS
TRAFFIC SIGNS	
R2000/NHD/2024/TS/01	STANDARD TRAFFIC SIGNS
PUBLICITY SIGNBOARD	
R2000/NHD/2024/PSB/01	PUBLICITY SIGNBOARD DETAILS

LOCATION MAP



TYPICAL CROSS-SECTIONS

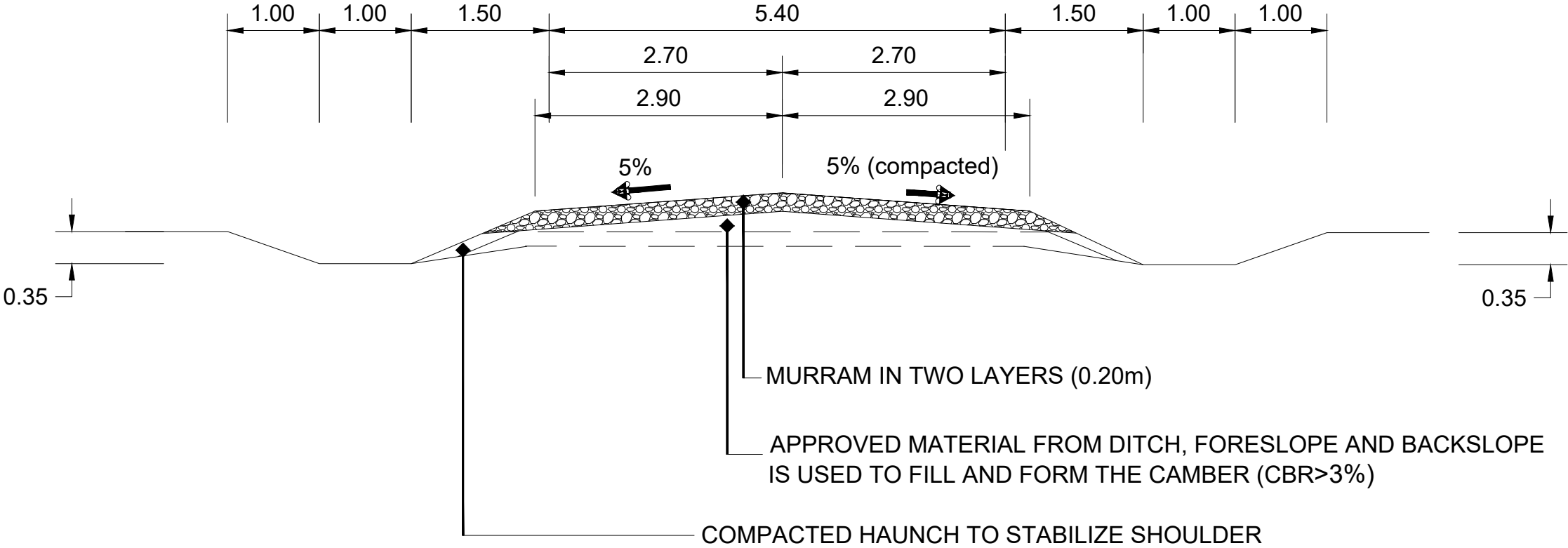
CROSS SECTION A (STANDARD CROSS-SECTION)



NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

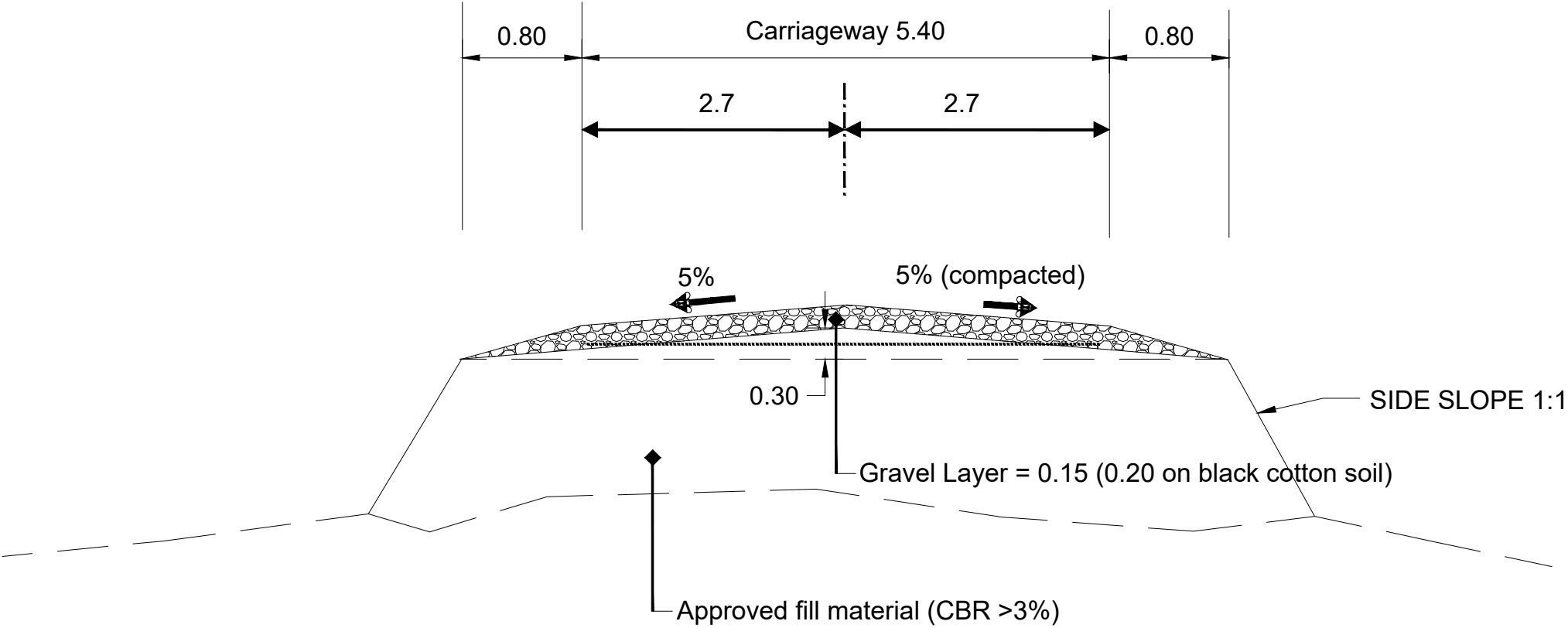
CROSS SECTION B (BLACK COTTON SOIL CROSS-SECTION)



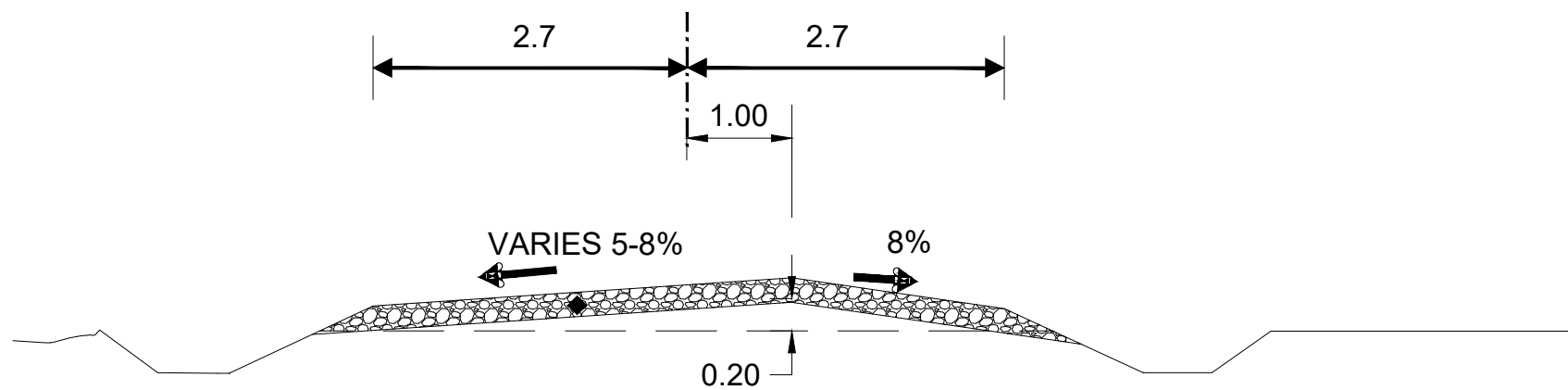
NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

CROSS SECTION D (EMBARKMENT CROSS-SECTION)

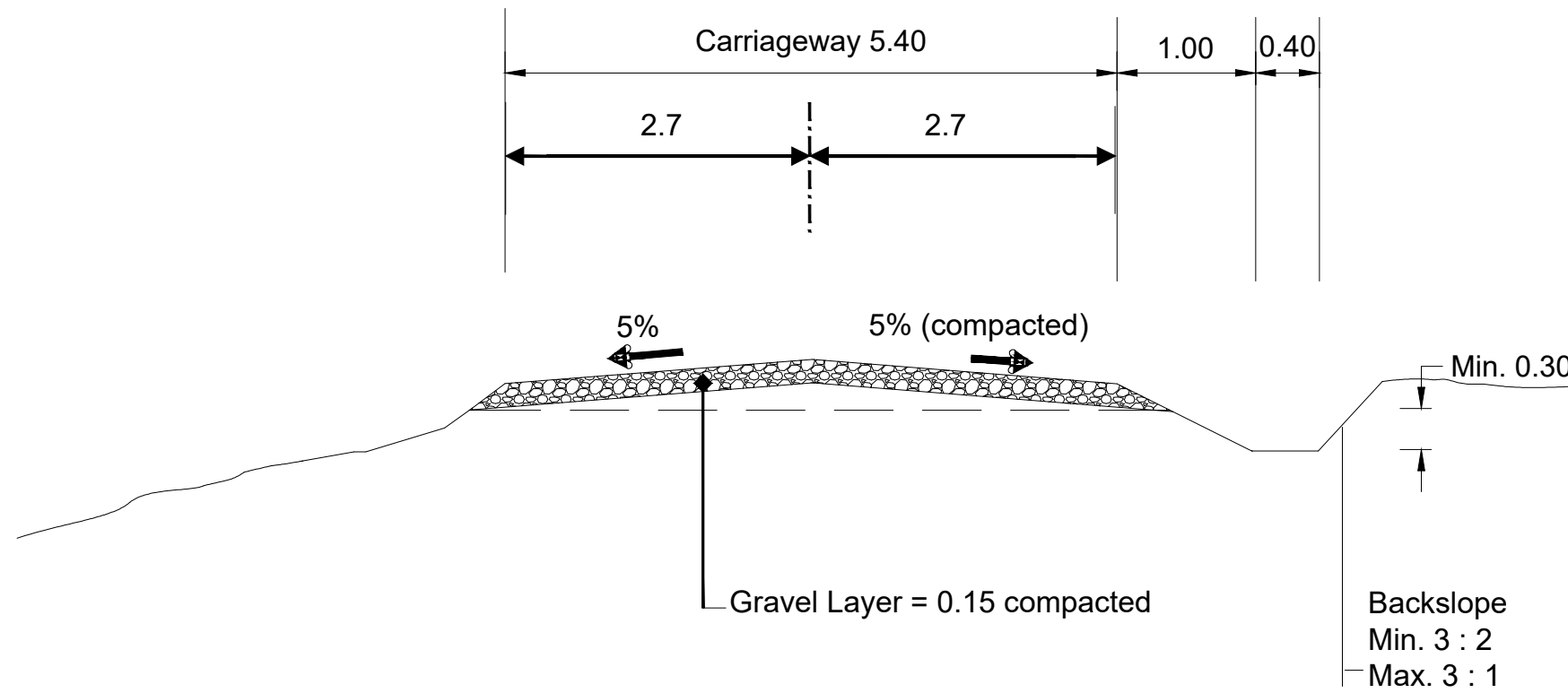


CROSS SECTION E (SUPERELEVATION CROSS-SECTION)



NOTE:
- ALL SPECIFIED DIMENSIONS IN m.

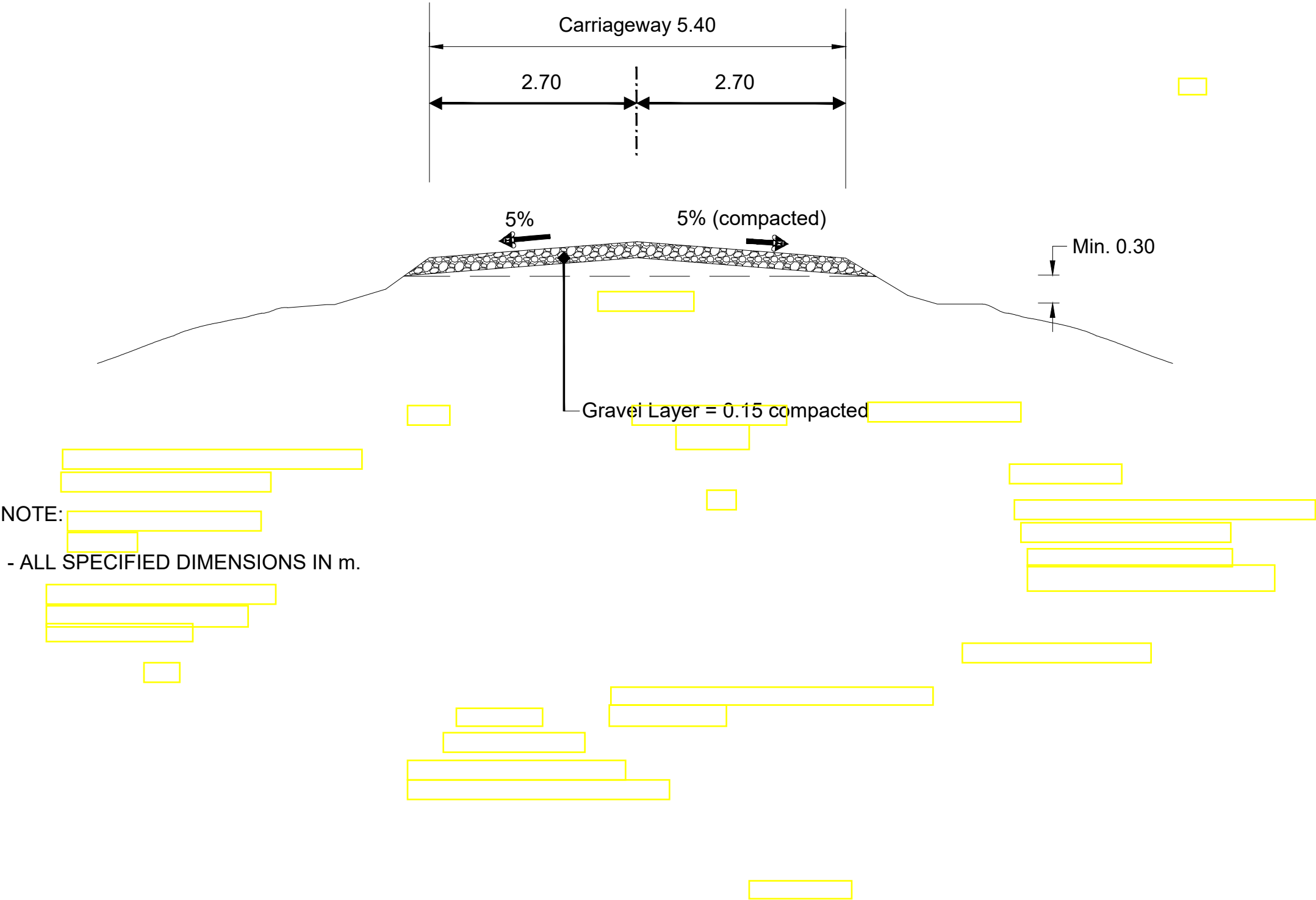
CROSS SECTION F (SIDELONG GROUND ONE SIDE)

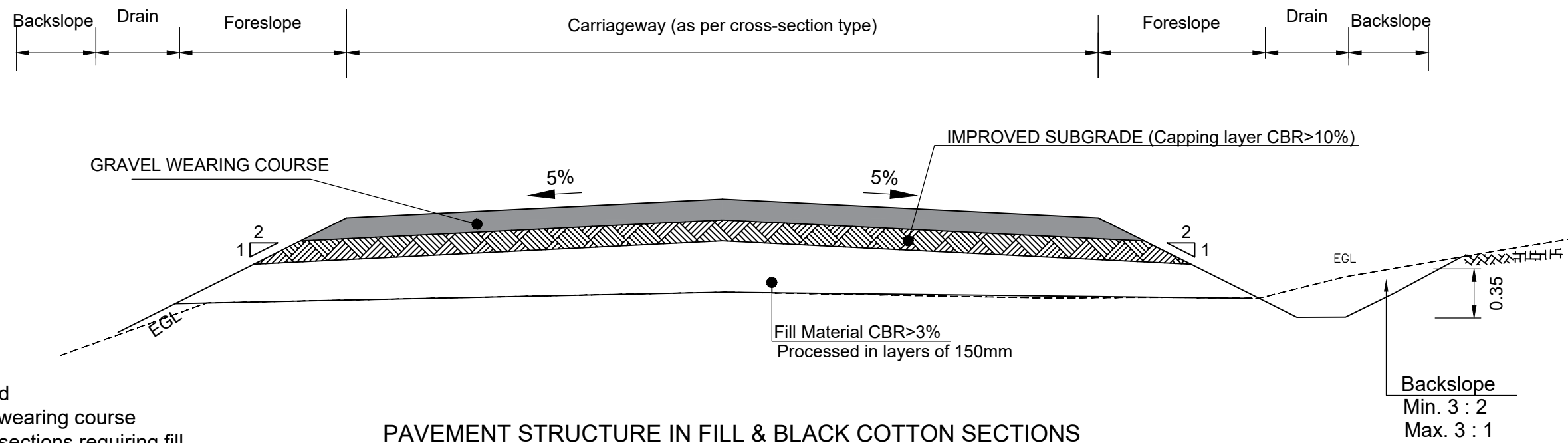


NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

CROSS SECTION G (SIDE LONG GROUND BOTH SIDES)



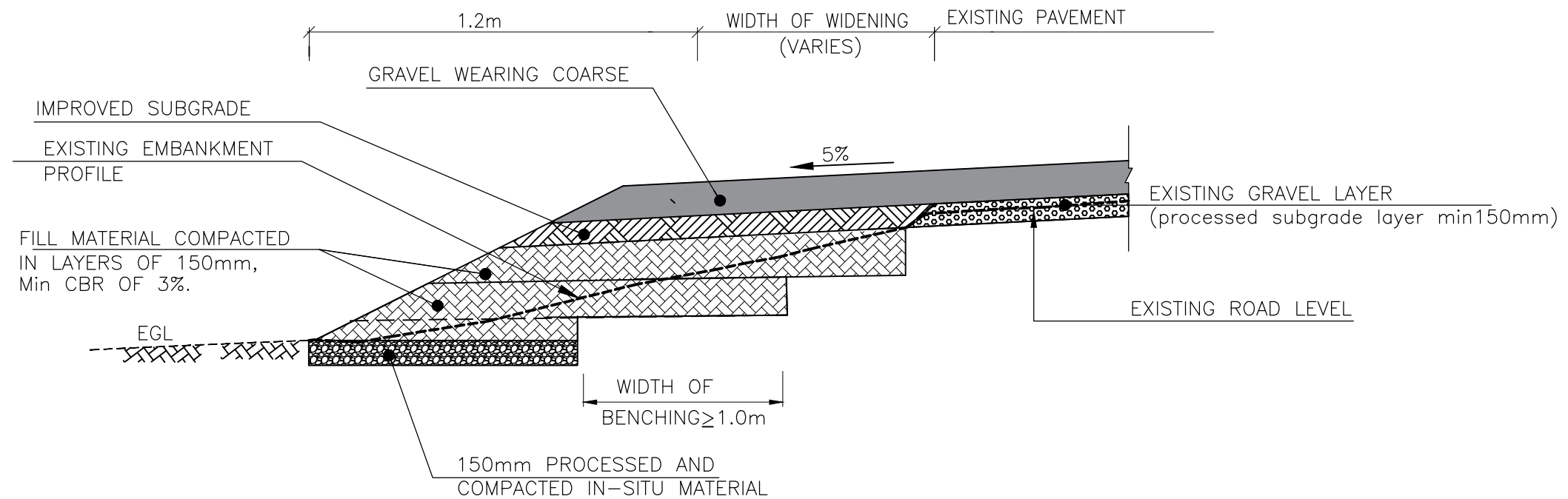


NOTE:

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



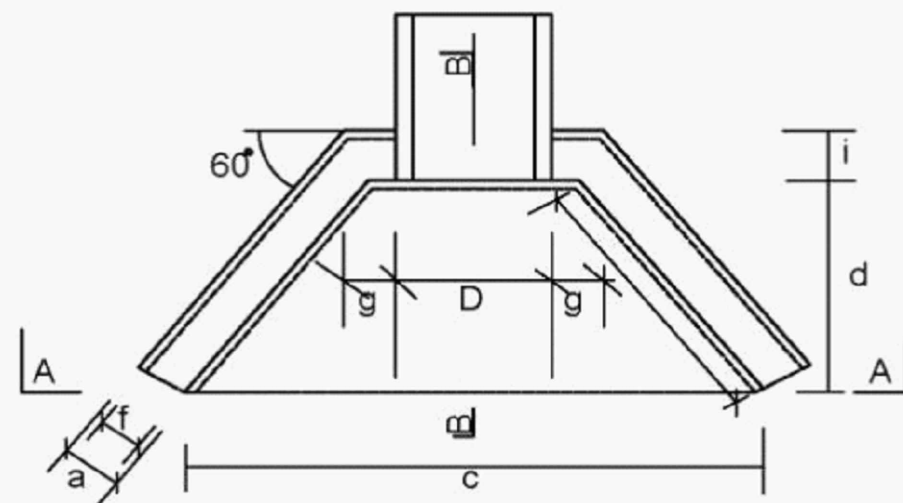
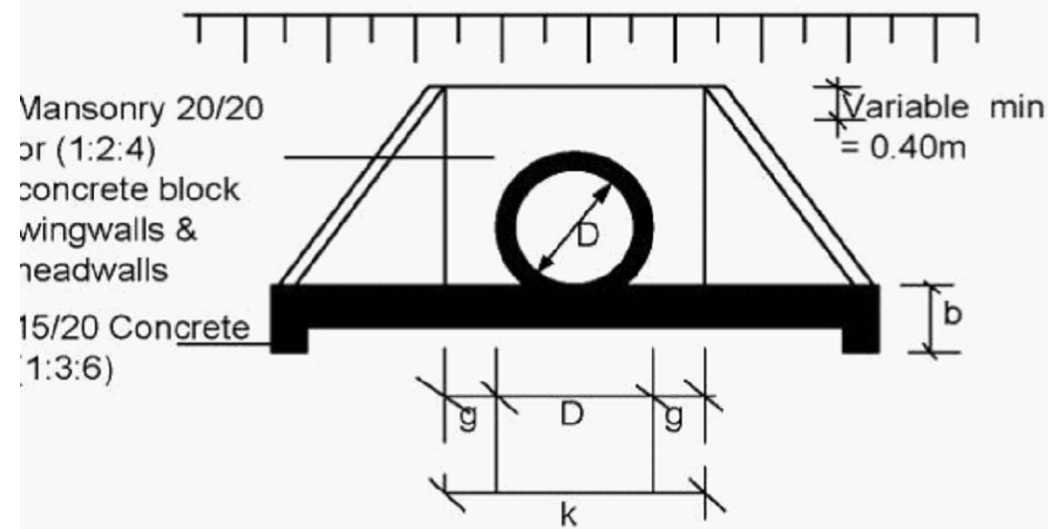
PAVEMENT WIDENING DETAILS :

SCALE 1:20

PIPE CULVERTS

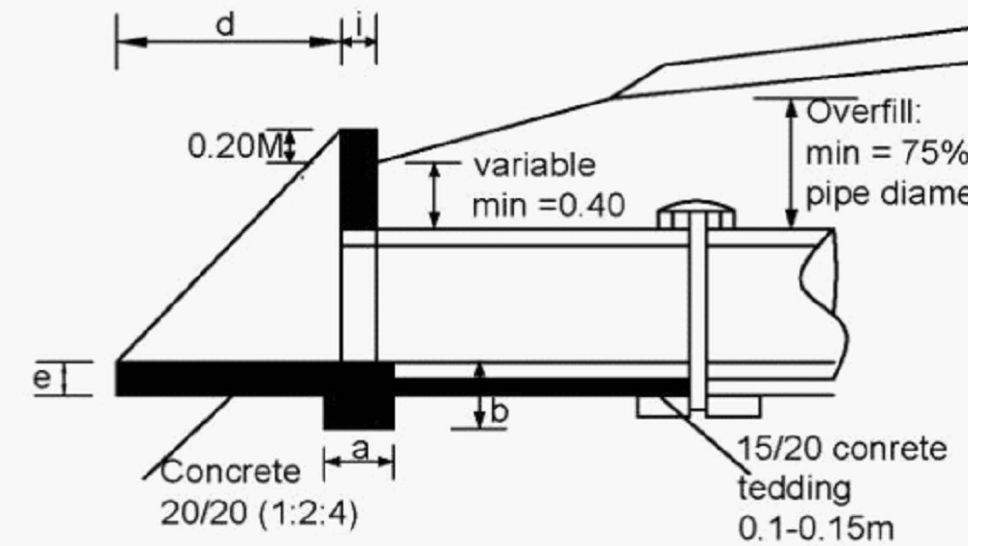
C8- HEADWALL TYPE 1 (HEAD AND WINGWALLS)

SECTION A-A



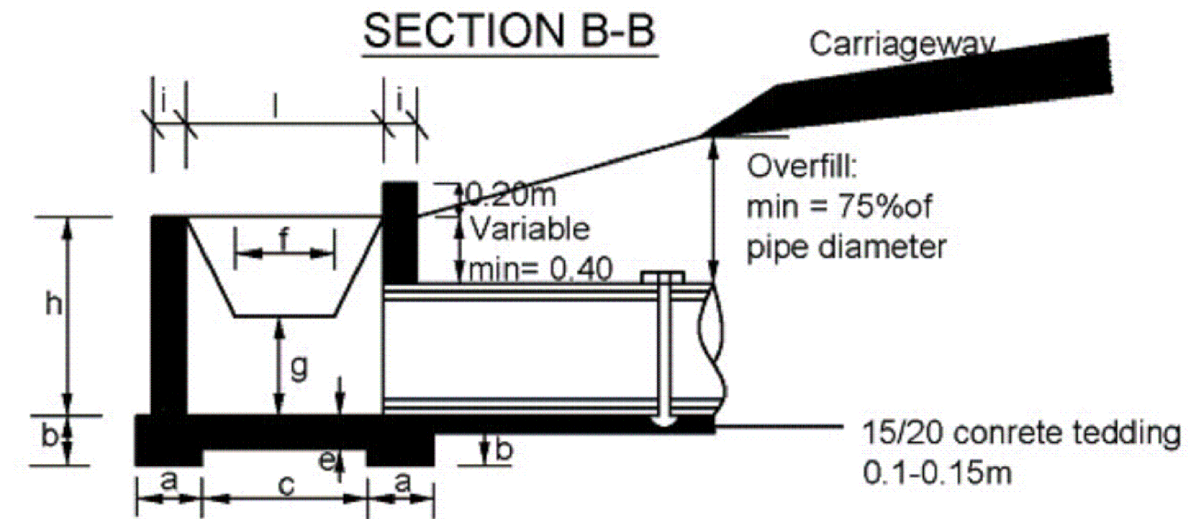
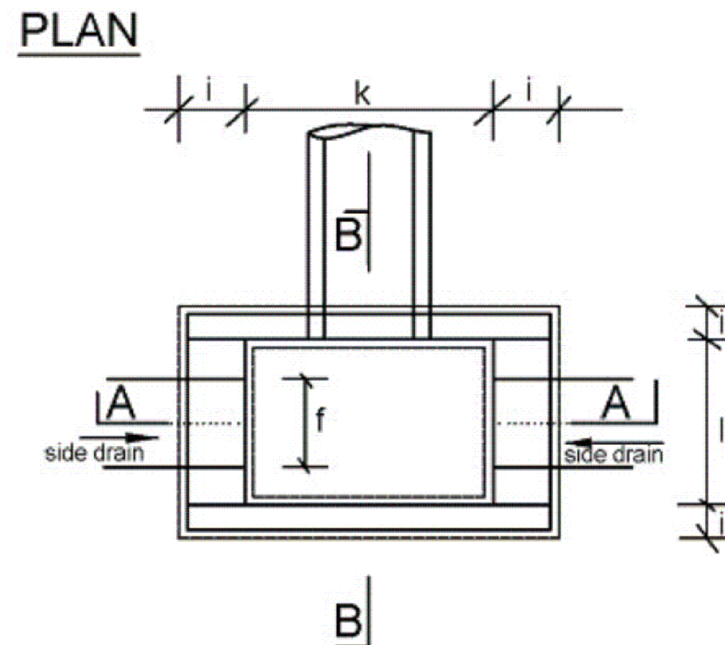
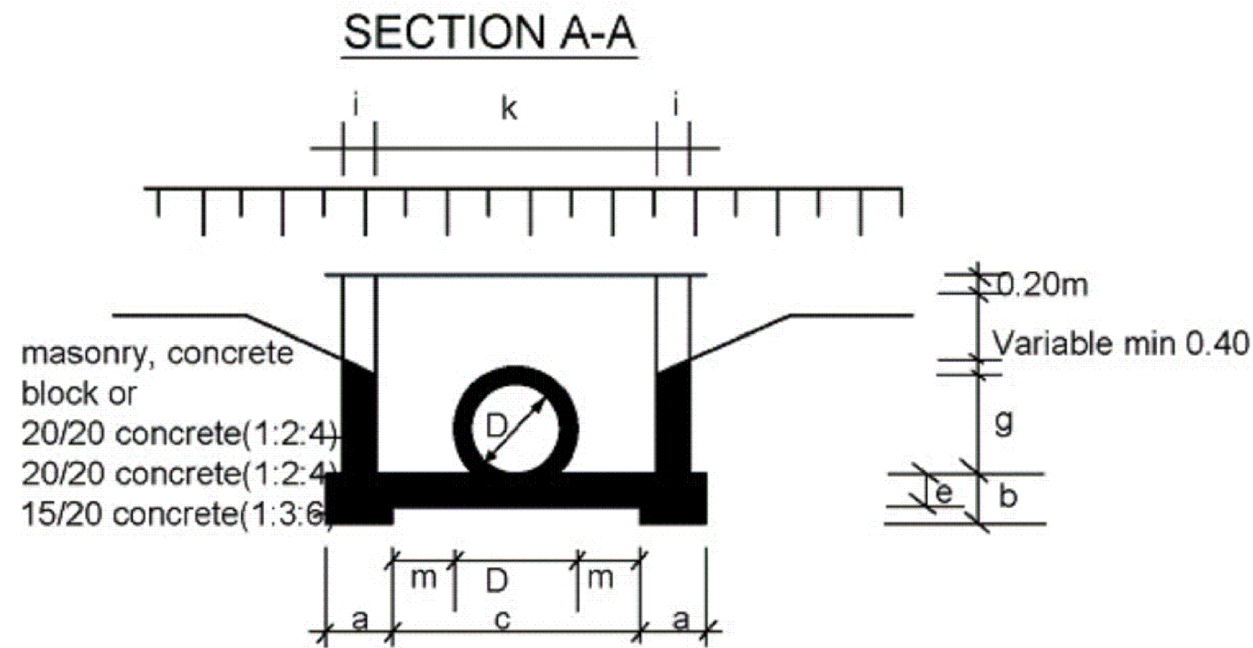
CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

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
HEAD/WINGWALLS (Concrete/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)

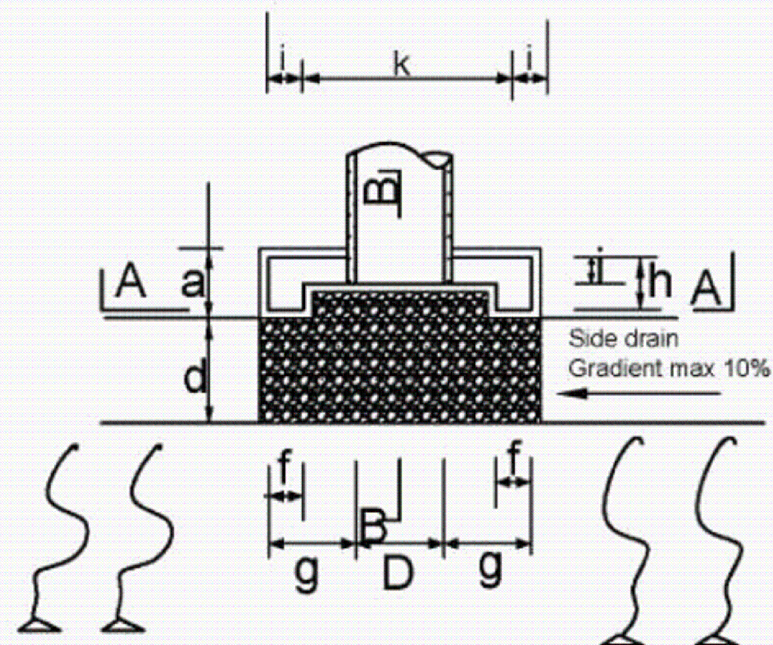
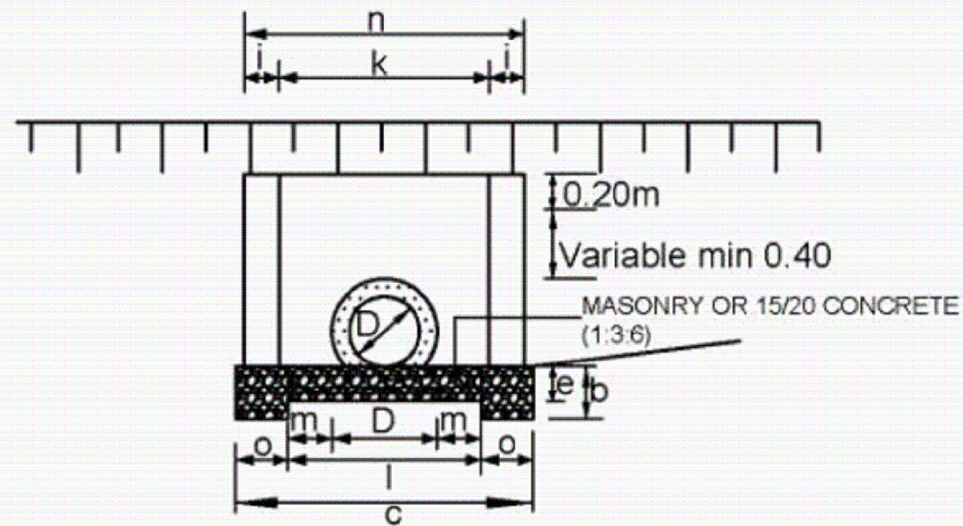


DIMENSIONS AND MATERIAL REQUIREMENTS

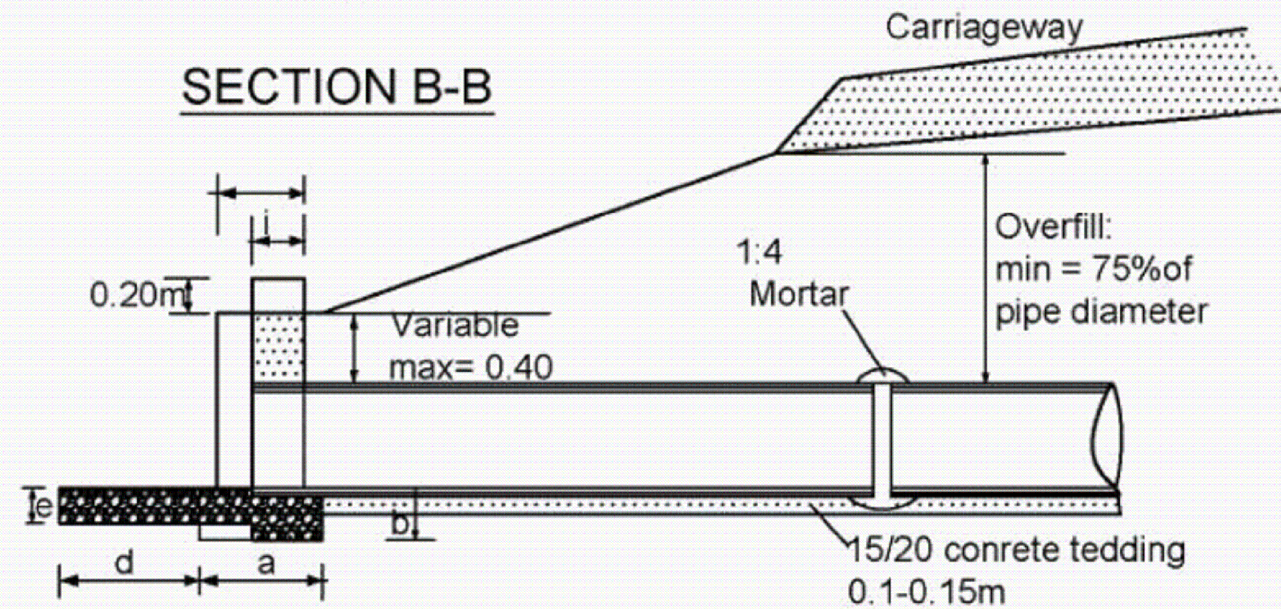
PIPE DIAMETER IN (M)			TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
DIMENSION	UNIT							
a	FOUNDATION	m	0.30	0.30	0.30	0.40	0.40	0.40
b	FOUNDATION	m	0.30	0.30	0.30	0.30	0.30	0.30
c	FOUNDATION	m	1.10	1.10	1.40	1.20	1.20	1.50
d	APRON	m	0.90	0.90	0.90	1.00	1.00	1.00
e	APRON	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
HEAD/WINGWALLS (Concrete/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

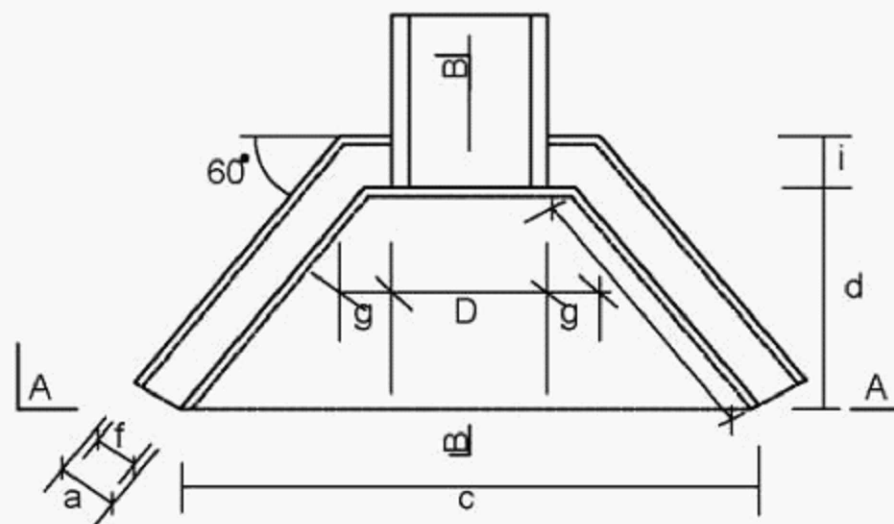
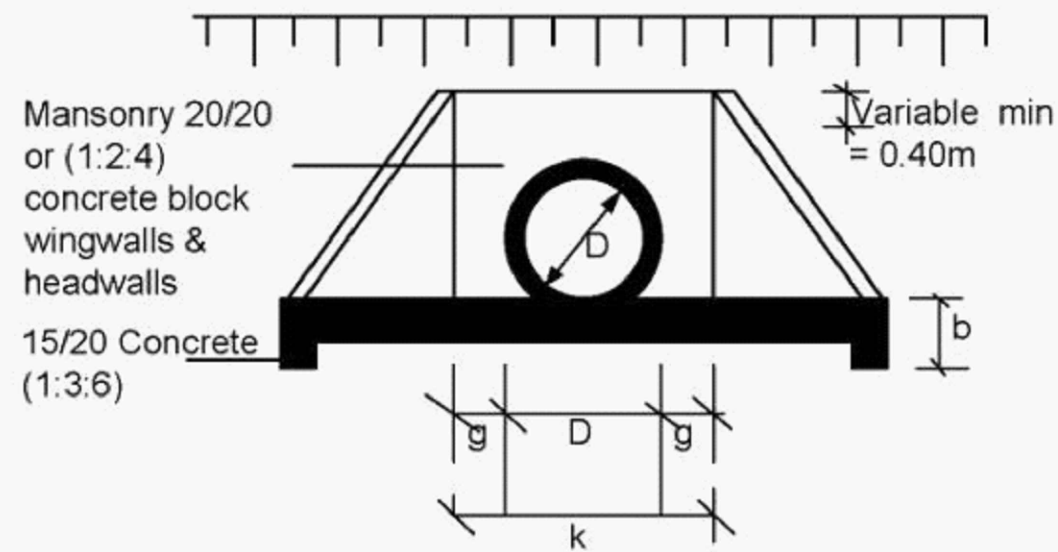


DIMENSIONS AND MATERIAL REQUIREMENTS

PIPE DIAMETER IN (M)	DIMENSION	UNIT	TYPE A and C CONCRETE BLOCKS	
			450	600
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
HEADWINGWALLS (Concrete/Masonry)			0.34	0.37
APRON (concrete)			0.95	0.99

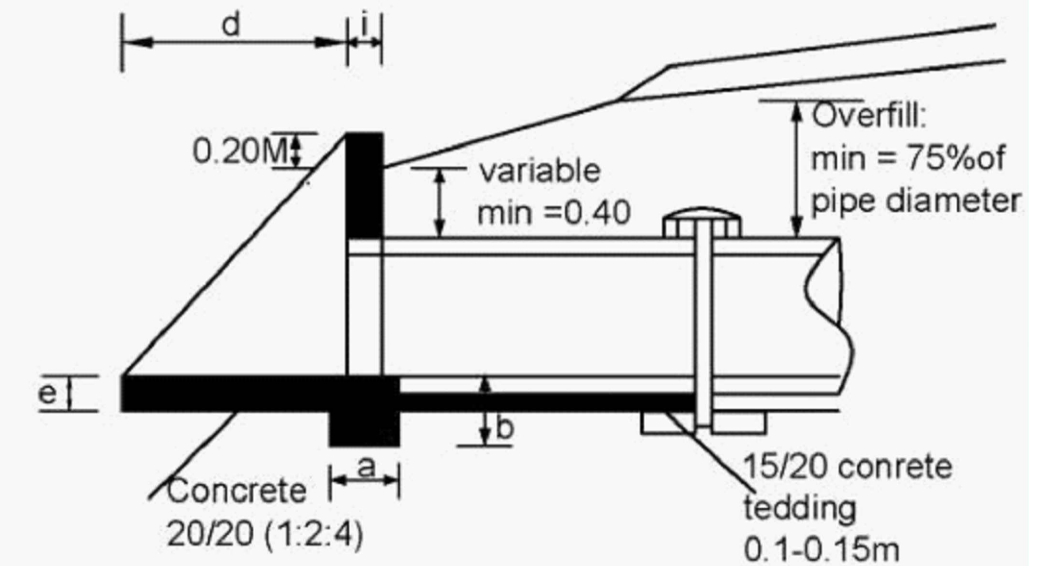
C12- HEADWALL TYPE 4 (FOR ACCESS CULVERTS)

SECTION A-A

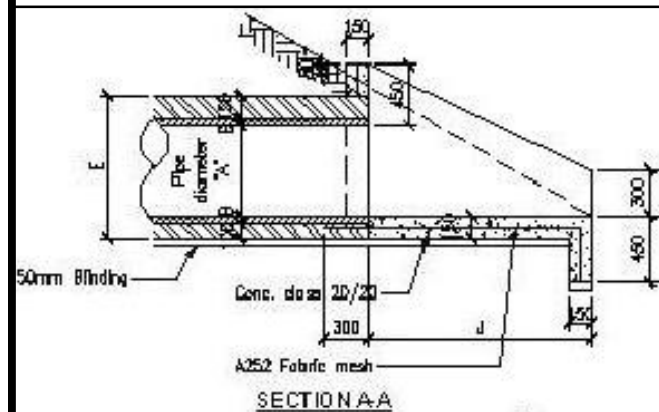


CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

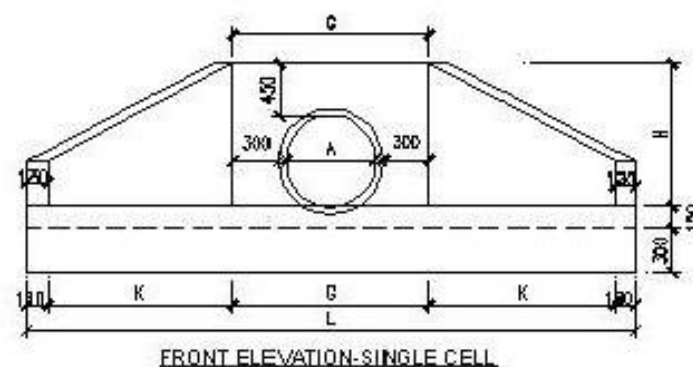
SECTION B-B



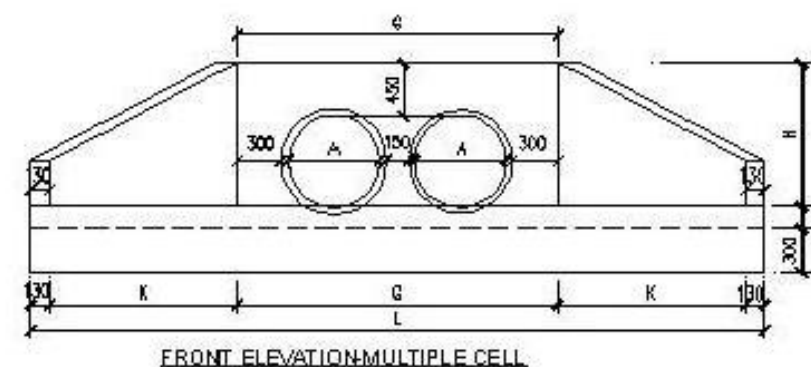
PIPE DIAMETER IN M			TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
DIMENSION	UNIT							
a	FOUNDATION	m	0.30	0.30		0.40	0.40	
b	FOUNDATION	m	0.30	0.30		0.30	0.30	
c	FOUNDATION	m	1.34	1.49		1.34	1.49	
d	APRON	m	0.6	0.6		0.60	0.60	
e	APRON	m	0.20	0.20		0.20	0.20	
f	WALL	m	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 (Concrete/Masonry)	m3		0.28	0.32		0.53	0.61	
APRON (concrete)	m3		0.12	0.14		0.12	0.14	



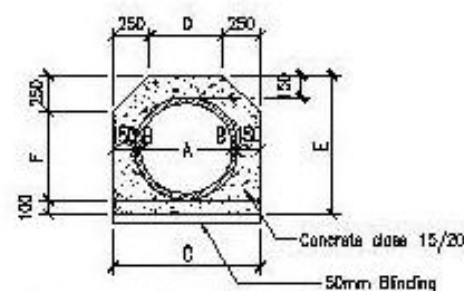
SECTION A-A



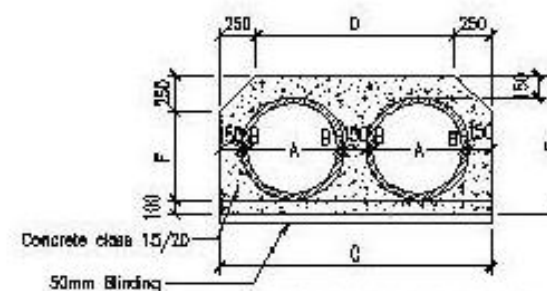
FRONT ELEVATION-SINGLE CELL



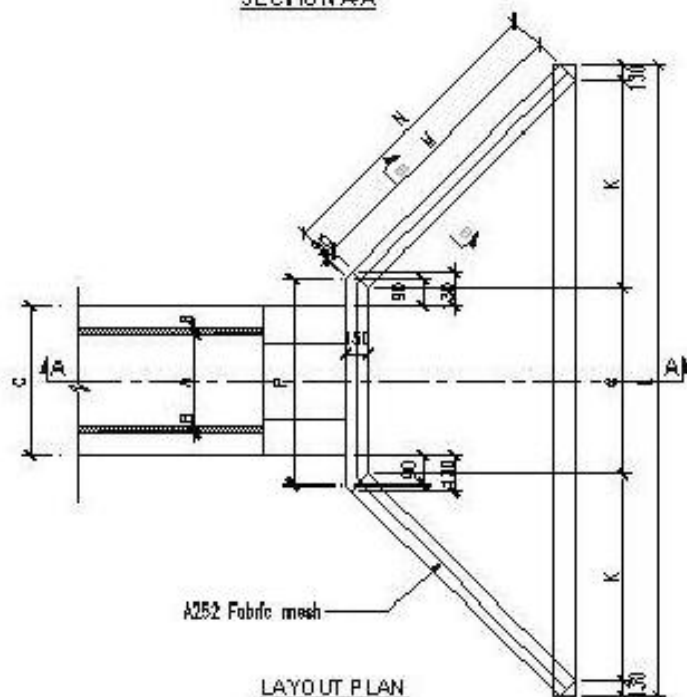
FRONT ELEVATION-MULTIPLE CELL



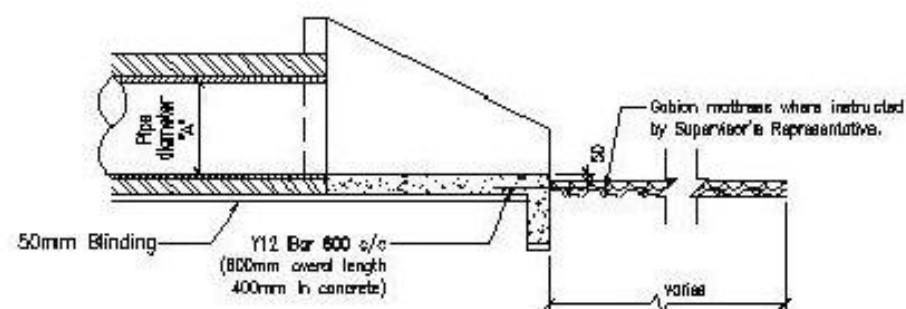
TYPICAL CONCRETE BED AND SURROUND - SINGLE CELL



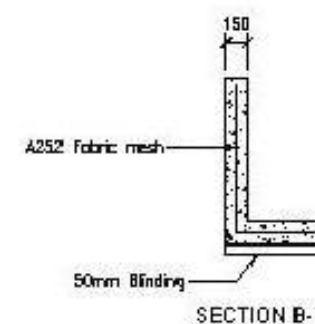
TYPICAL CONCRETE BED AND SURROUND - MULTIPLE CELL



LAYOUT PLAN



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

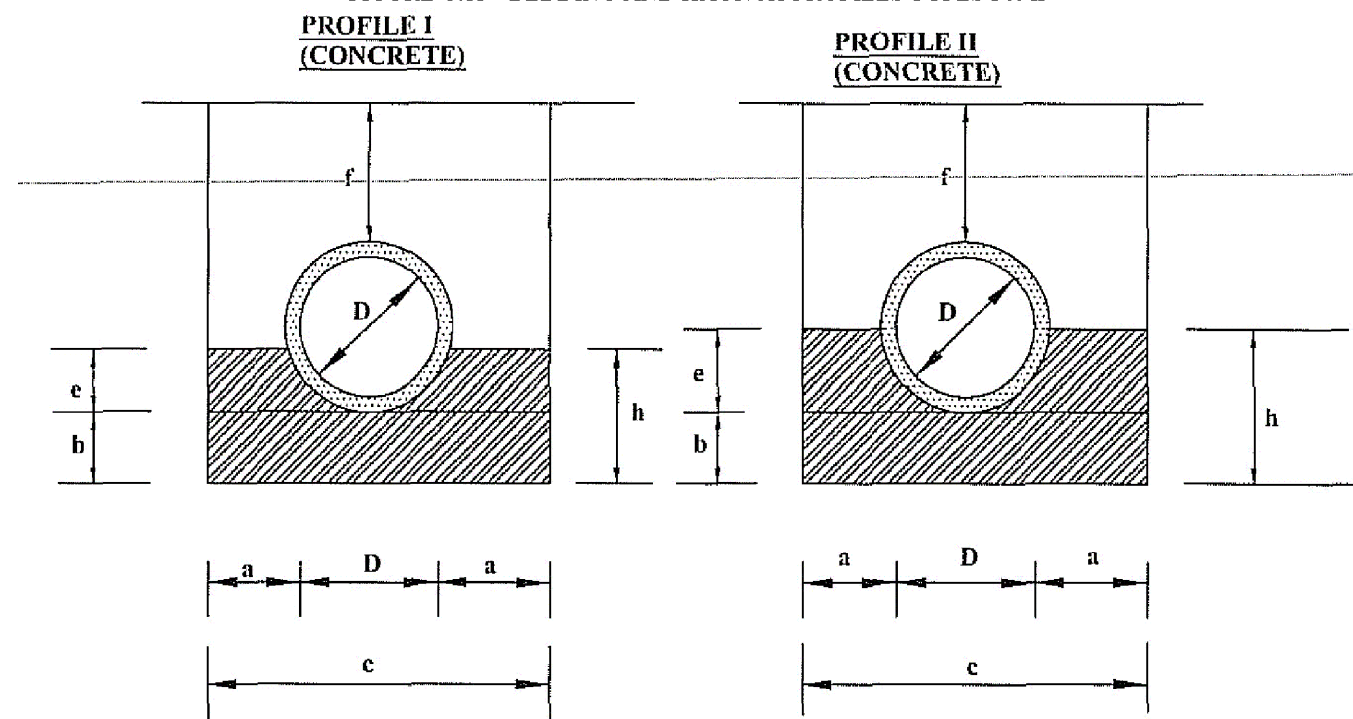
TABLE C - 3-CELL CONCRETE PIPE CULVERTS

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	5.88m 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

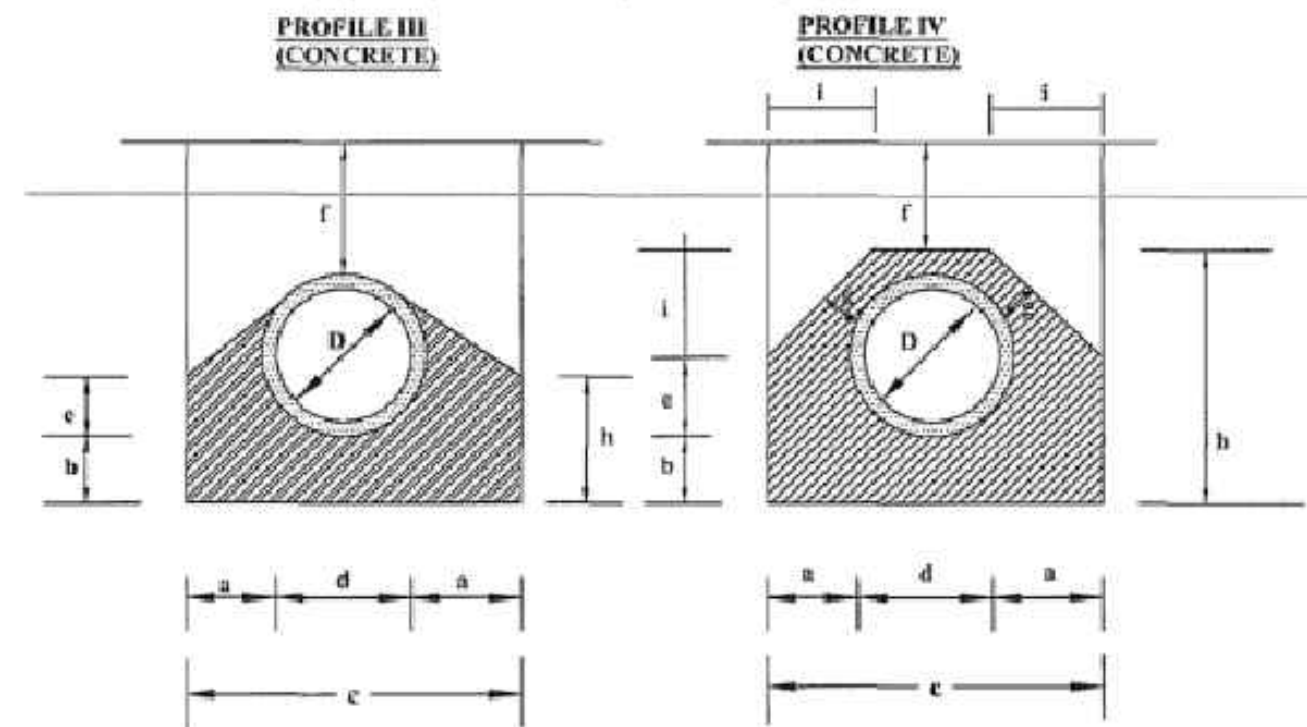
FIGURE C.13 - BEDDING AND HAUNCH PROFILES TYPES I & II



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 Class 15/20	Volume in (m3/m)		
	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		

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	0.28	0.36	0.54
f(min)	0.34	0.45	0.68
g	-	-	-
h	0.38	0.51	0.69
i	-	-	-
Concrete Class 15/20	Volume in (m3/m)		
	0.20	0.37	0.56
Application	-Fair to poor subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Remarks	Material for back/overfill shall be approved by the Engineer		

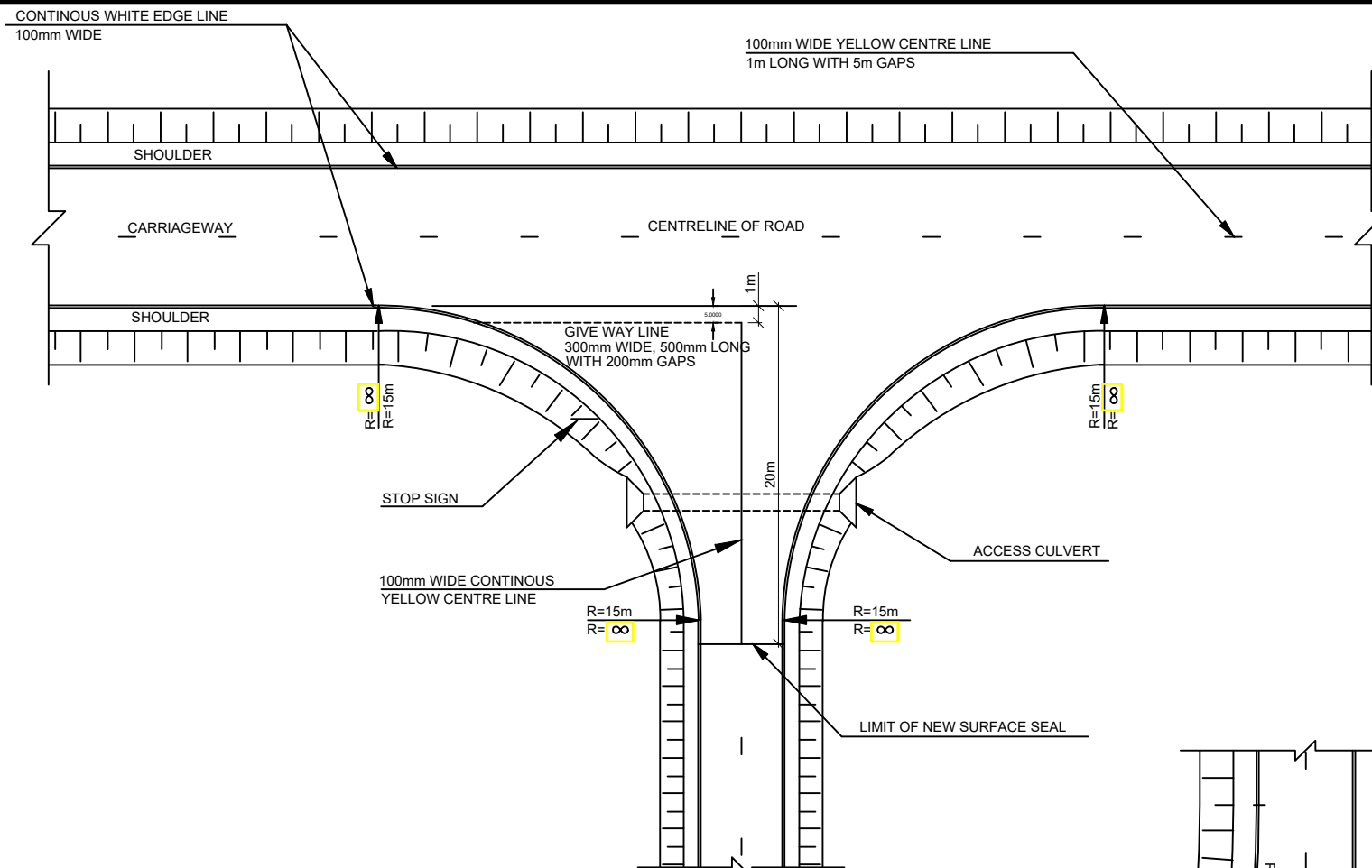
FIGURE C.14 - BEDDING AND HAUNCH PROFILES TYPES III & IV



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 Class 15/20	Volume in (m3/m)		
	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		

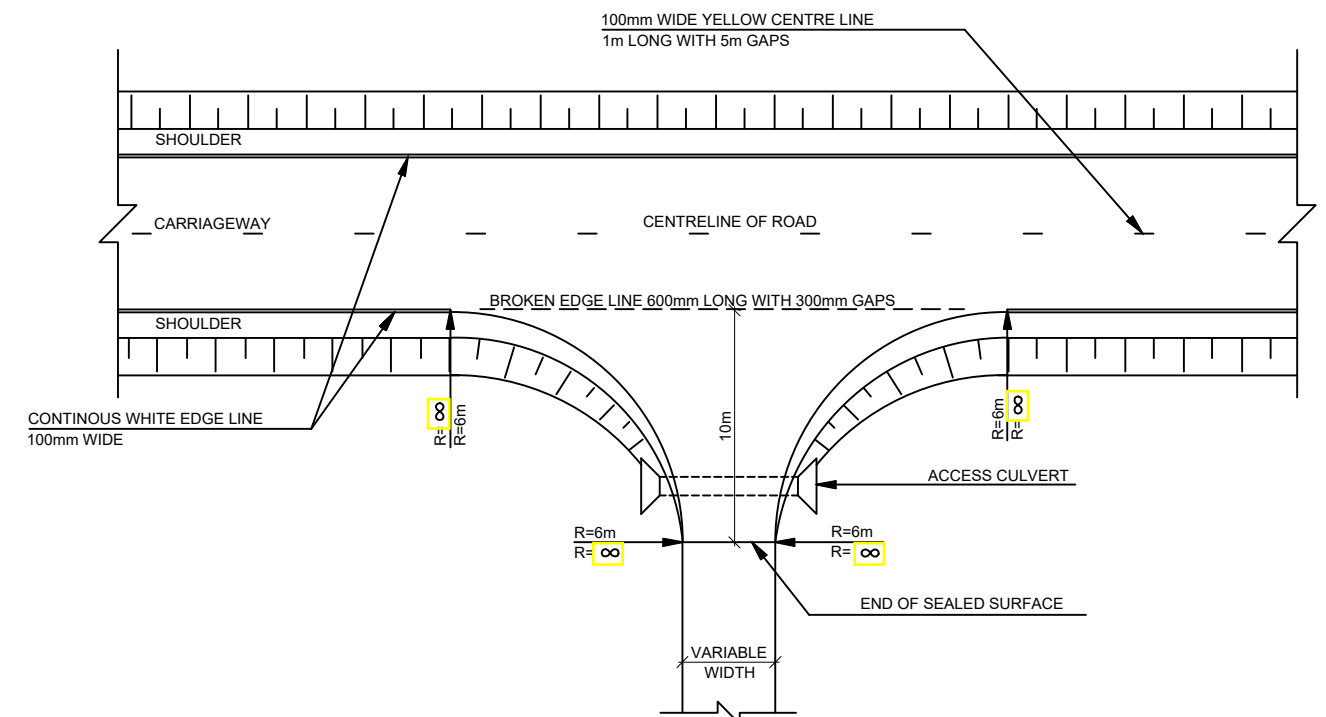
Diameter (D)	450 (mm)	600 (mm)	900 (mm)
a	0.15	0.20	0.20
b	0.10	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.46	0.52	0.78
f(min)	0.15	0.15	0.15
g	0.15	0.15	0.15
h	0.81	1.02	1.38
i	0.28	0.35	0.45
Concrete Class 15/20	Volume in (m3/m)		
	0.37	0.61	0.92
Application	-Fair to poor subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Remarks	Material for back/overfill shall be approved by the Engineer		

STANDARD DRAWINGS



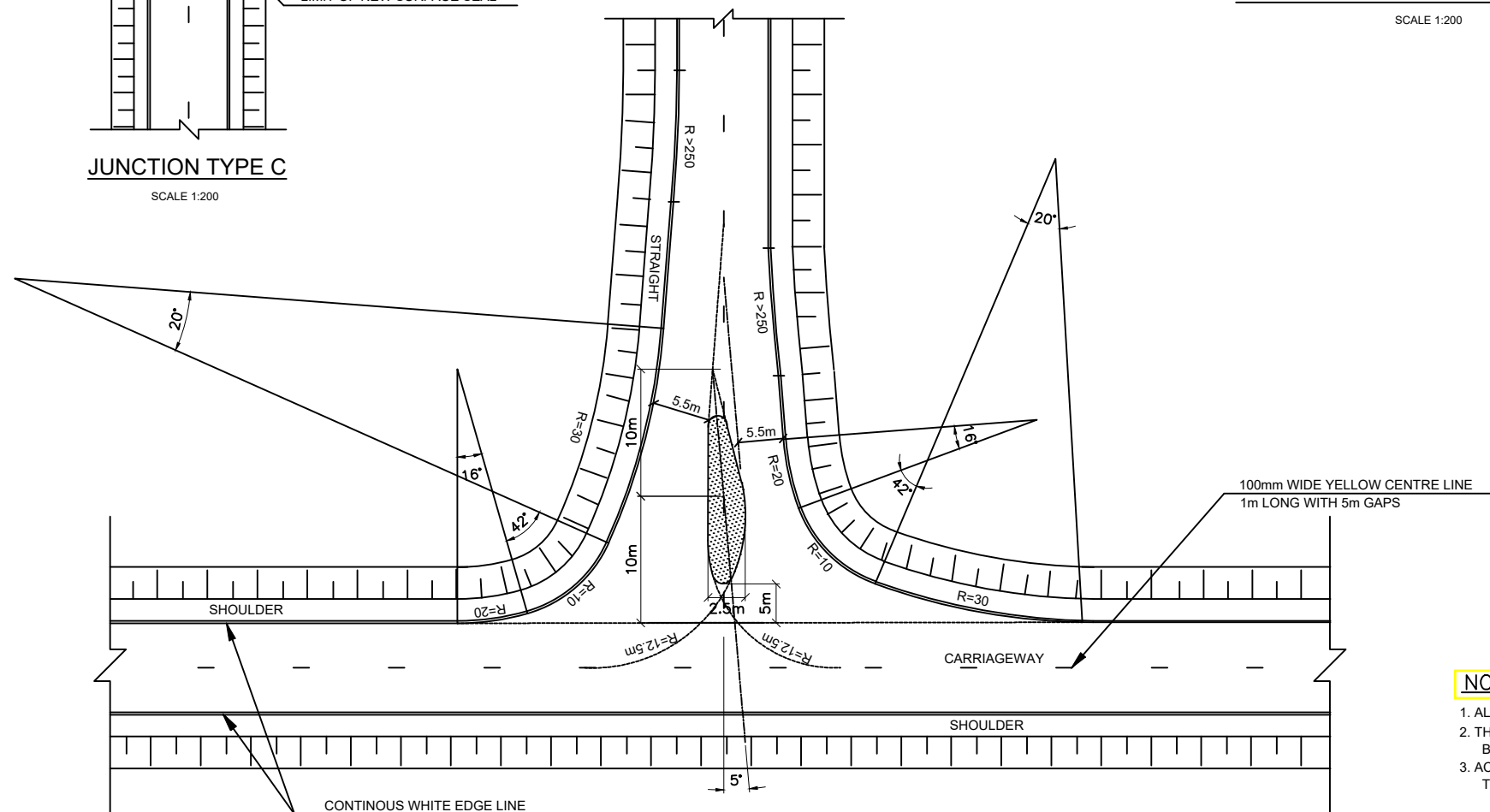
JUNCTION TYPE C

SCALE 1:200



JUNCTION TYPE D : MINOR ACCESSSES

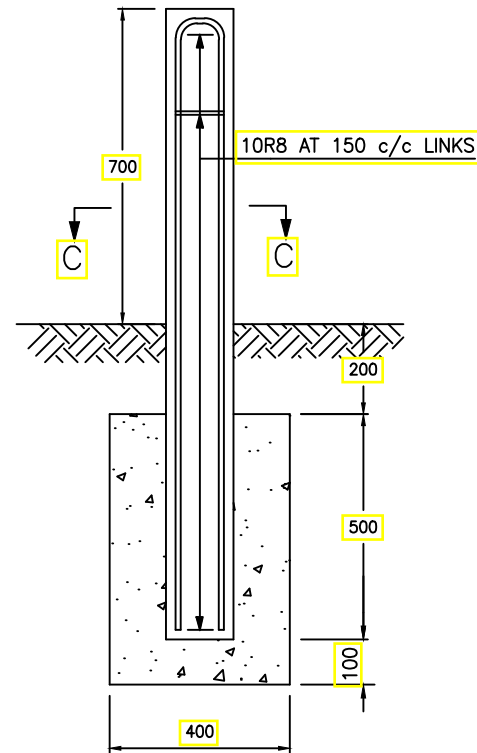
SCALE 1:200



JUNCTION TYPE B

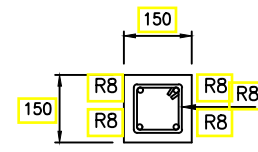
NOTES:

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.



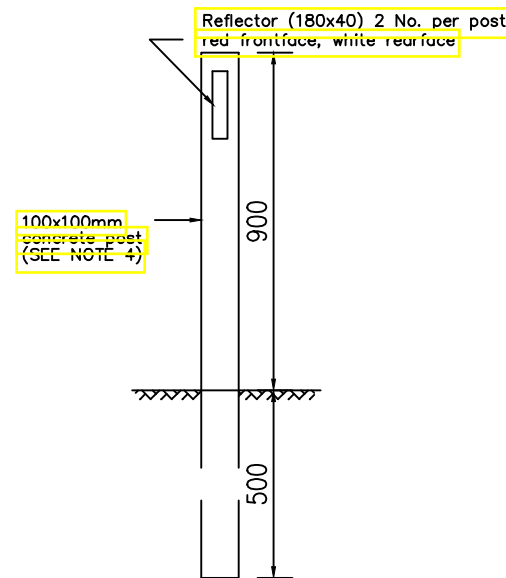
CULVERT/SERVICE DUCT MARKER POST

SCALE 1:10



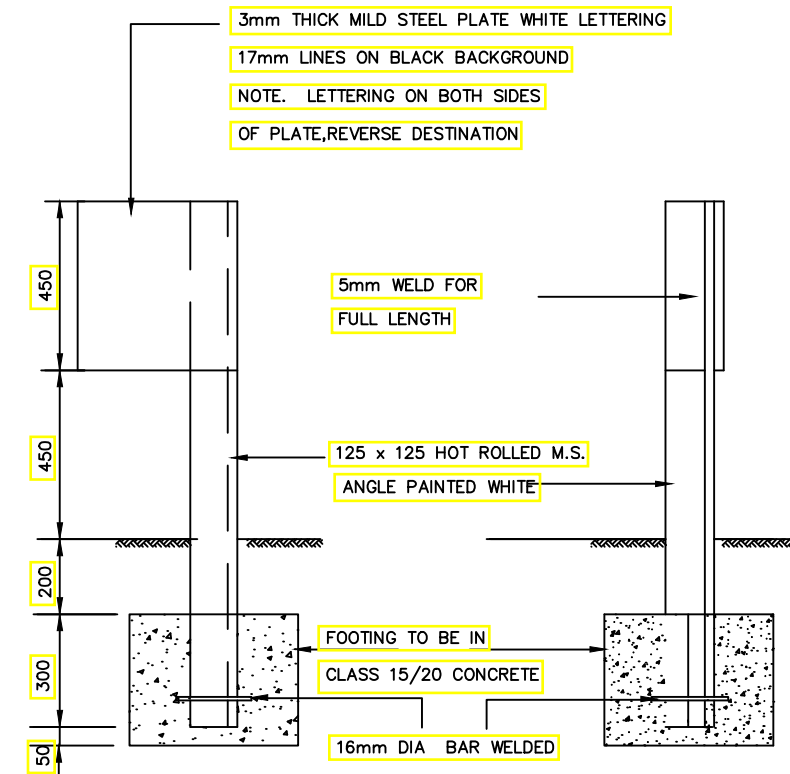
SECTION C-C

SCALE 1:10



EDGE MARKER POST

SCALE 1 : 20

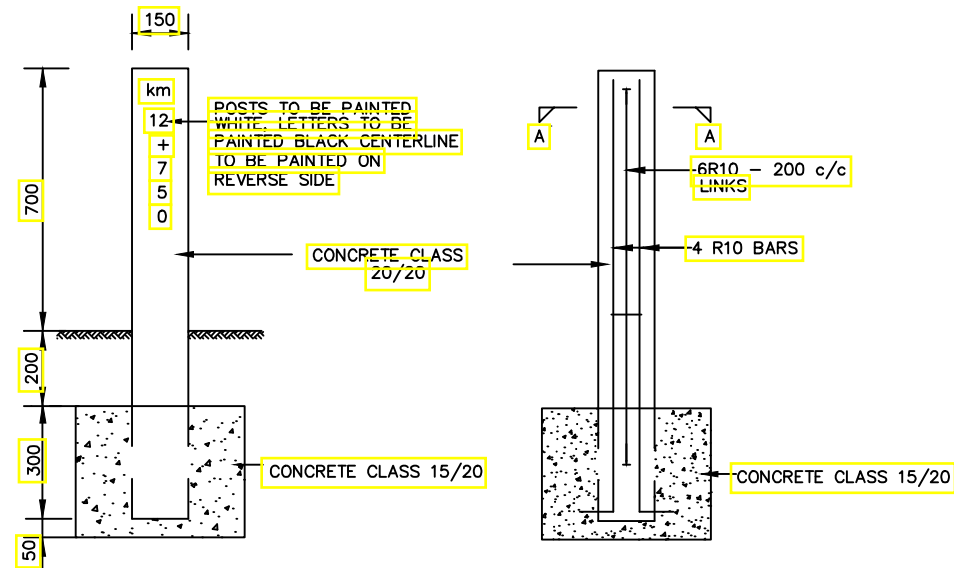


FRONT ELEVATION

SIDE ELEVATION

KILOMETER MARKER POST

SCALE 1 : 20

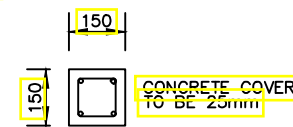


FRONT ELEVATION

REINFORCED DETAILS

ROAD RESERVE BOUNDARY POST

SCALE 1: 20



SECTION A - A

NOTES

1. Edge marker posts

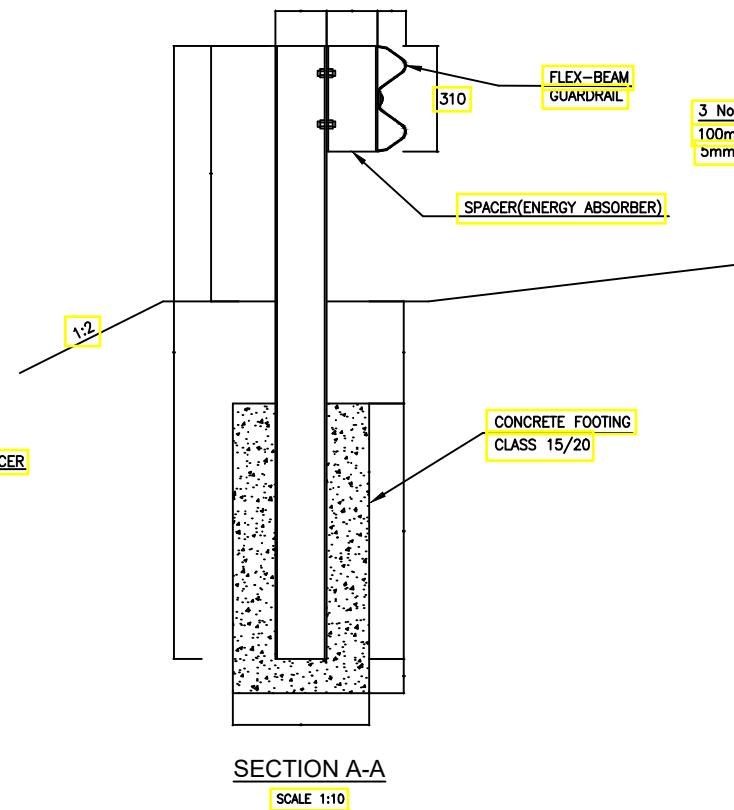
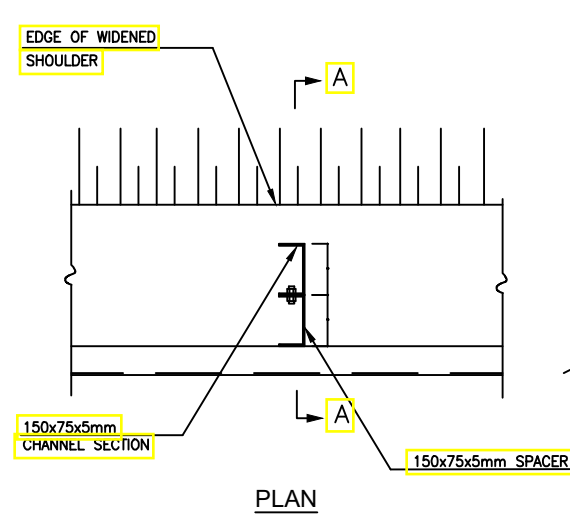
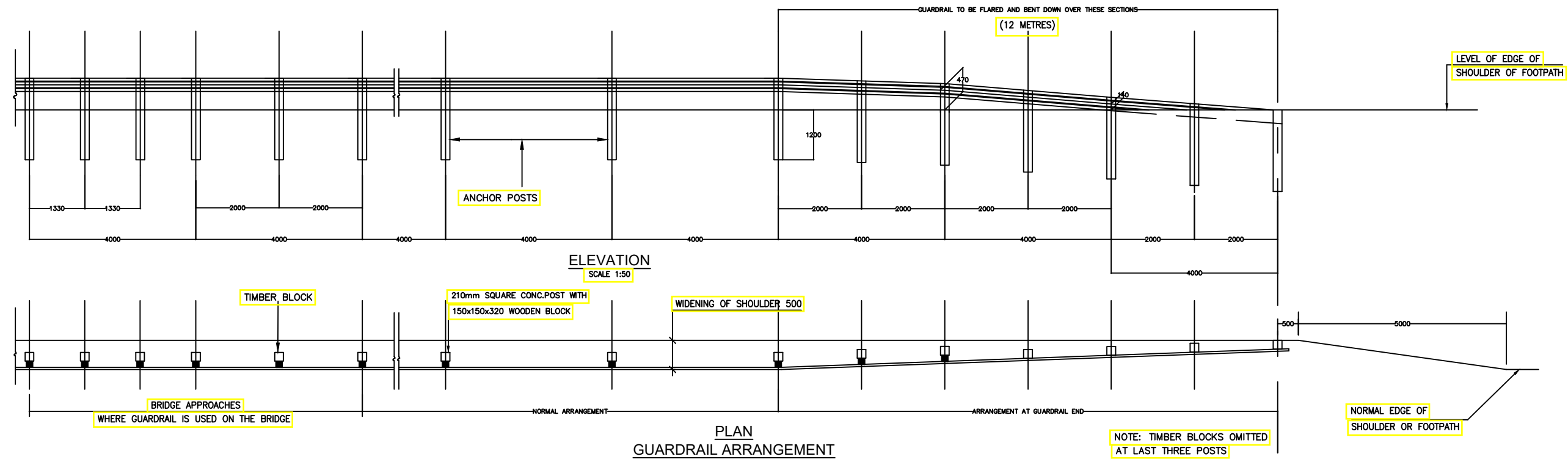
To be provided both sides of carriageway in the following cases:-

- Embankments of height 2m or above where guardrail is not provided
- As shown in the contract dwgs or directed by the Engineer.

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

- 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



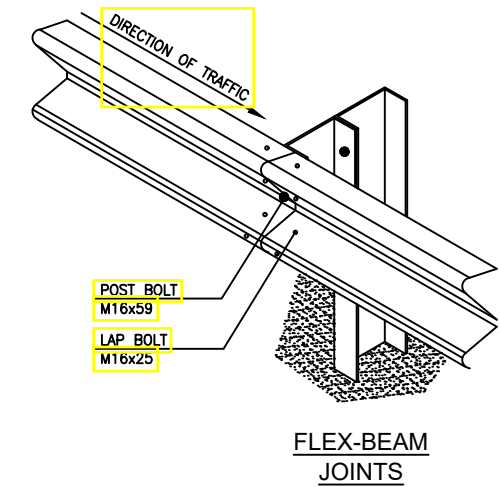
3 No. BOLTS
100mm CENTRES
5mm DIAMETER

WHITE PAINTED METAL
PLATE 80 x 600 x 5mm

REFLECTOR PLATE
(180x40x1mm) 2 No.
PER POST RED FRONT
FACE WITH WHITE REAR
FACE

REAR ELEVATION

FRONT ELEVATION

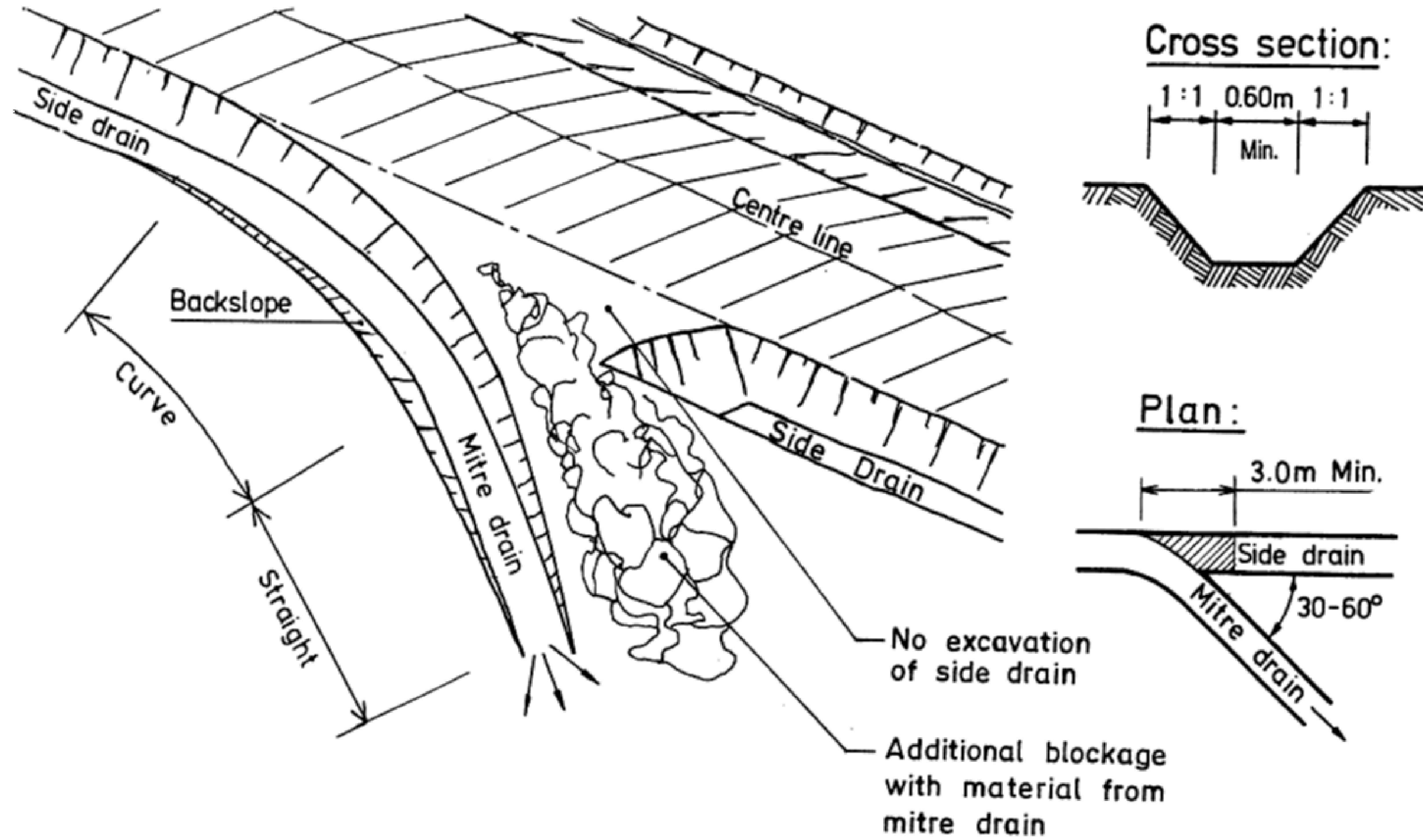


NOTES:

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 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.

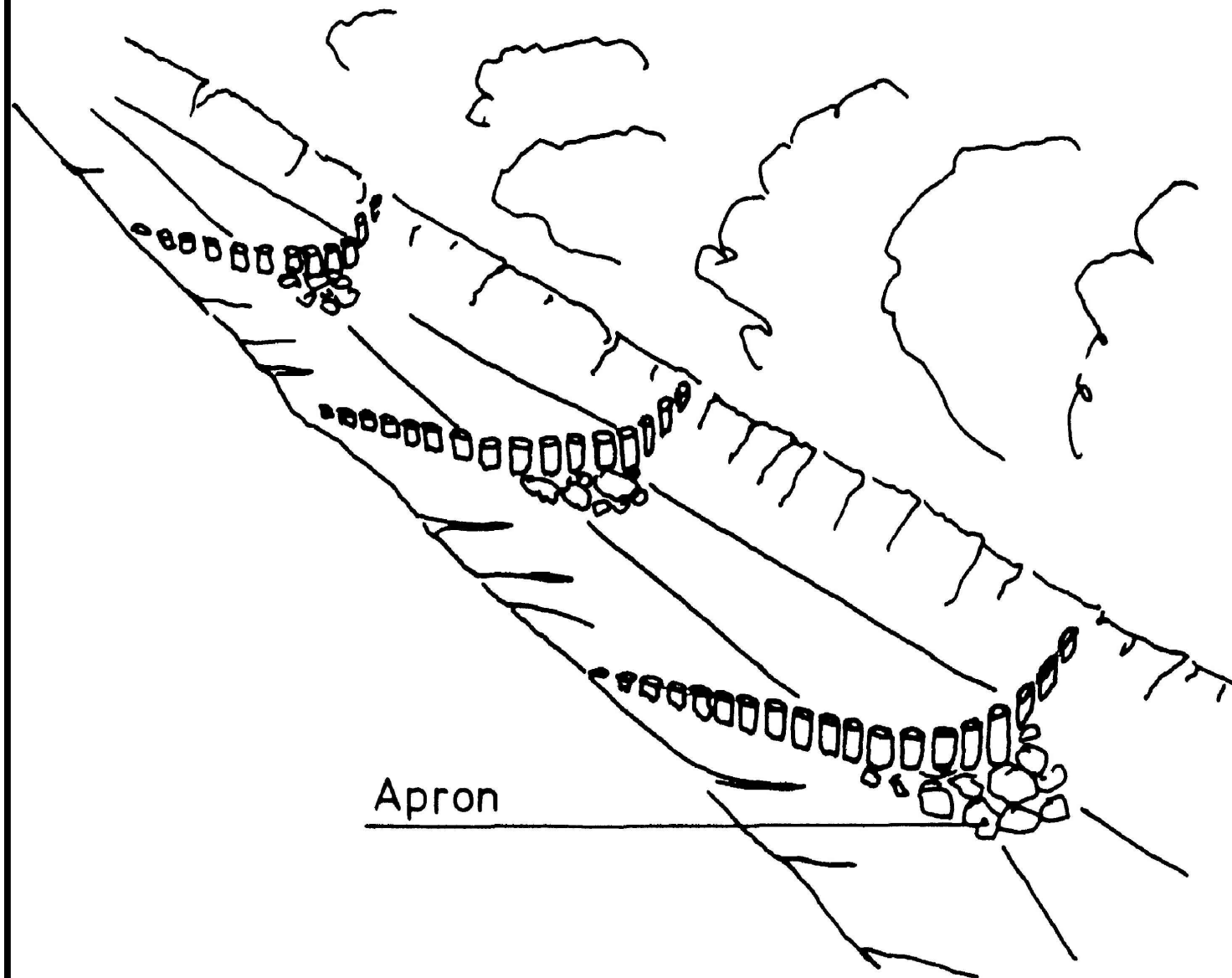
GENERAL DRAINAGE

MITRE DRAIN

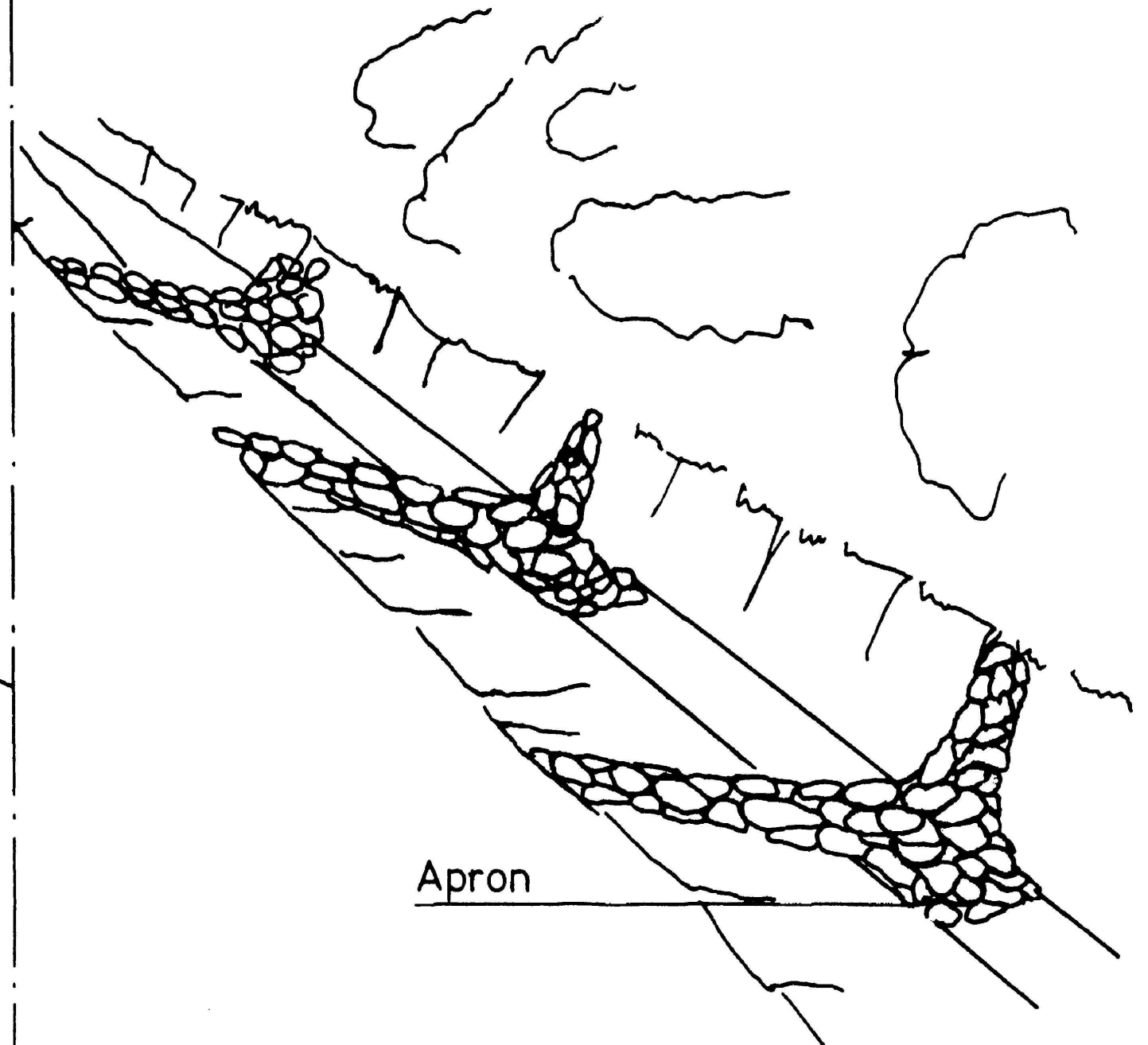


SCOUR CHECKS

Scour checks made of wooden stakes:

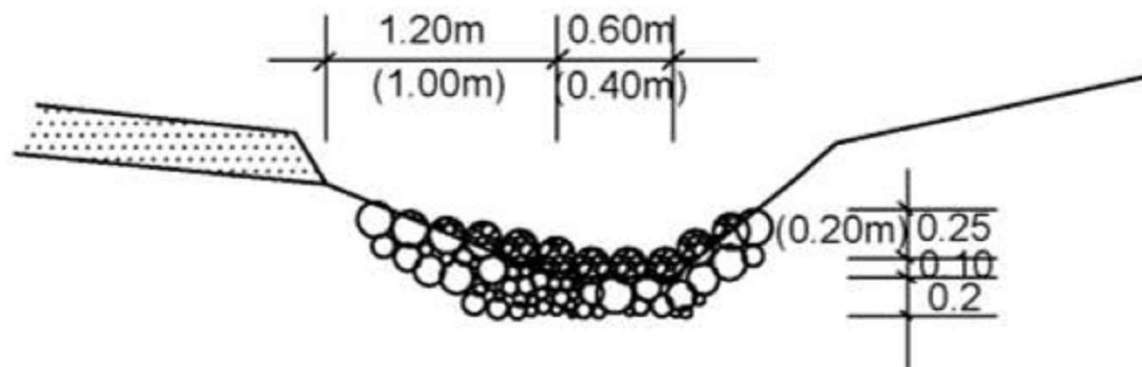


Scour checks made of stones:

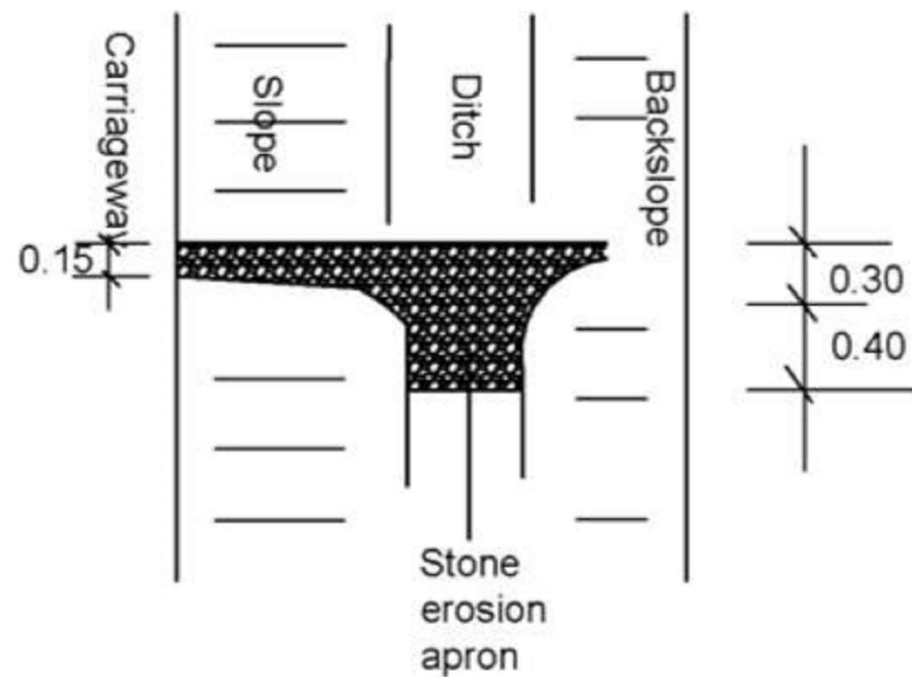


Scour checks made of stones

Cross section



Ground plan



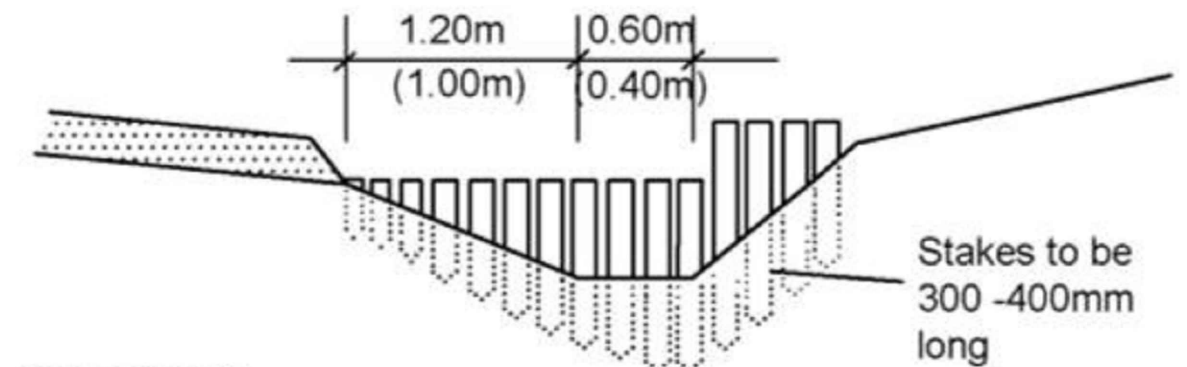
NOTE

1Dimensions in metres

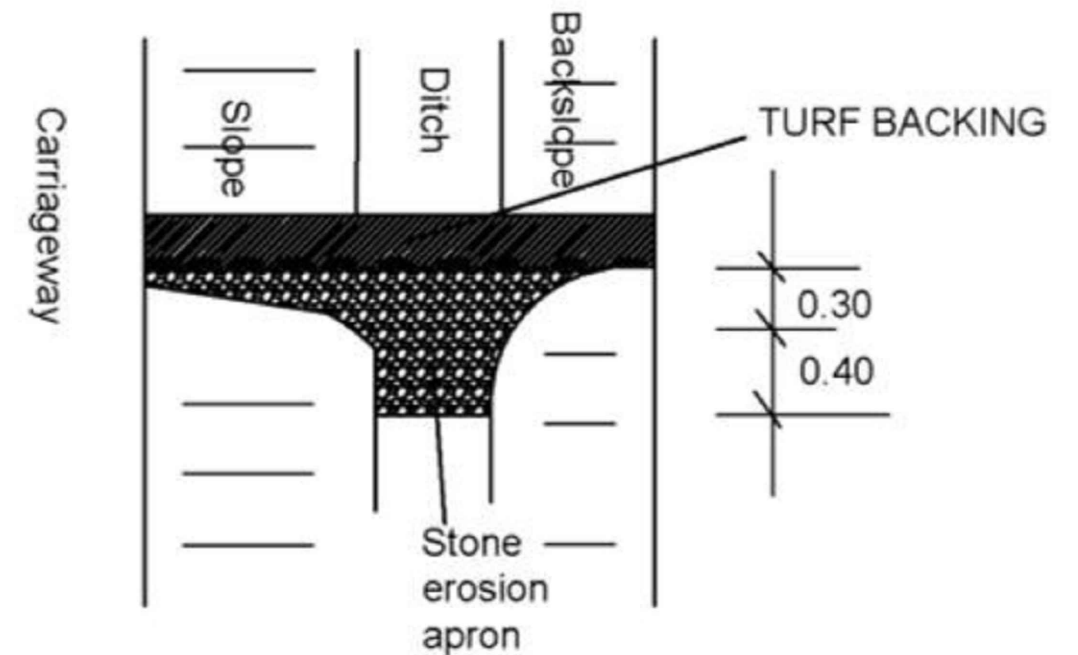
STONE WEIGHT: MIN 10KG
STAKE DIAMETER: MIN. 0.10m

Scour checks made of wooden stakes

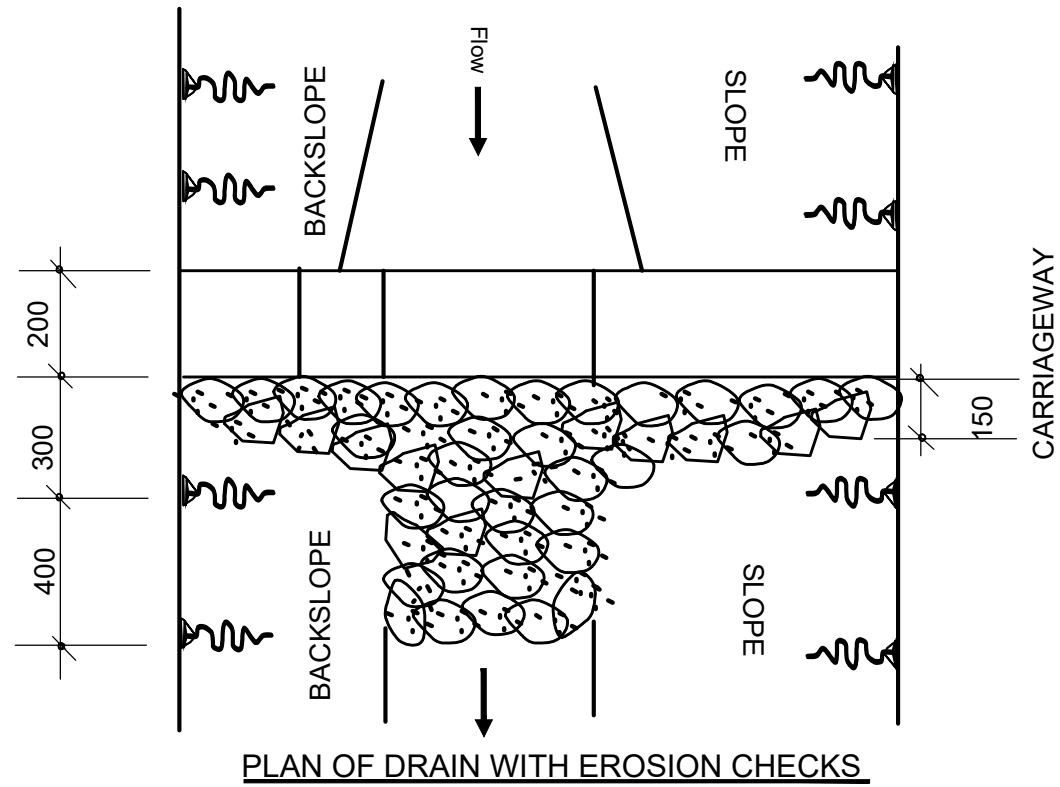
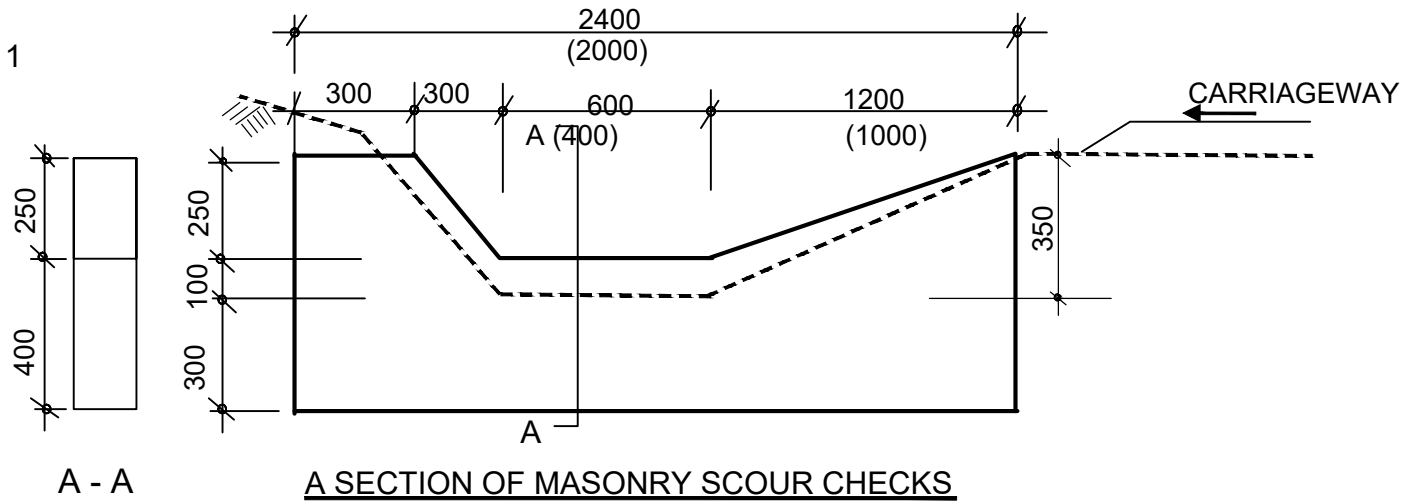
Cross section



Ground plan

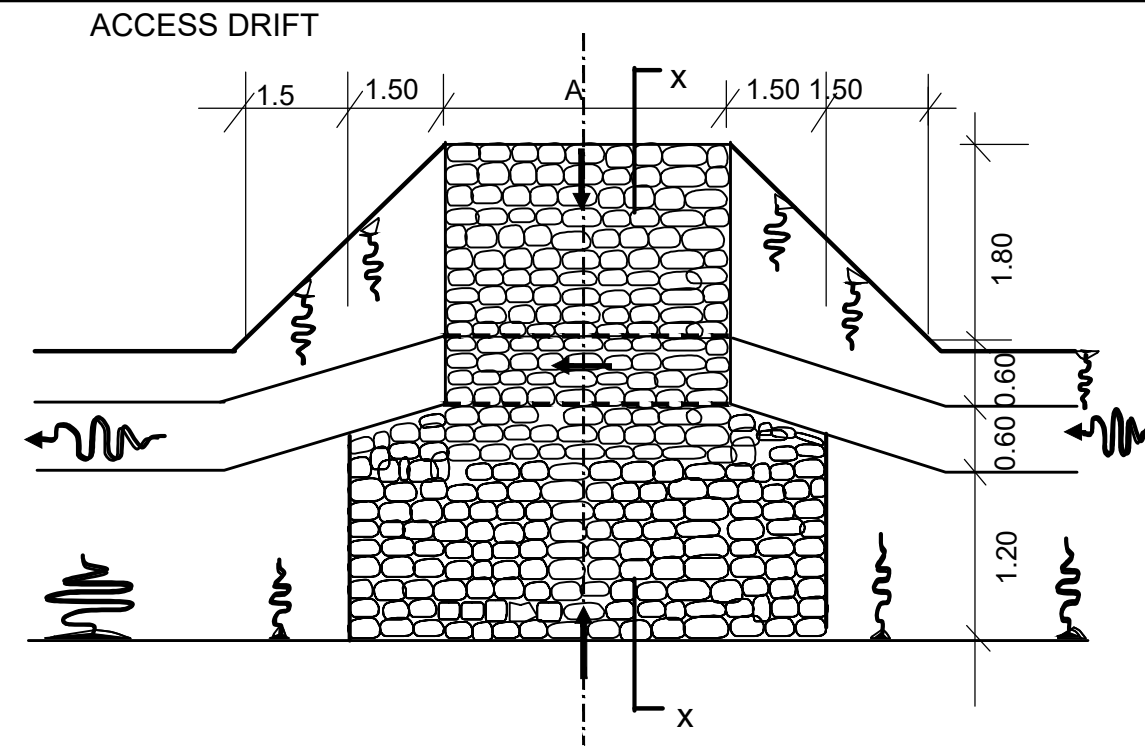


- MASONRY SCOUR CHECKS



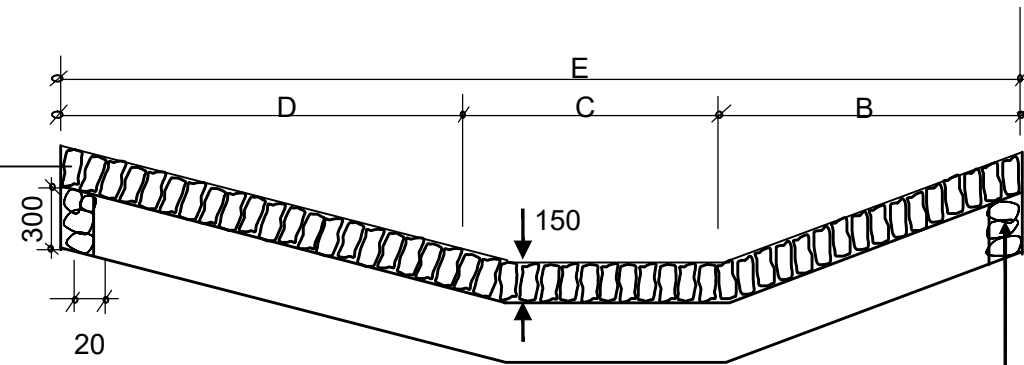
QUANTITIES TABLE

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



PLAN

150mm GROUTED
STONE PITCHING



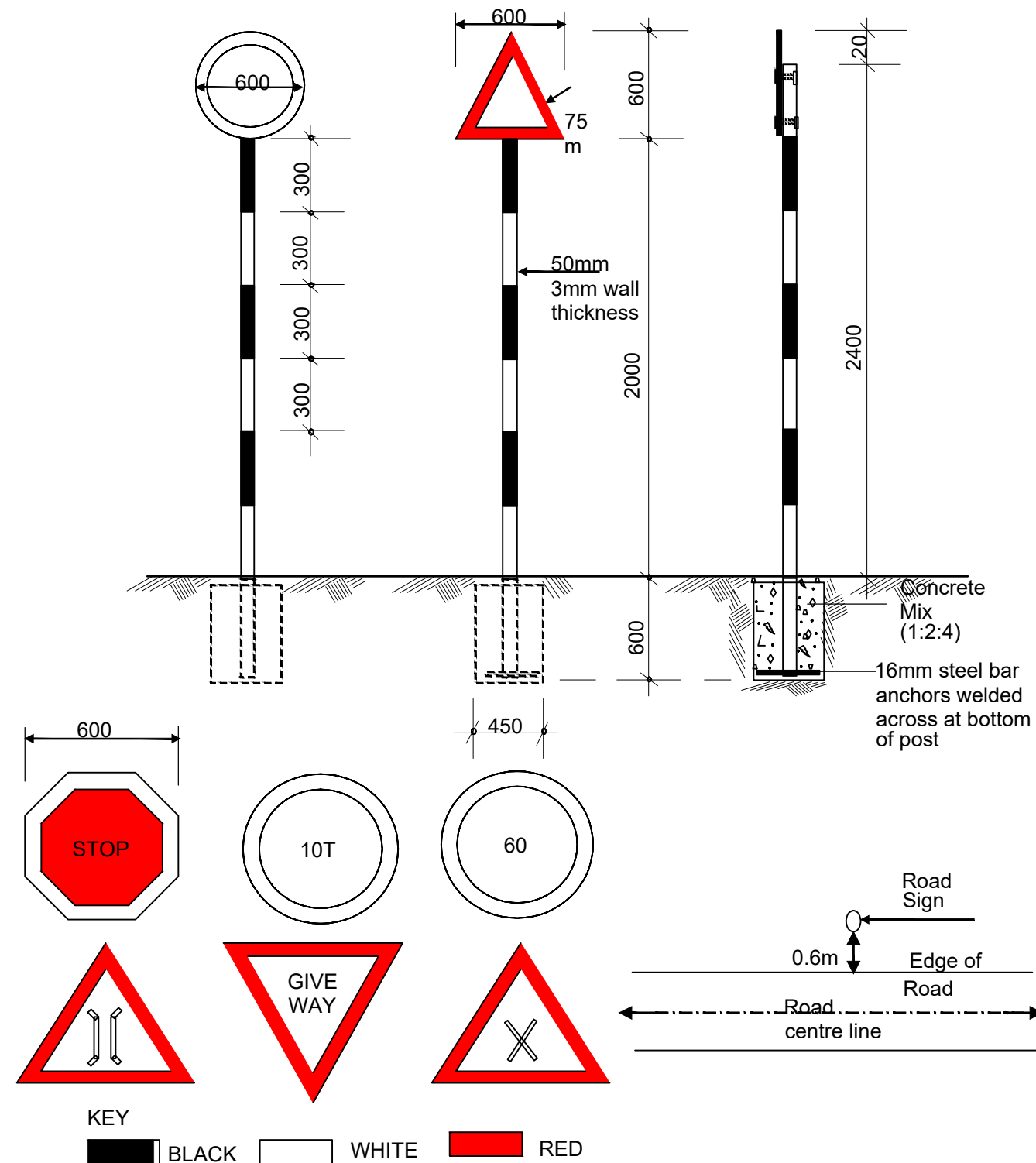
X-SECTION X-X

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 be fixed to steel tube by 4 Nos M10 bolts and 2 Nos 50 mm 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"



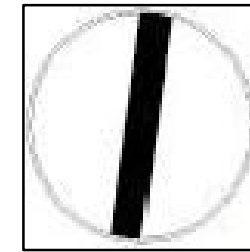
"Road narrows on Right Ahead" (sign may be reversed)



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



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



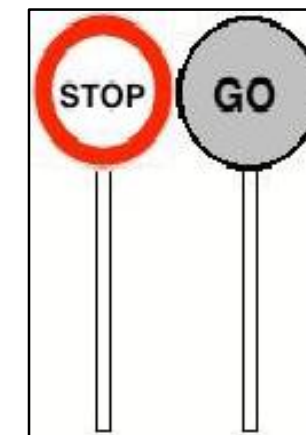
"Road Clear"



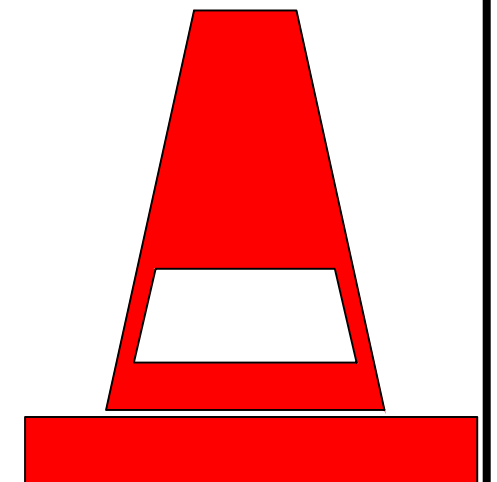
"Speed Limit"



"No Overtaking"



Reversible stop/go signs



Traffic cones

PUBLICITY SIGNBOARD

