



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 LOGLOGO-KORR-KARGI (E4299-01C) ROAD-10 KM**

TENDER NO: AFD/EU/MA/GR/01C/4/2024-25

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

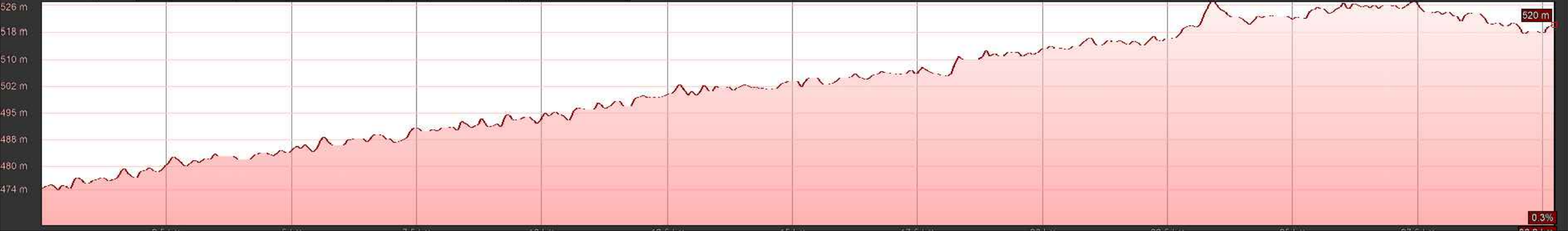
NAIROBI

LOG LOGO-KORR	
GRAVEL ROADS BOOK OF DRAWING	
DRAWING No.	GENERAL DRAWINGS
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R2000/LLK/2025/TCS/04	CROSS-SECTION D (EMBARKMENT CROSS-SECTION)
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R2000/LLK/2025/GDR/03	SCOUR CHECKS
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TRAFFIC SIGNS	
R2000/LLK/2025/TS/01	STANDARD TRAFFIC SIGNS
PUBLICITY SIGNBOARD	
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LOCATION MAP

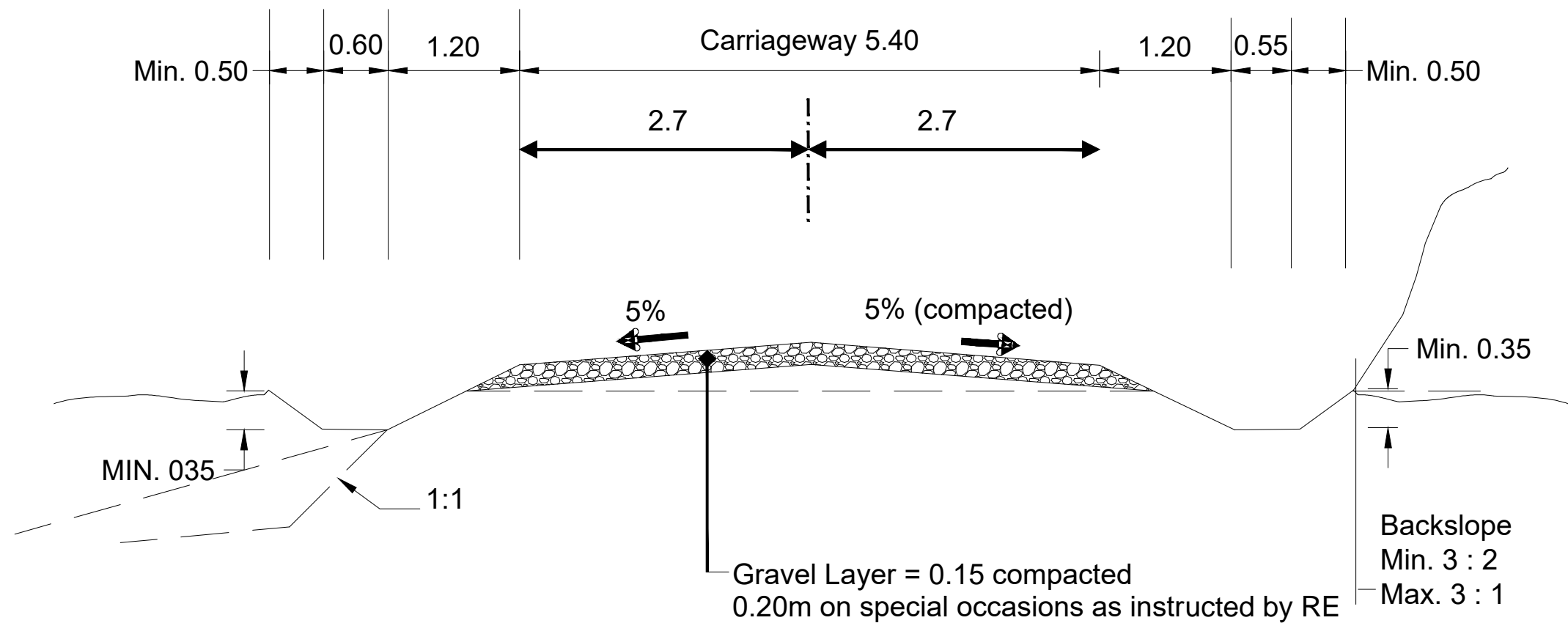


Graph: Min, Avg, Max Elevation: 474, 503, 526 m
Range Totals: Distance: 30.2 km Elev Gain/Loss: 151 m, -106 m Max Slope: 3.3%, -1.9% Avg Slope: 0.7%, -0.6%



TYPICAL CROSS-SECTIONS

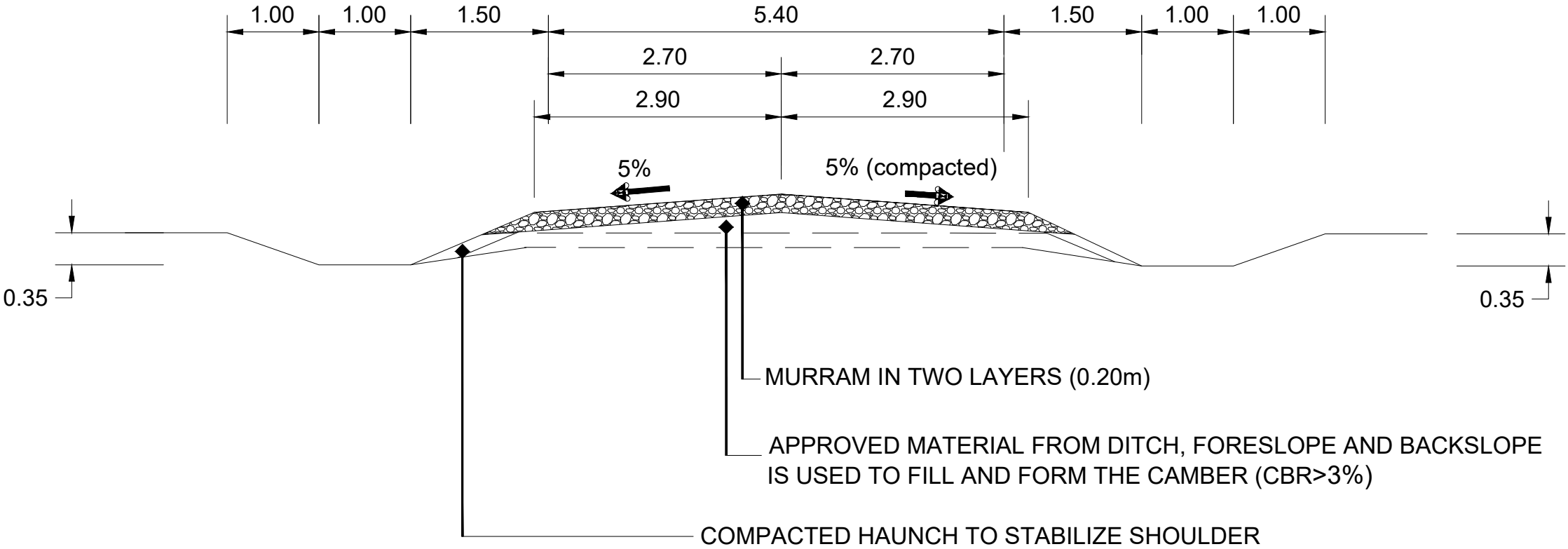
CROSS SECTION A (STANDARD CROSS-SECTION)



NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

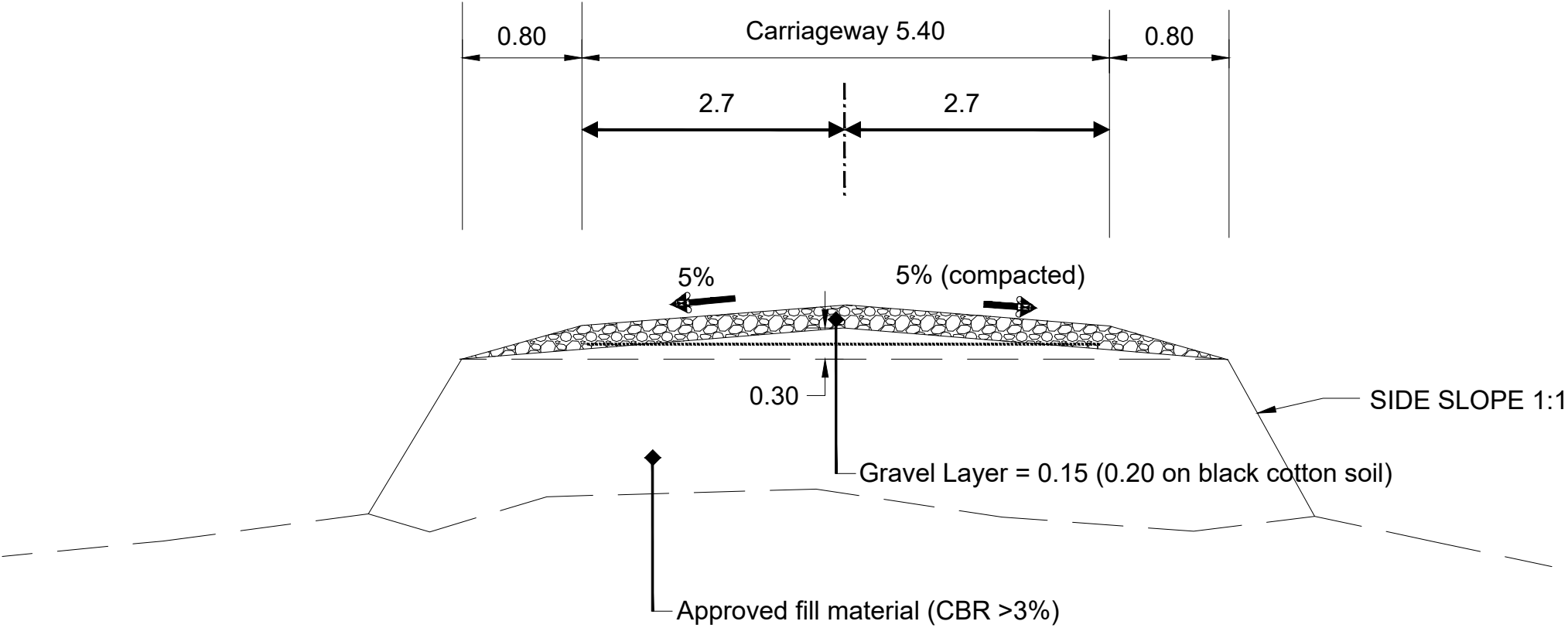
CROSS SECTION B (BLACK COTTON SOIL CROSS-SECTION)



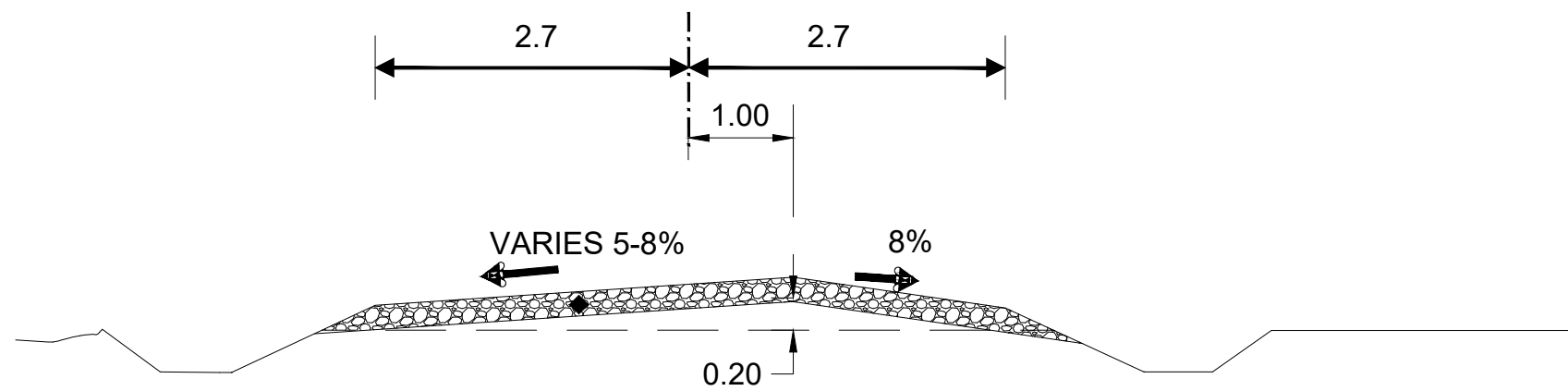
NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

CROSS SECTION D (EMBARKMENT CROSS-SECTION)



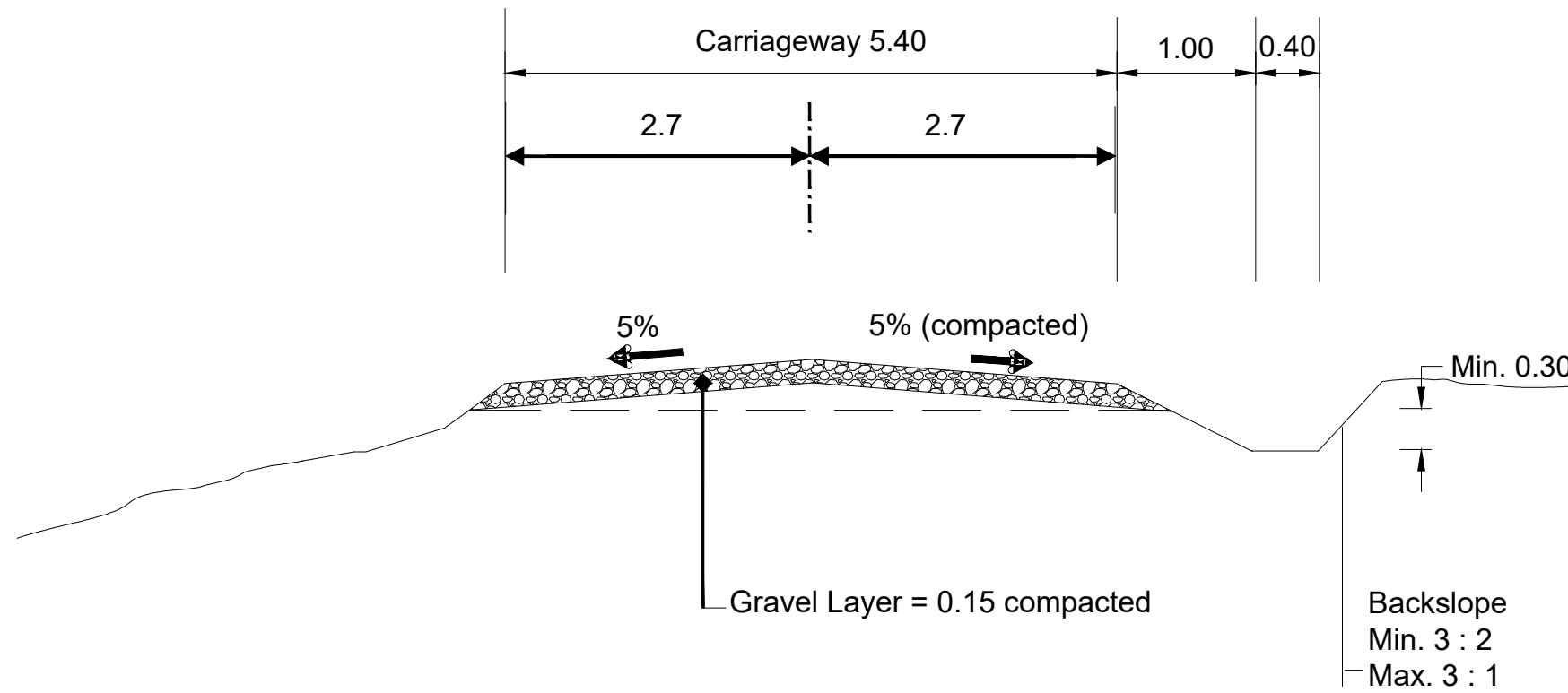
CROSS SECTION E (SUPERELEVATION CROSS-SECTION)



NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

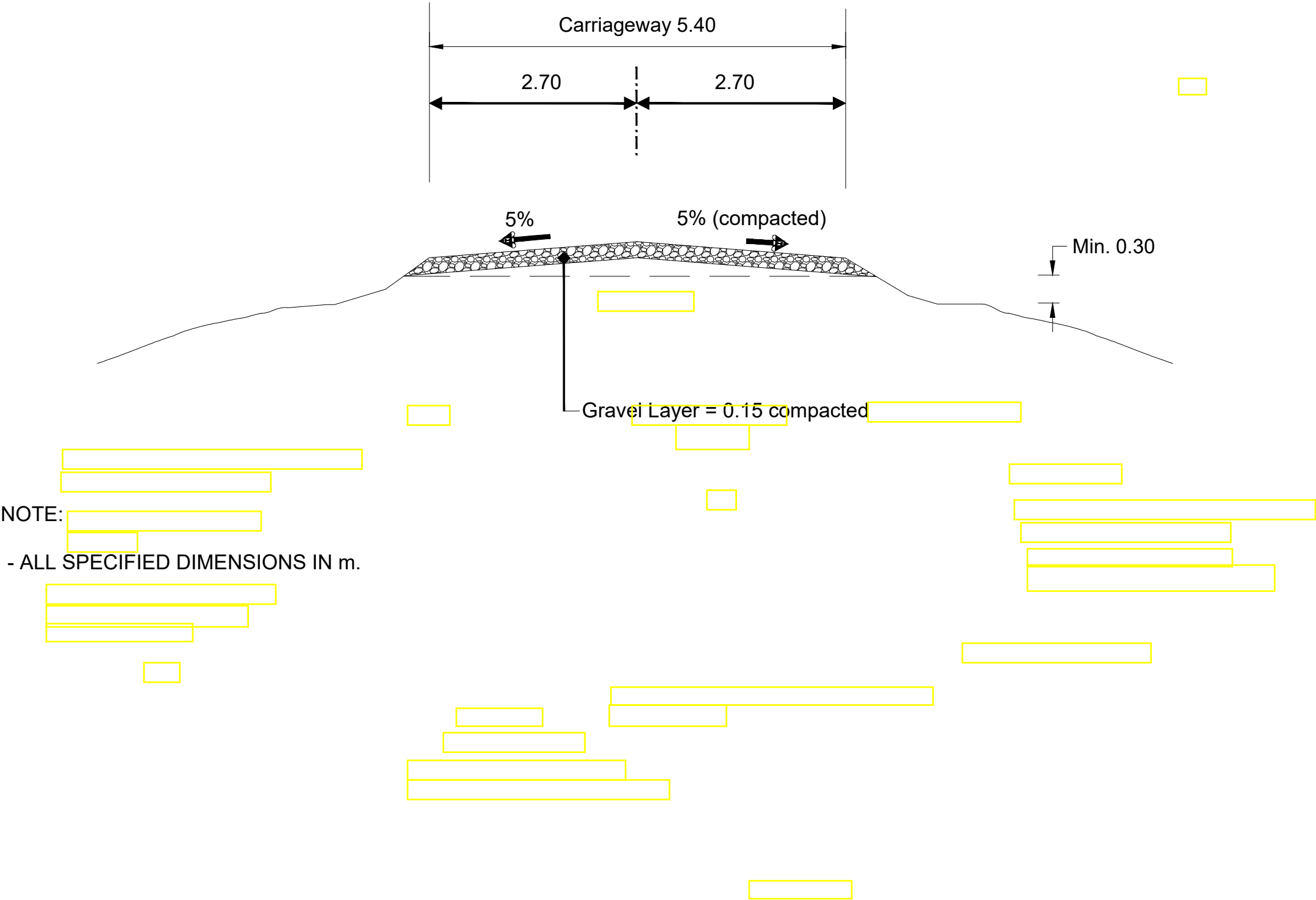
CROSS SECTION F (SIDELONG GROUND ONE SIDE)

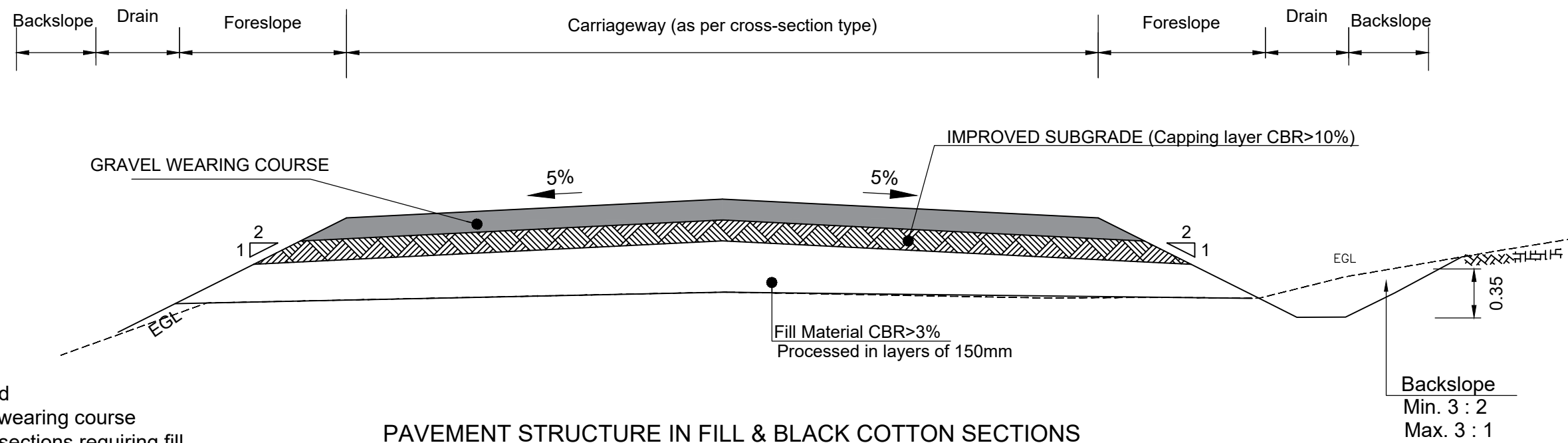


NOTE:

- ALL SPECIFIED DIMENSIONS IN m.

CROSS SECTION G (SIDE LONG GROUND BOTH SIDES)



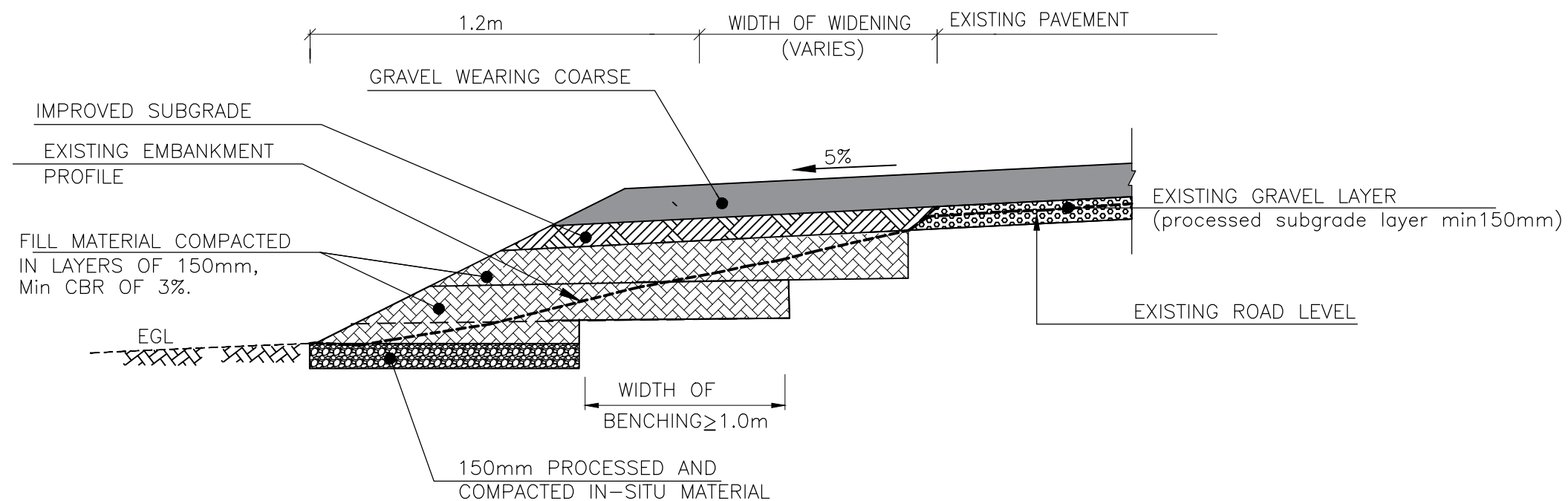


NOTE:

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



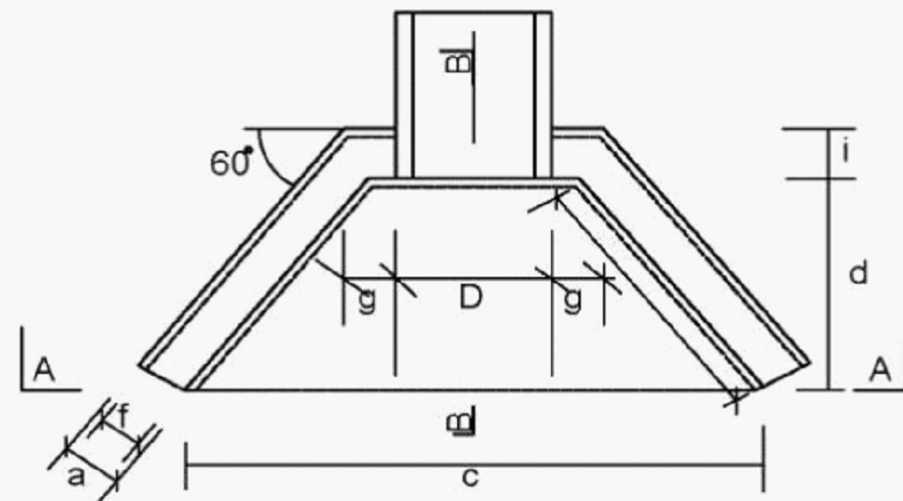
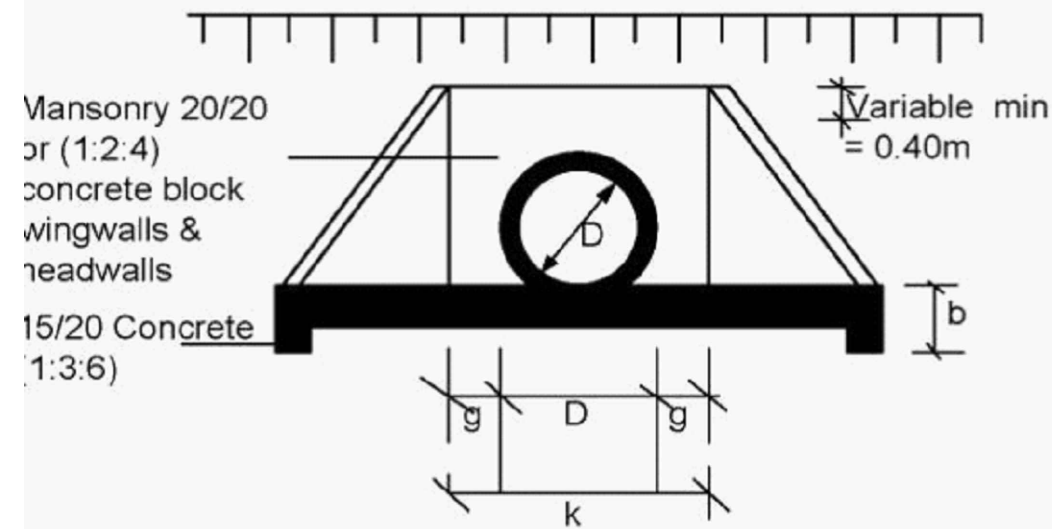
PAVEMENT WIDENING DETAILS :

SCALE 1:20

PIPE CULVERTS

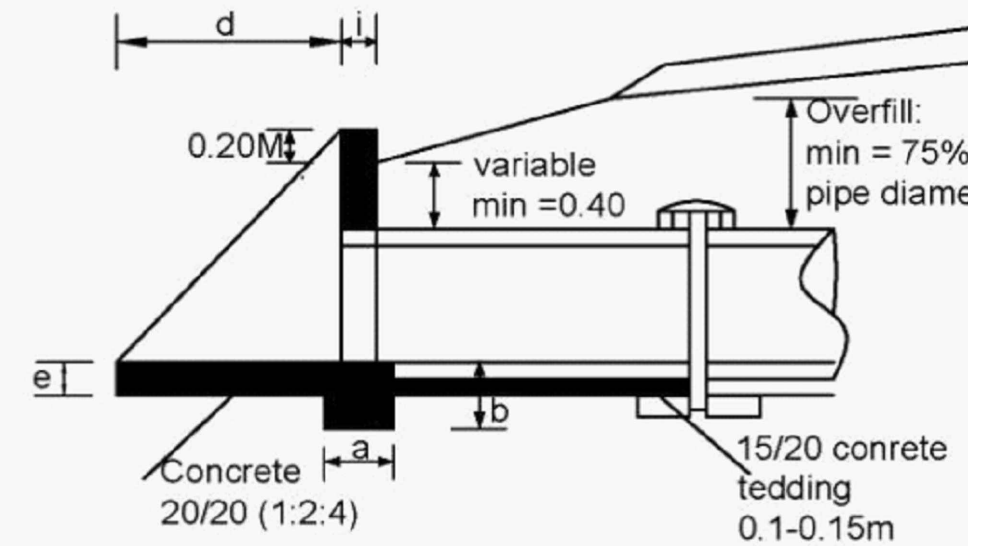
C8- HEADWALL TYPE 1 (HEAD AND WINGWALLS)

SECTION A-A



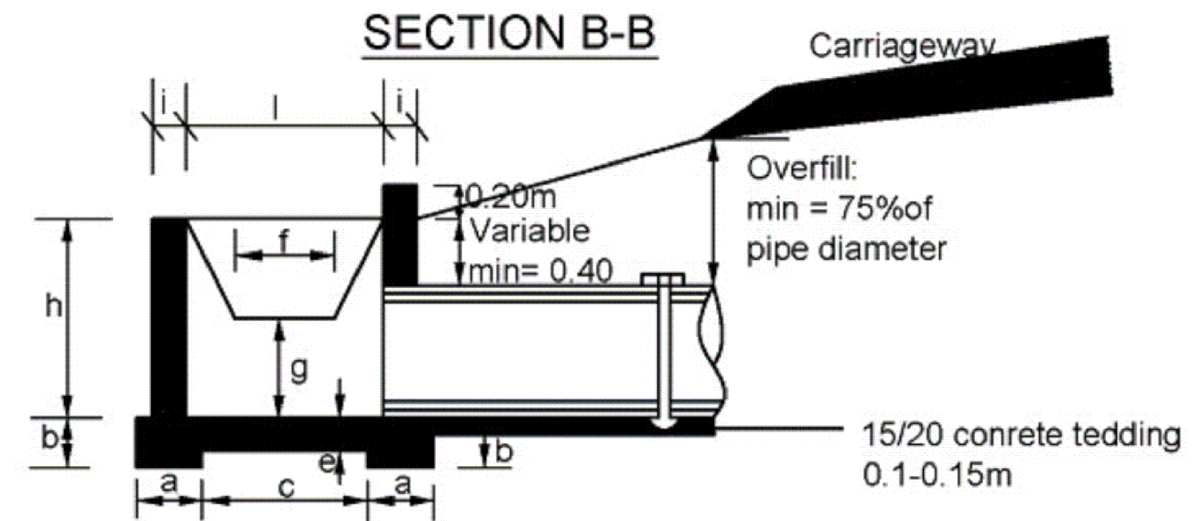
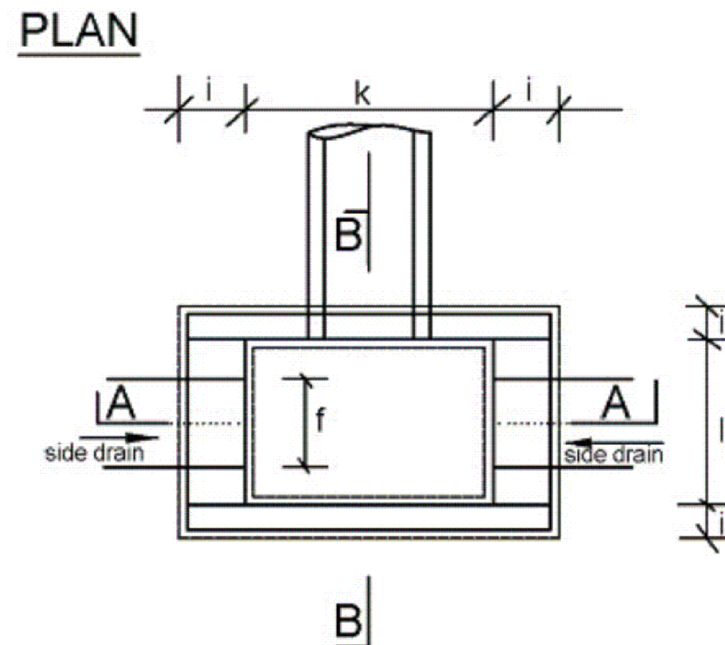
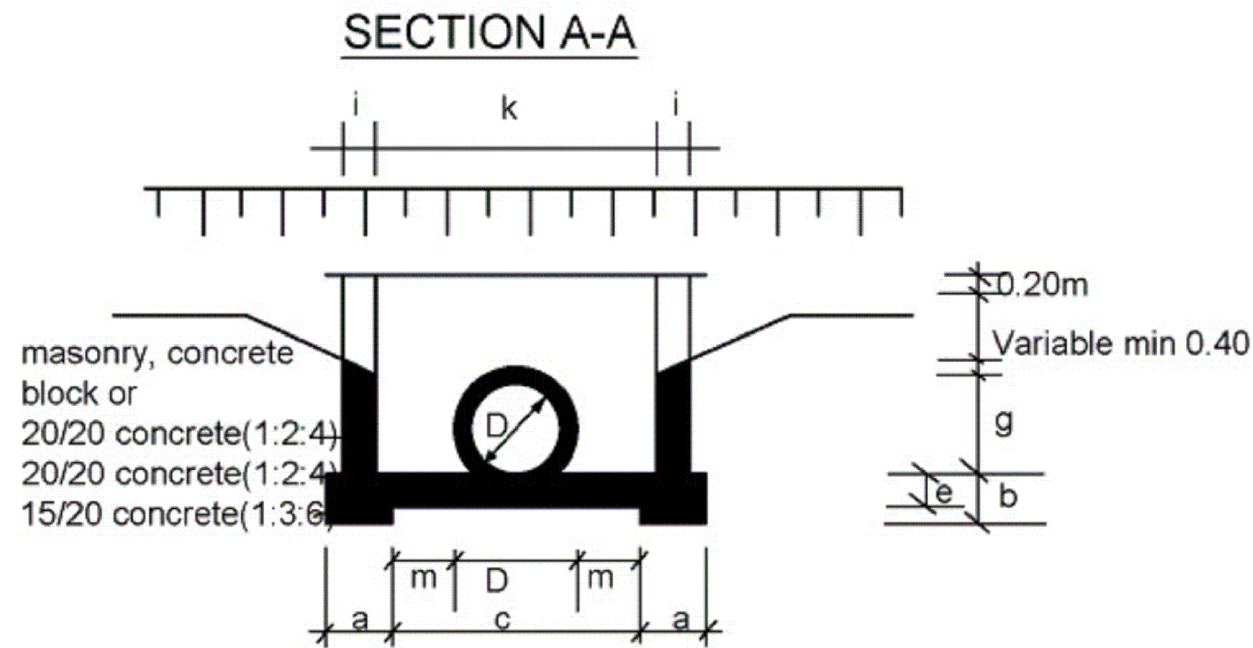
CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

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	0.60
b	FOUNDATION	m	0.30	0.30	0.40	0.30	0.40
c	FOUNDATION	m	2.20	2.35	2.89	2.20	2.89
d	APRON	m	1.00	1.00	1.20	1.00	1.20
e	APRON	m	0.20	0.20	0.20	0.20	0.20
f	WALL	m	0.20	0.20	0.20	0.40	0.40
g	WALL	m	0.30	0.30	0.30	0.30	0.30
h	WALL	m	1.15	1.15	1.39	1.15	1.39
i	WALL	m	0.20	0.20	0.20	0.40	0.40
k	APRON	m	1.05	1.20	1.50	1.05	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 (concrete)	m3	0.33	0.36	0.53	0.33	0.36	0.53

C9-HEADWALL TYPE 2(DROP INLET)

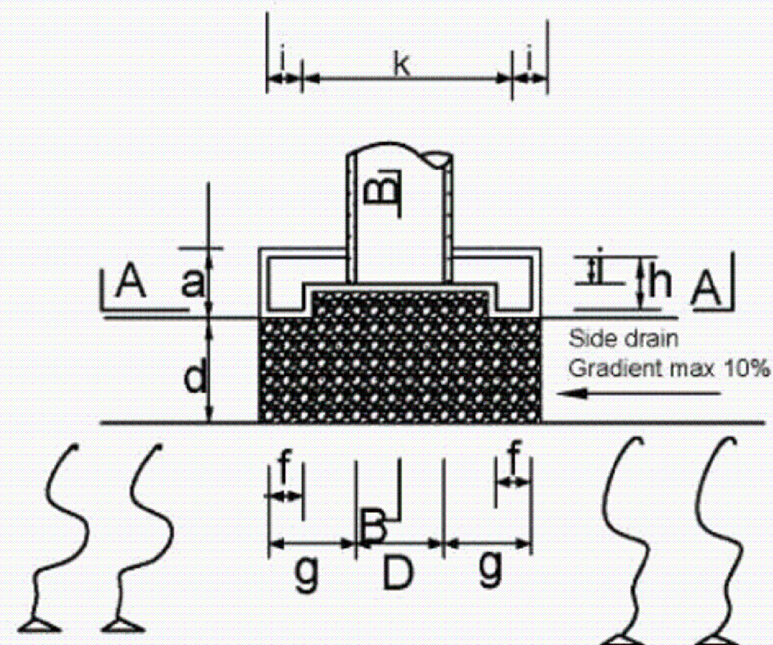
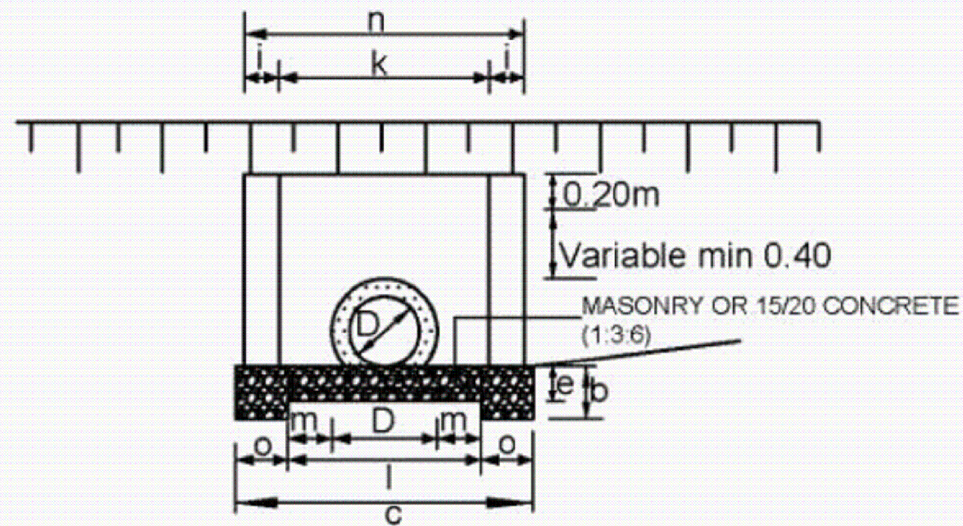


DIMENSIONS AND MATERIAL REQUIREMENTS

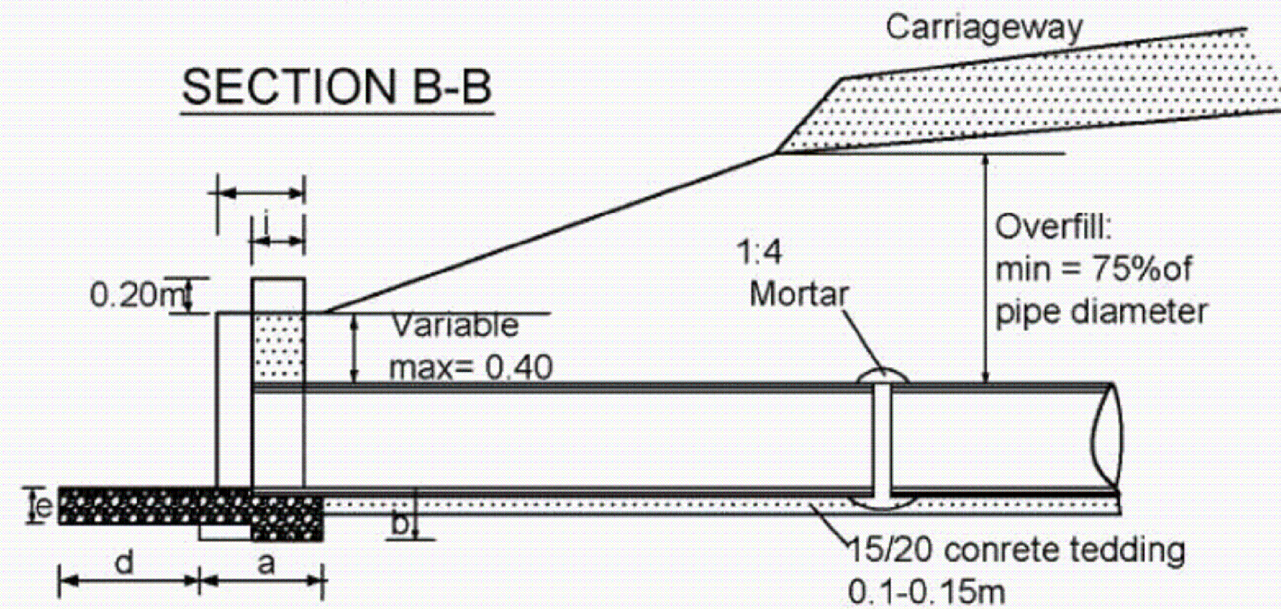
PIPE DIAMETER IN (M)			TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
DIMENSION	UNIT							
a	FOUNDATION	m	0.30	0.30	0.30	0.40	0.40	0.40
b	FOUNDATION	m	0.30	0.30	0.30	0.30	0.30	0.30
c	FOUNDATION	m	1.10	1.10	1.40	1.20	1.20	1.50
d	APRON	m	0.90	0.90	0.90	1.00	1.00	1.00
e	APRON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

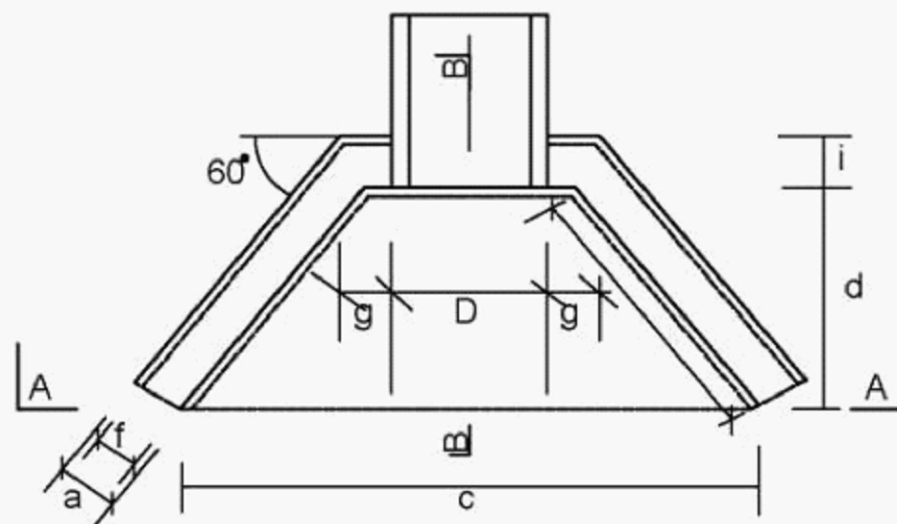
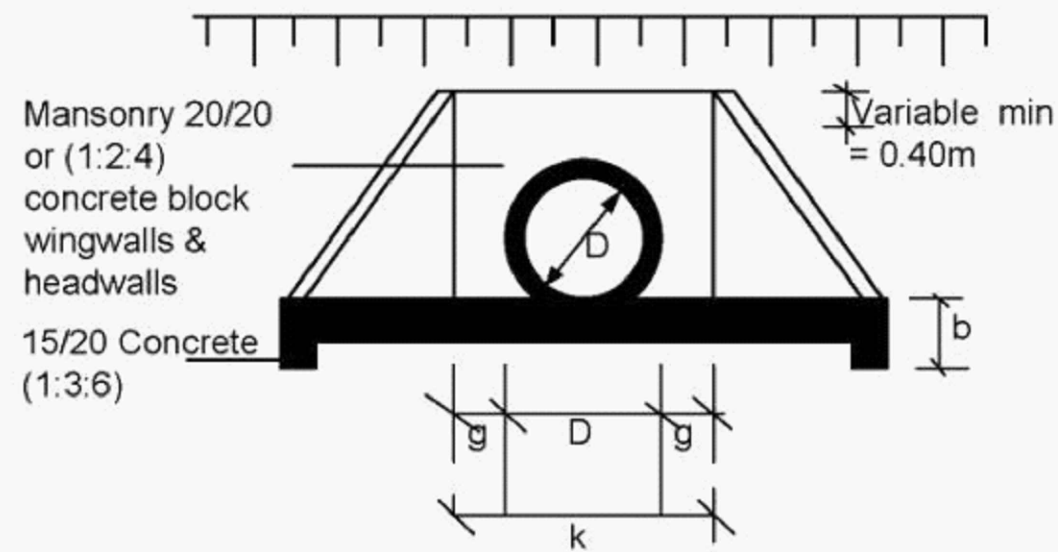


DIMENSIONS AND MATERIAL REQUIREMENTS

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

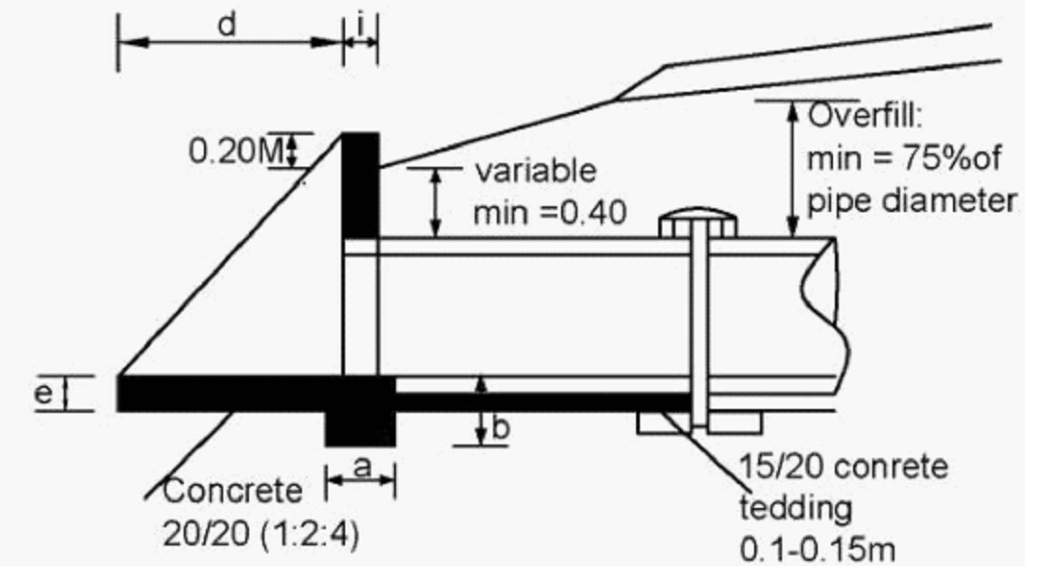
C12- HEADWALL TYPE 4 (FOR ACCESS CULVERTS)

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	

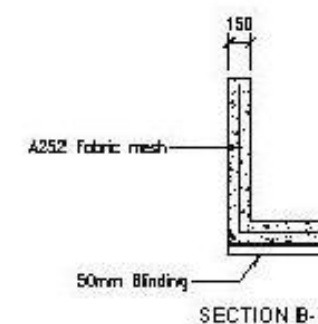
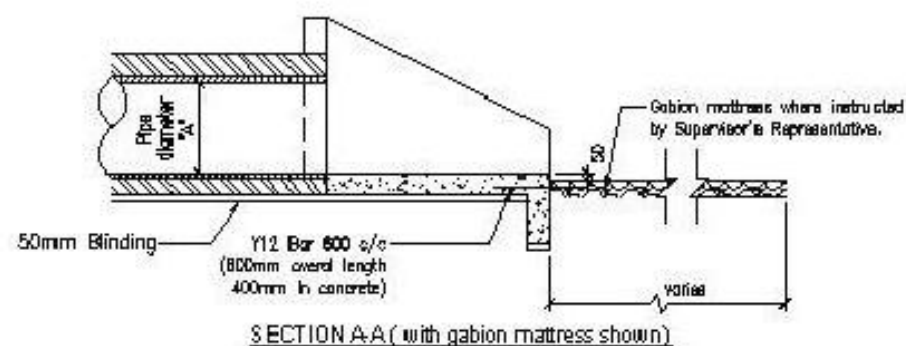
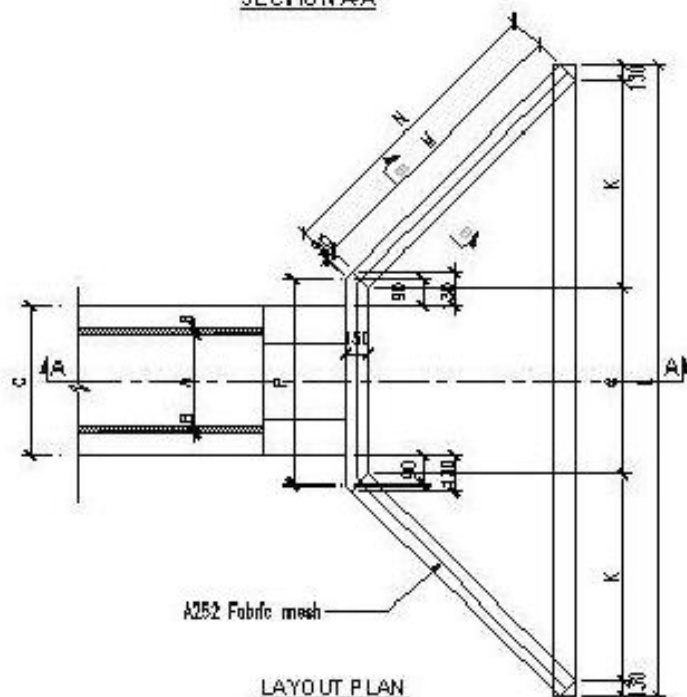
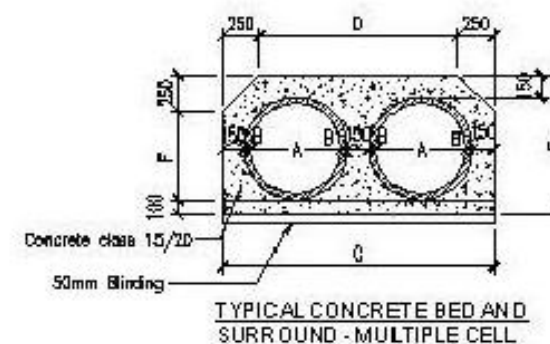
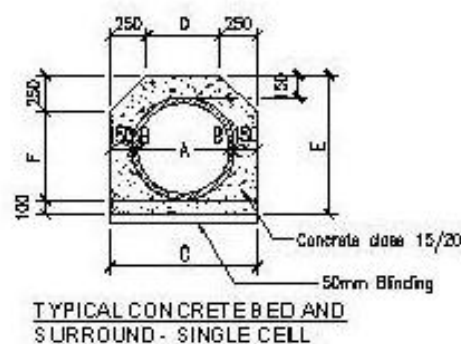
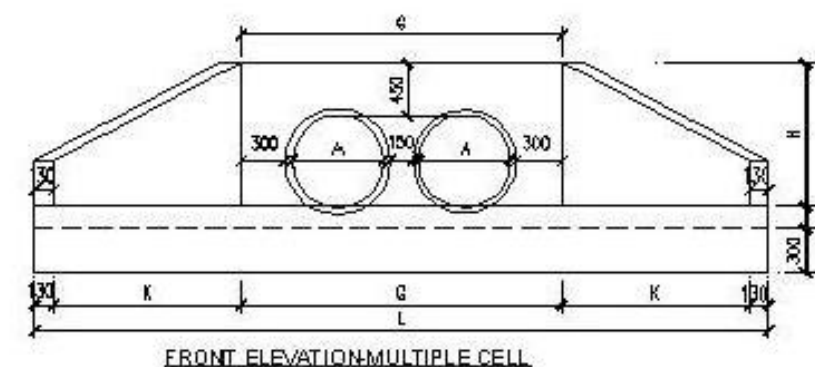
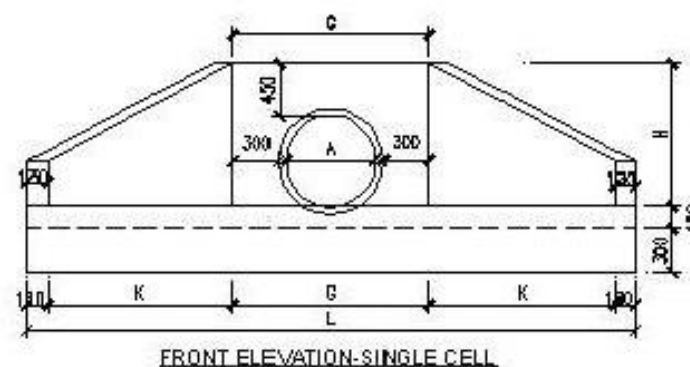
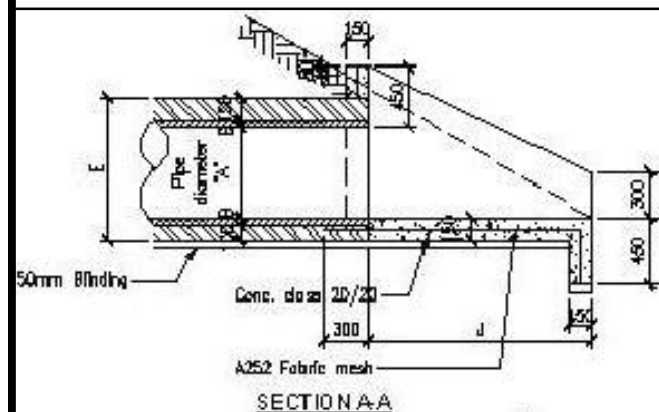


TABLE A - 1-CELL CONCRETE PIPE CULVERTS

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

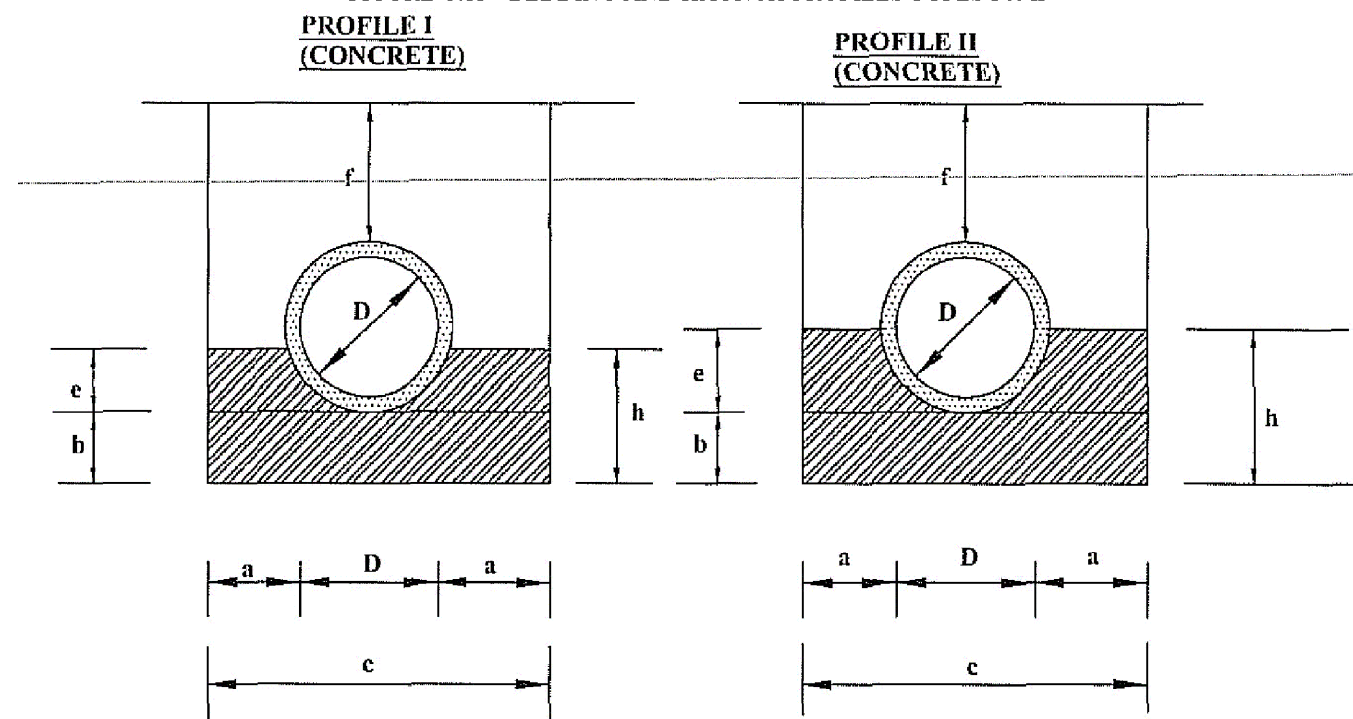
TABLE C - 3-CELL CONCRETE PIPE CULVERTS

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

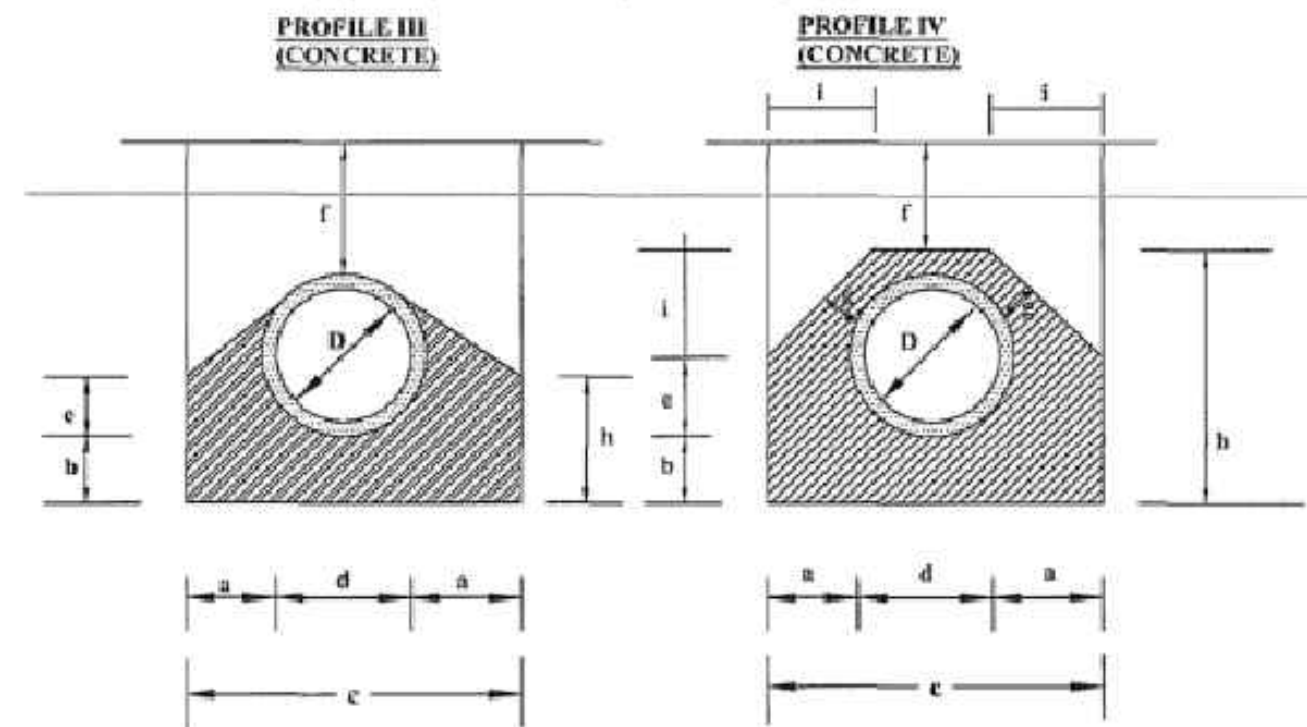
FIGURE C.13 - BEDDING AND HAUNCH PROFILES TYPES I & II



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



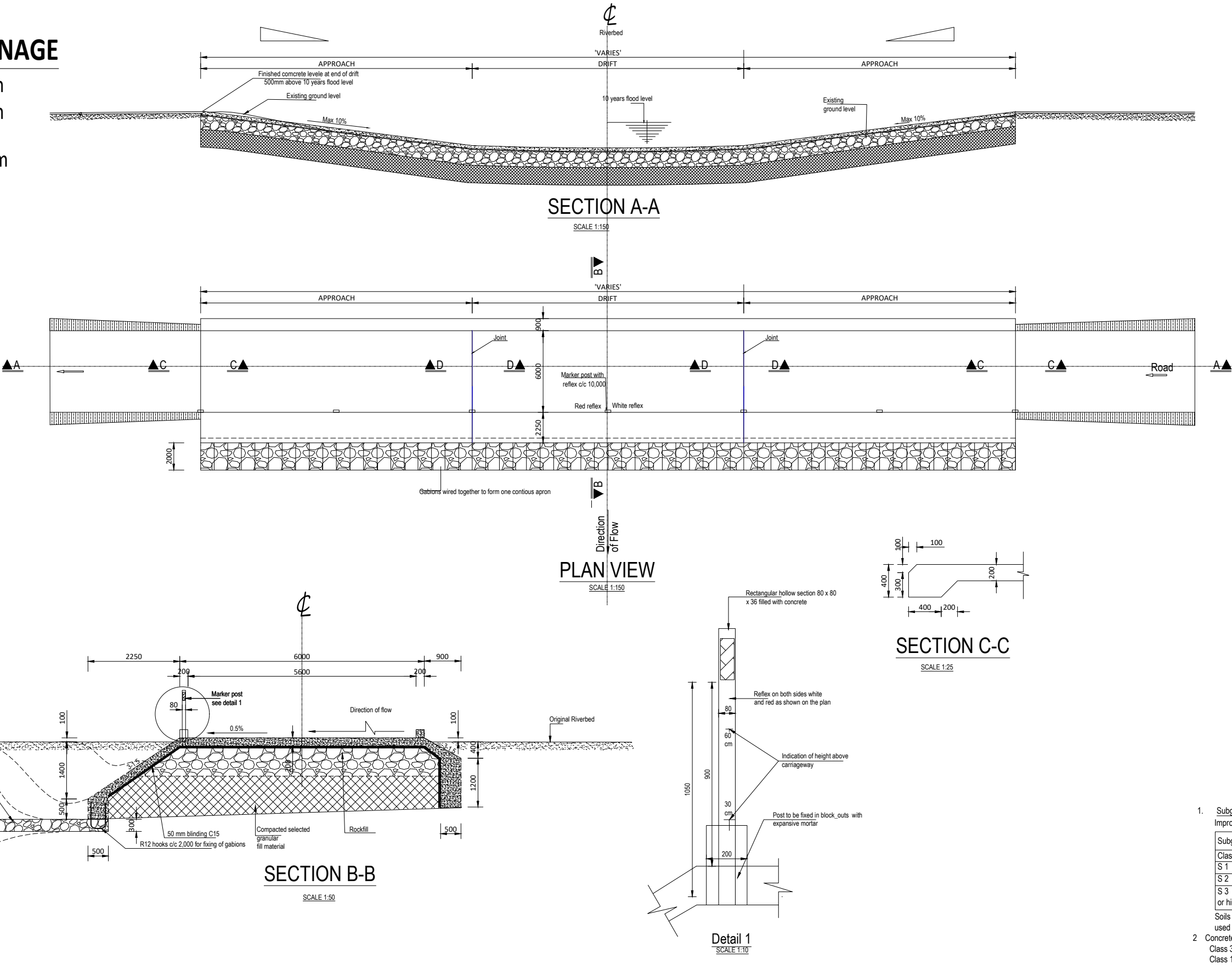
Diameter (D)	450 (mm)	600 (mm)	900 (mm)
a	0.15	0.20	0.20
b	0.10	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.42	0.54	0.81
f(min)	0.23	0.3	0.45
g	-	-	-
h	0.52	0.69	0.96
i	-	-	-
Concrete Class 15/20	Volume in (m3/m)		
	0.26	0.47	0.71
Application	-Fair subgrade condition -Overfill > 75% of the pipe diameter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

MAJOR DRAINAGE STRUCTURES

APPLIES TO CHAINAGE

KM 32+000 - 60m
KM 35+920 - 40m
KM 36+150 - 40m
KM 36+150 - 200m

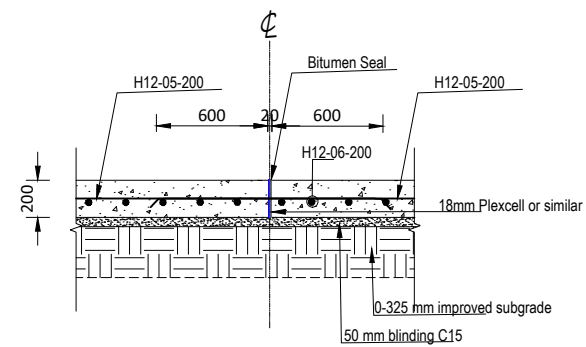
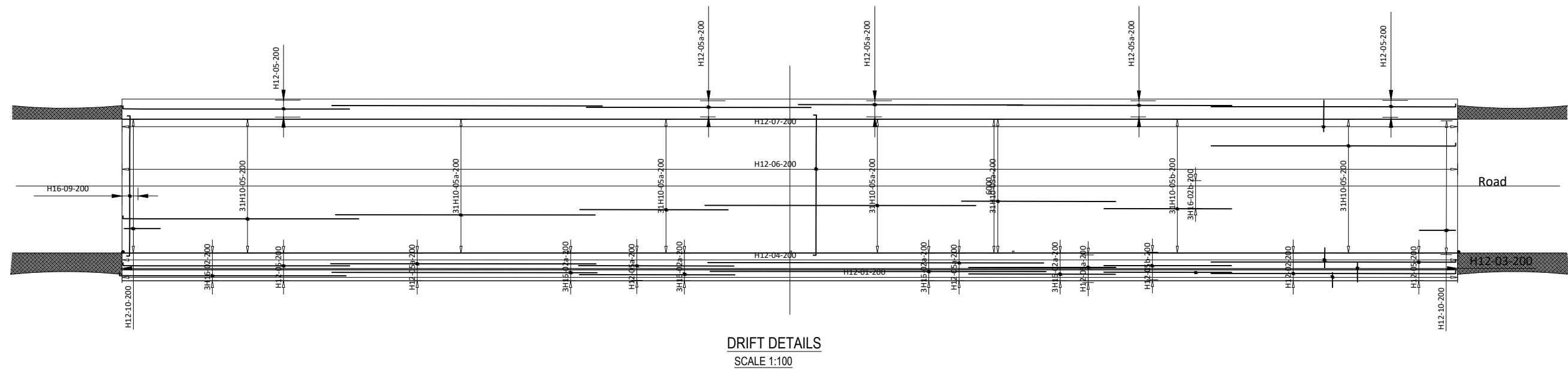
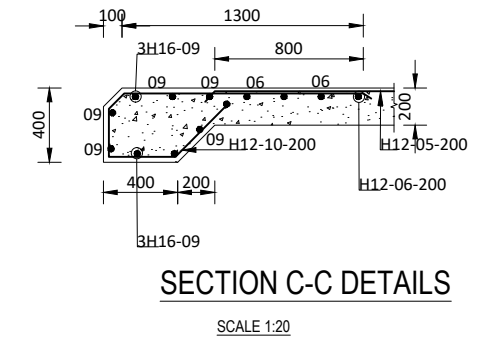
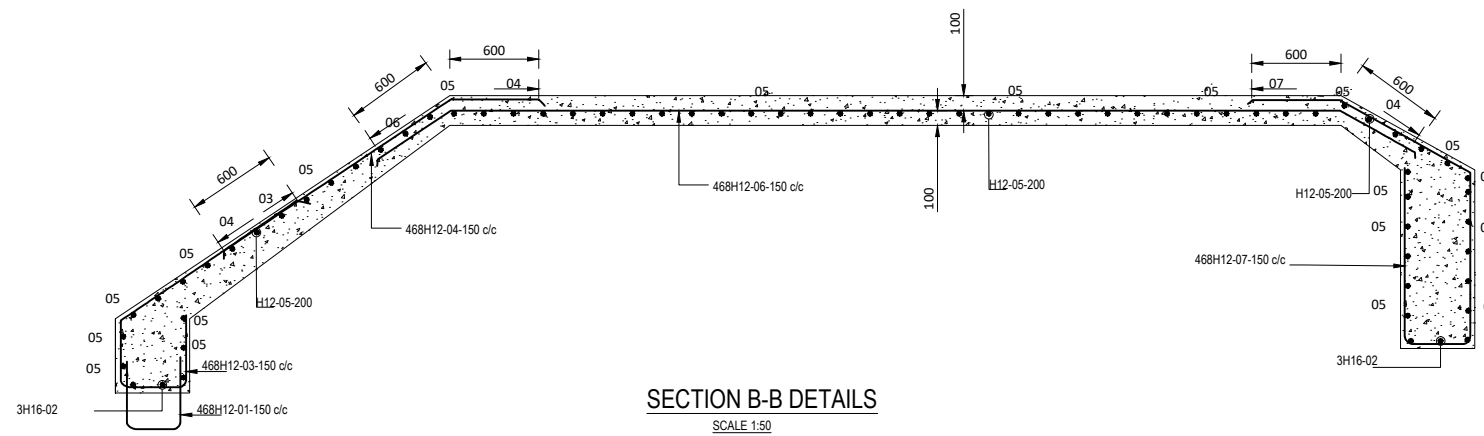


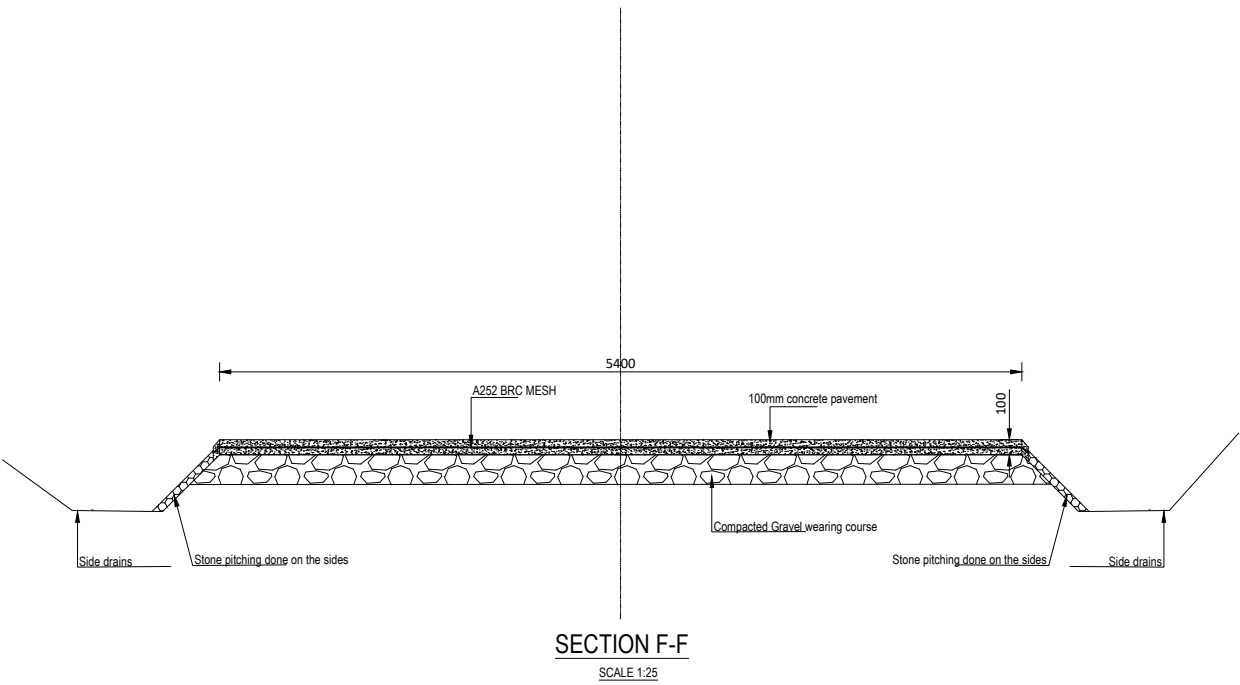
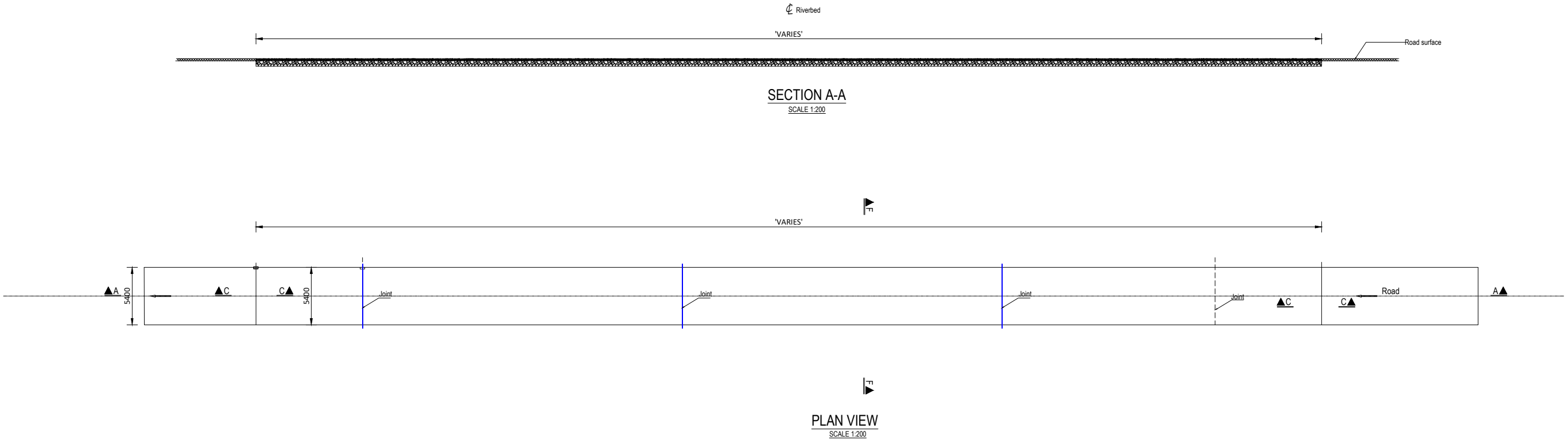
NOTES

- Subgrade
Improved subgrade under drift us required when;

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

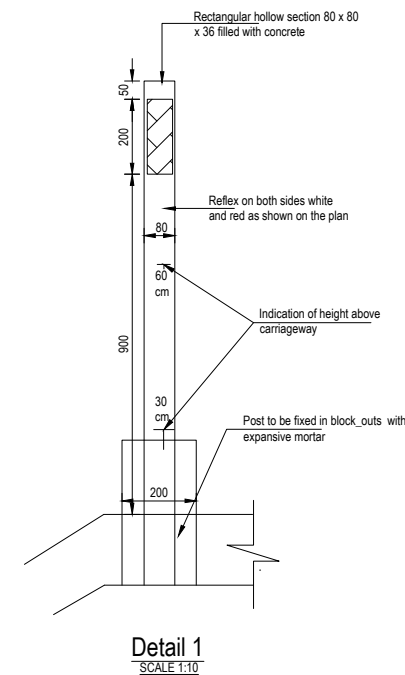
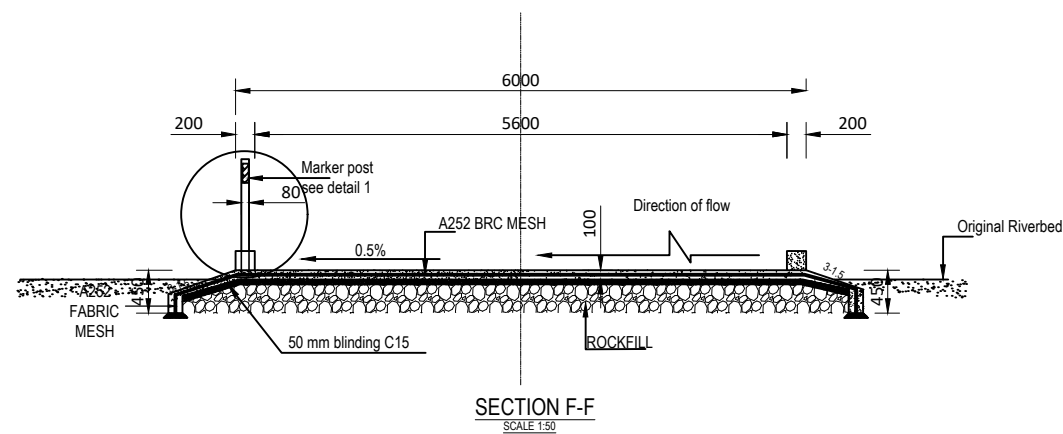
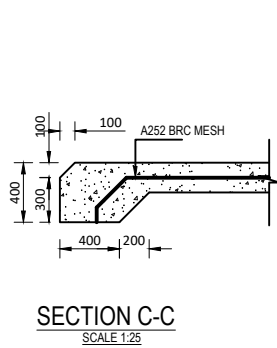
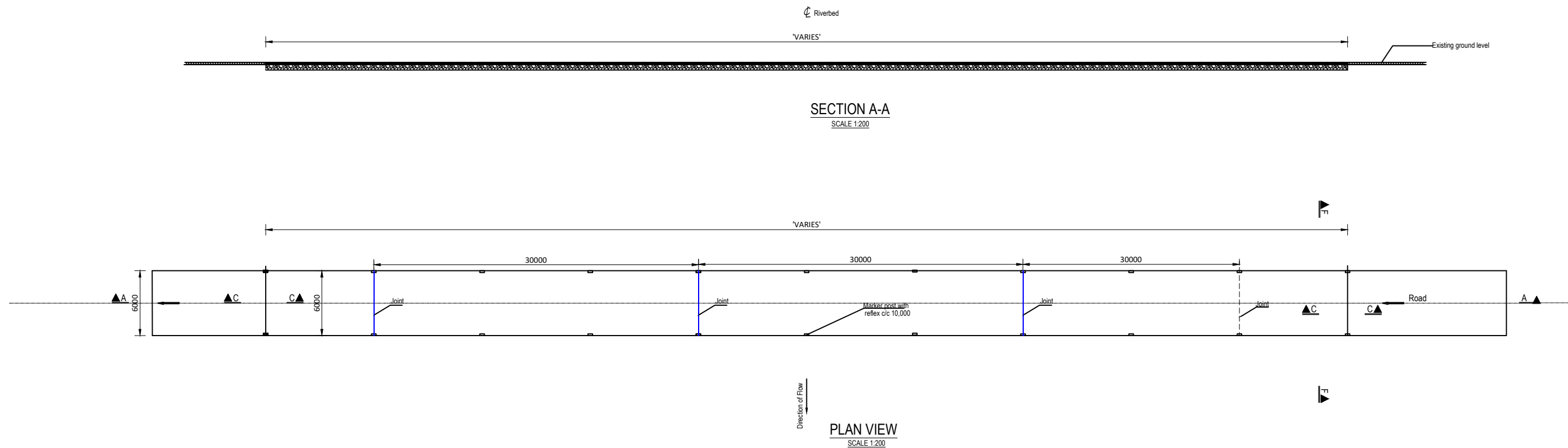
Soils of class S4 (CBR range 10-19) should be used for Improvement.
- Concrete strength to be ;
Class 30/20 for drift
Class 15/35 for blinding





NOTES

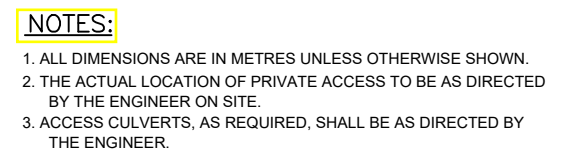
1. Subgrade
Improved sub grade under concrete pavement is required when;
- | Subgrade soil | | Improved Subgrade |
|---------------|-----------|-------------------|
| Class | CBR range | |
| S 1 | 2 - 5 | 325mm |
| S 2 | 5 - 10 | 200mm |
| S 3 or higher | 7 - 13 | 0 |
- Soils of class S4 (CBR range 10-19) should be used for Improvement.
2. Concrete strength to be;
Class 30/20 for the concrete pavement
Class 15/35 for blinding

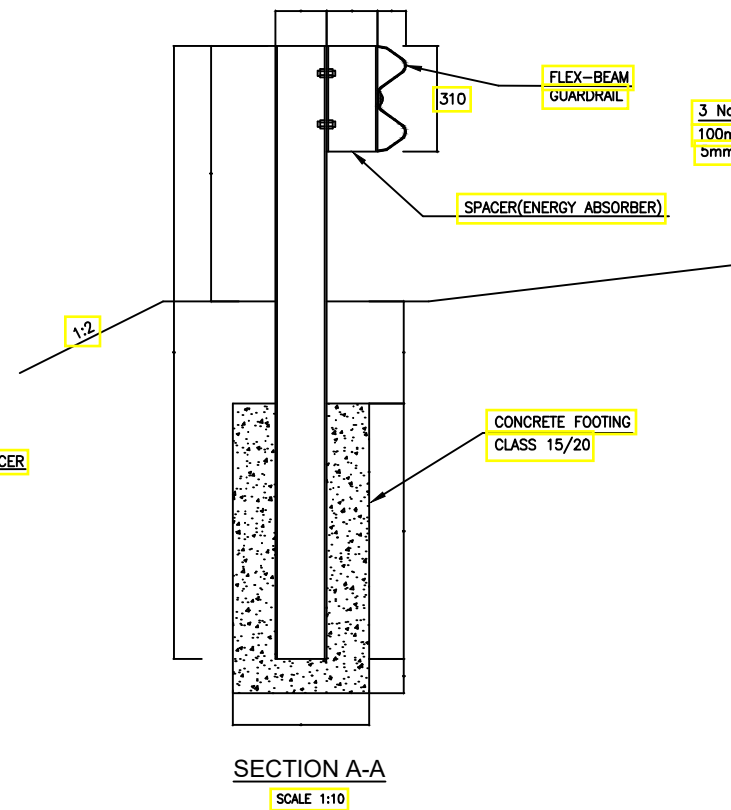
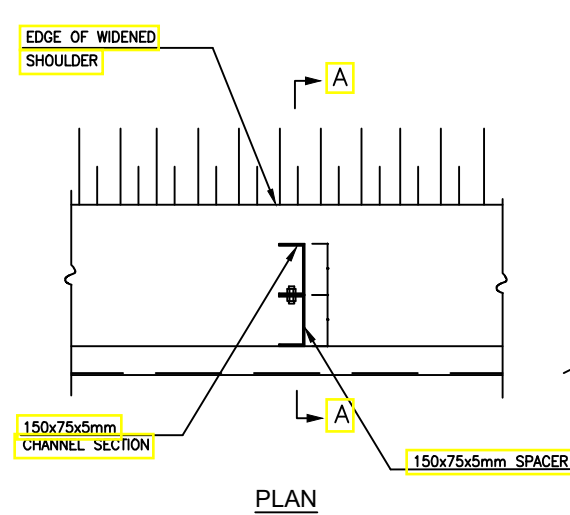
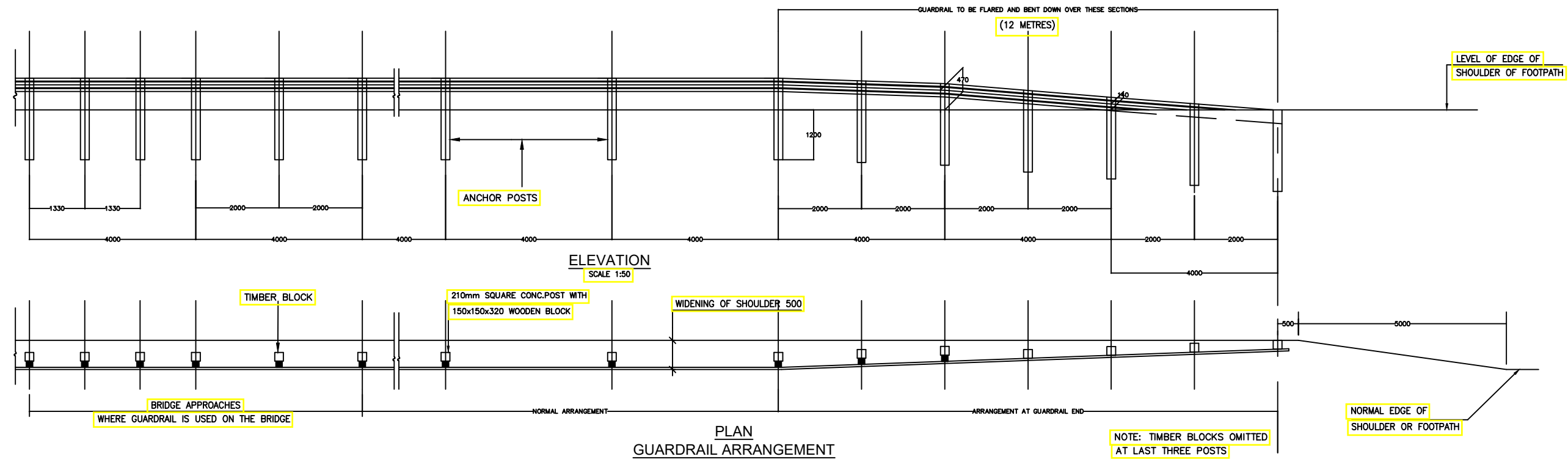


NOTES

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

STANDARD DRAWINGS





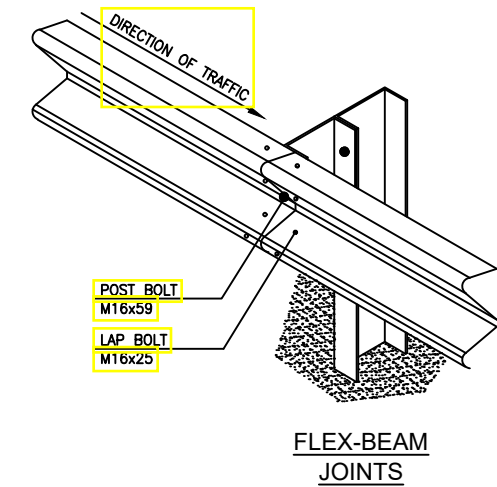
3 No. BOLTS
100mm CENTRES
5mm DIAMETER

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

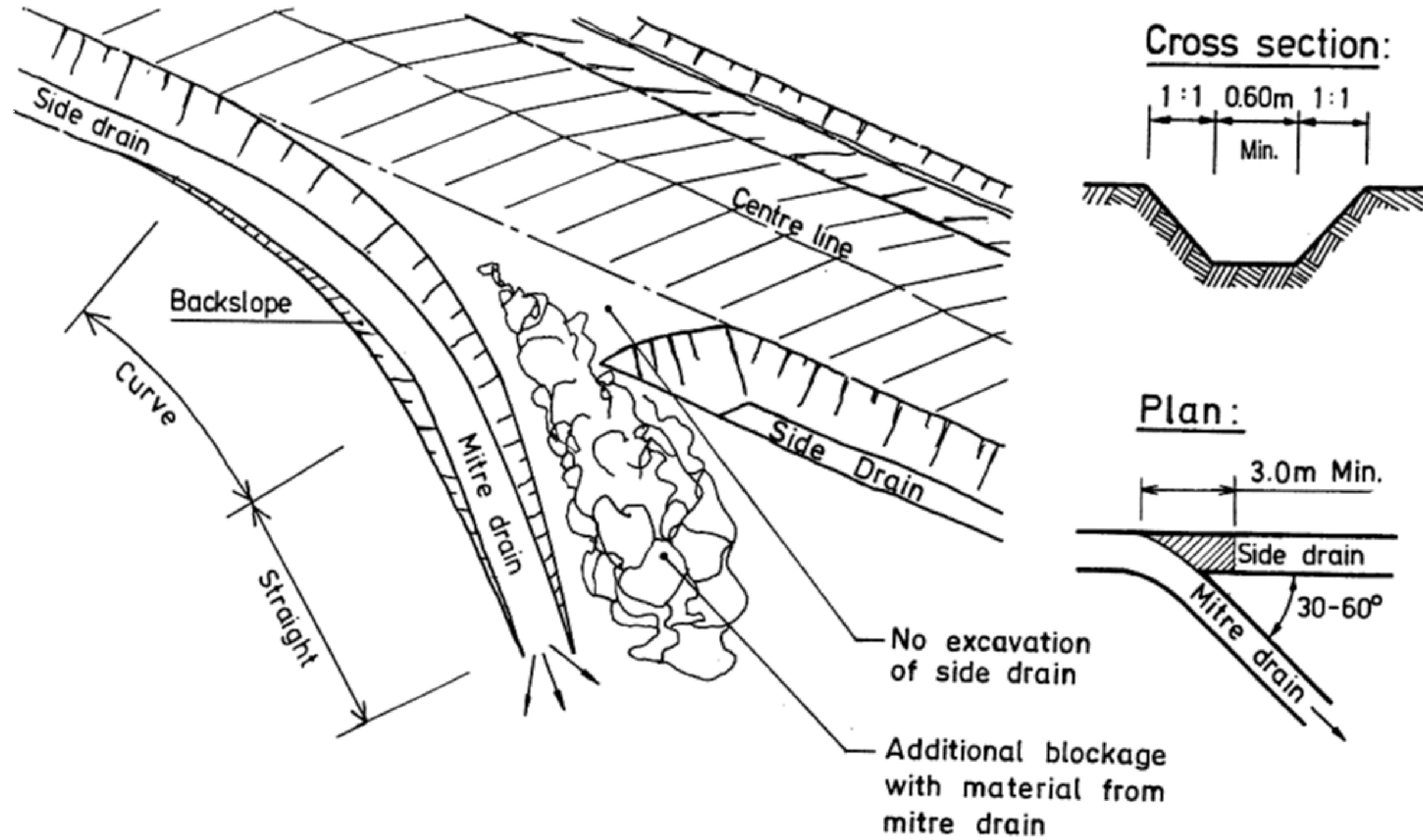


NOTES:

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.

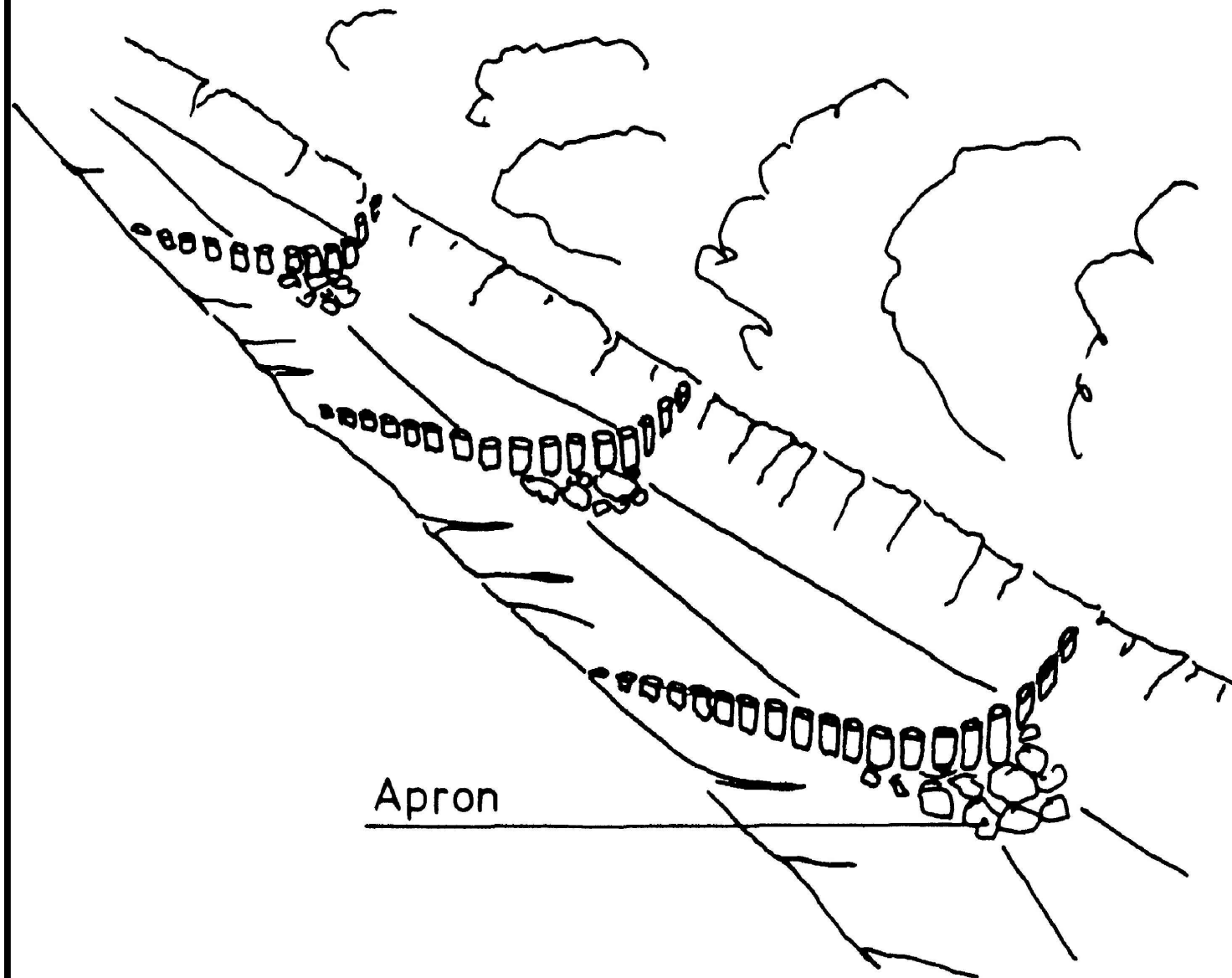
GENERAL DRAINAGE

MITRE DRAIN

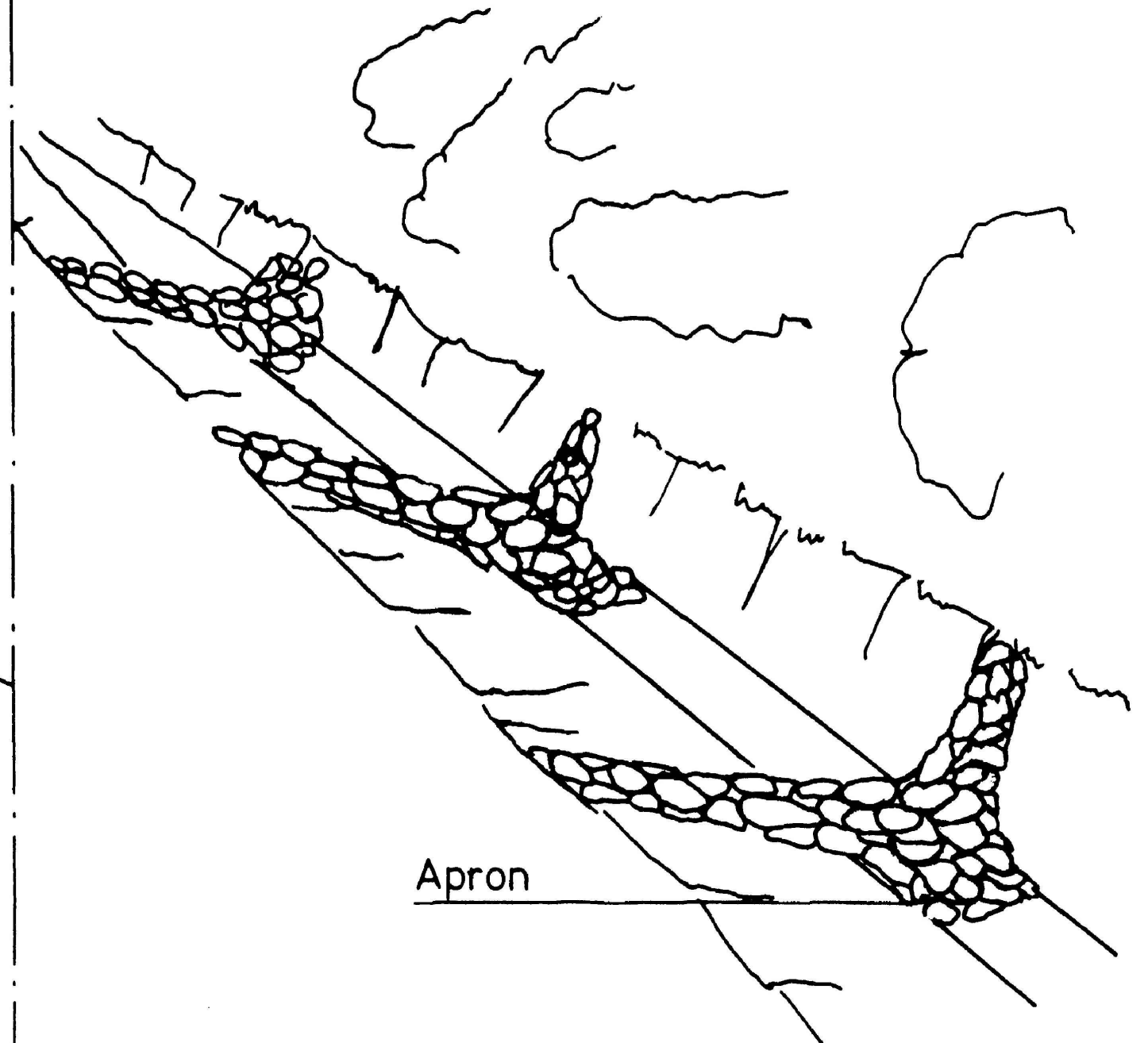


SCOUR CHECKS

Scour checks made of wooden stakes:

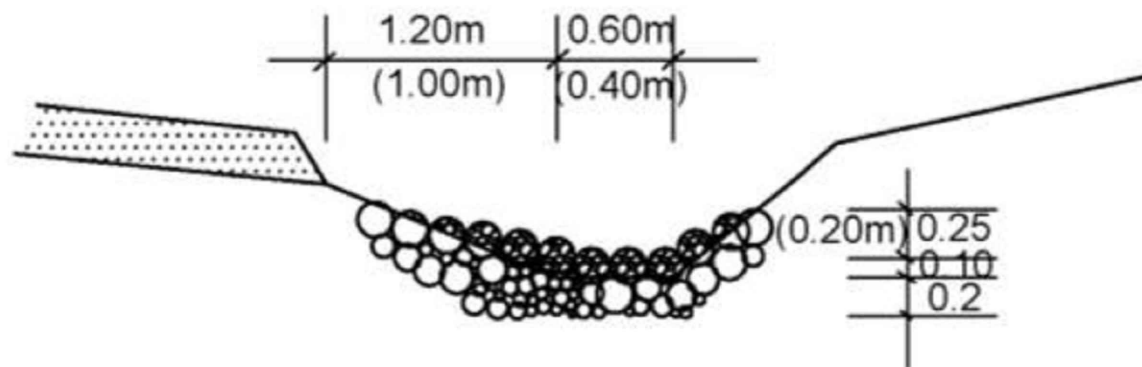


Scour checks made of stones:

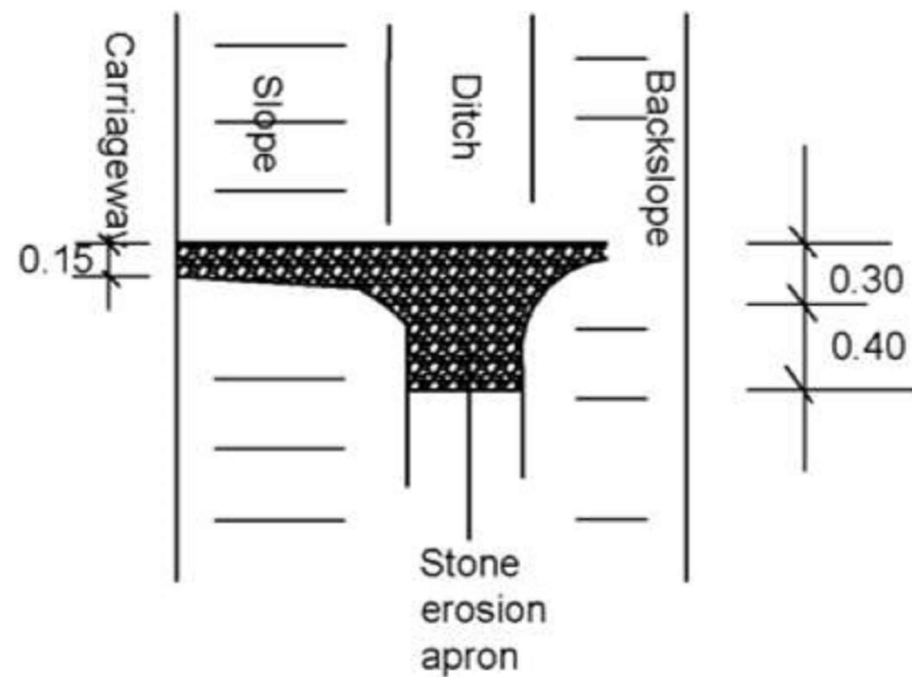


Scour checks made of stones

Cross section



Ground plan

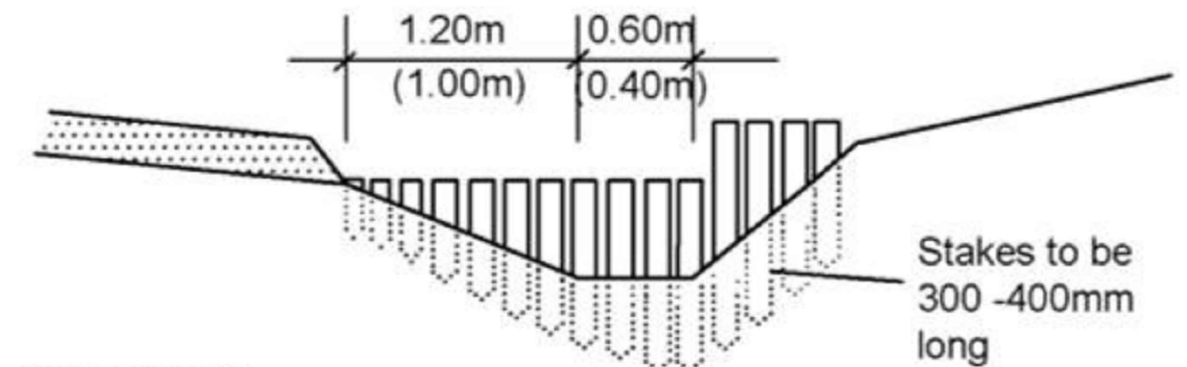


NOTE

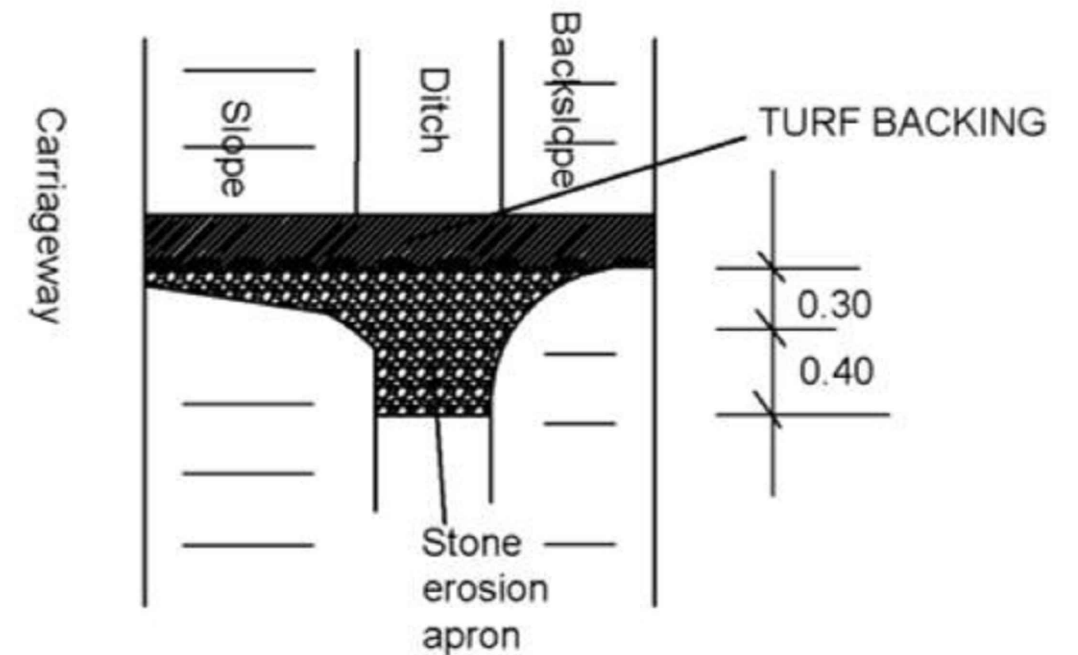
1Dimensions in metres

Scour checks made of wooden stakes

Cross section

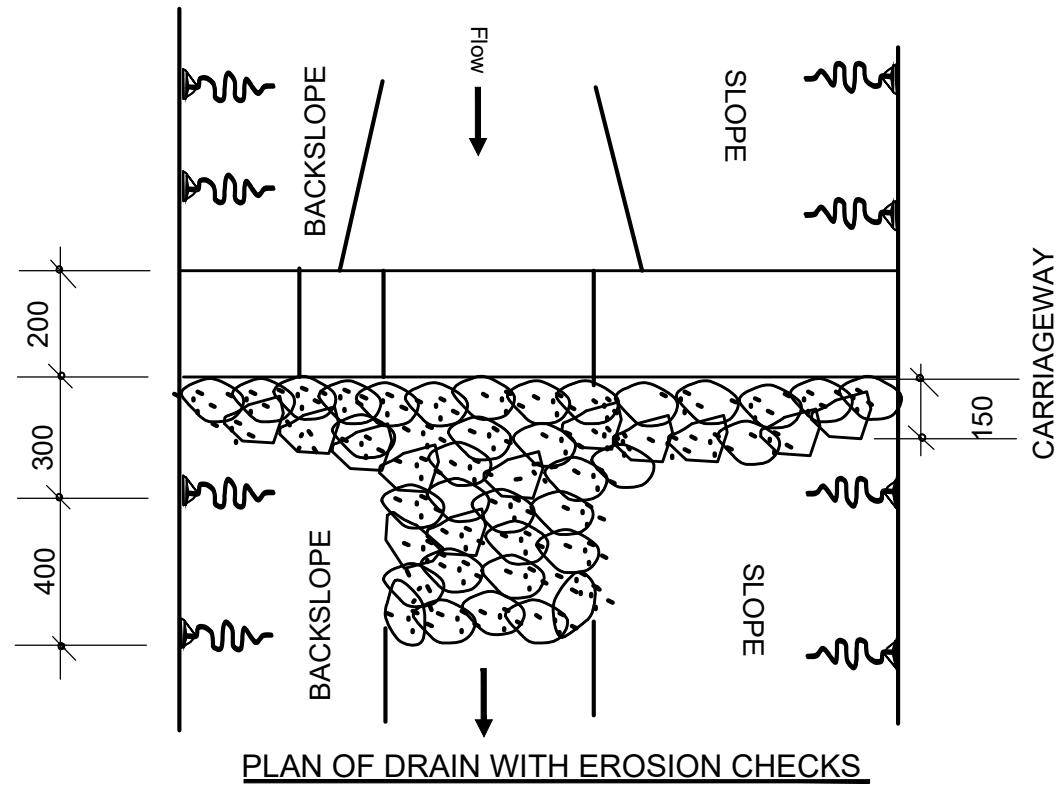
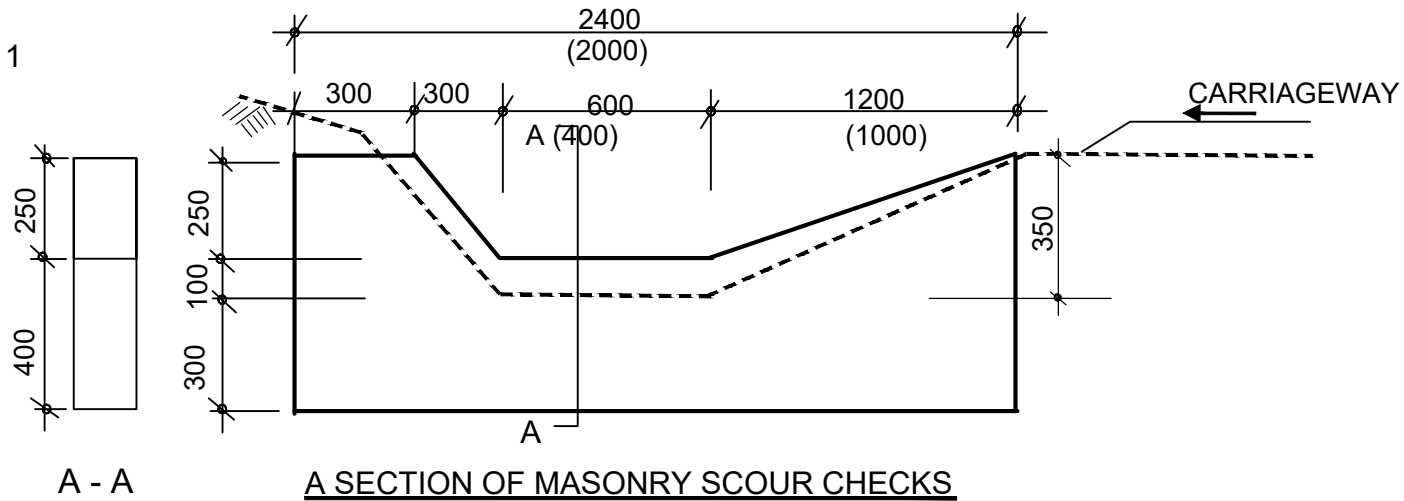


Ground plan



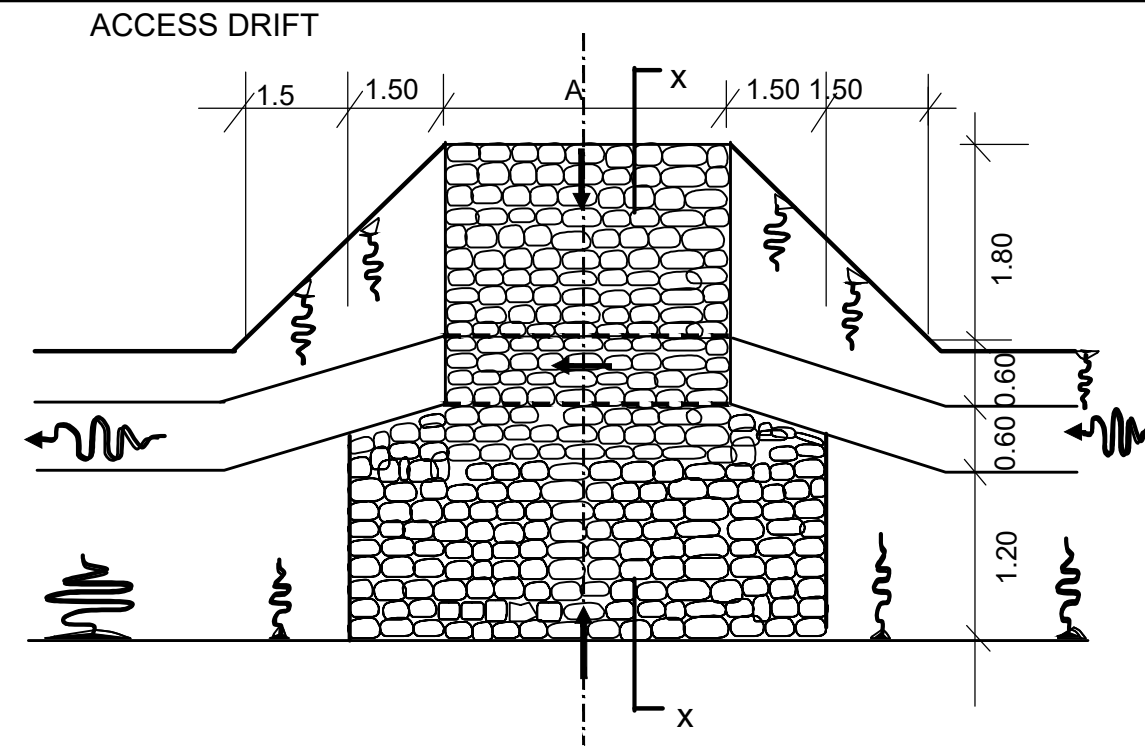
STONE WEIGHT: MIN 10KG
STAKE DIAMETER: MIN. 0.10m

- MASONRY SCOUR CHECKS



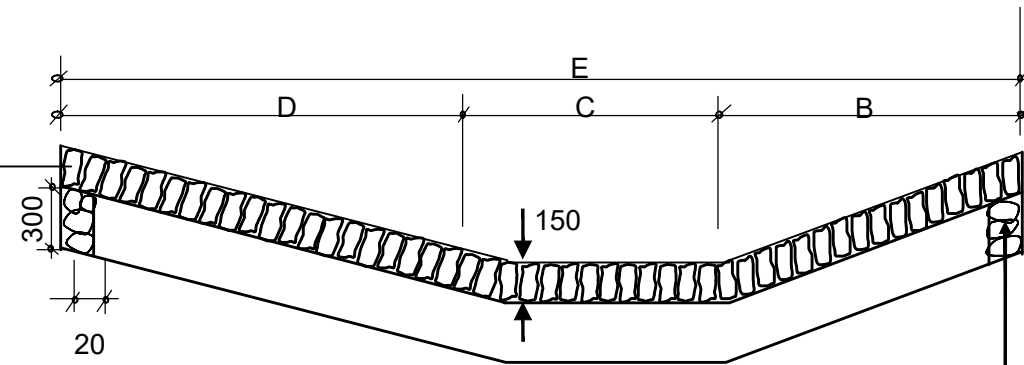
QUANTITIES TABLE

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



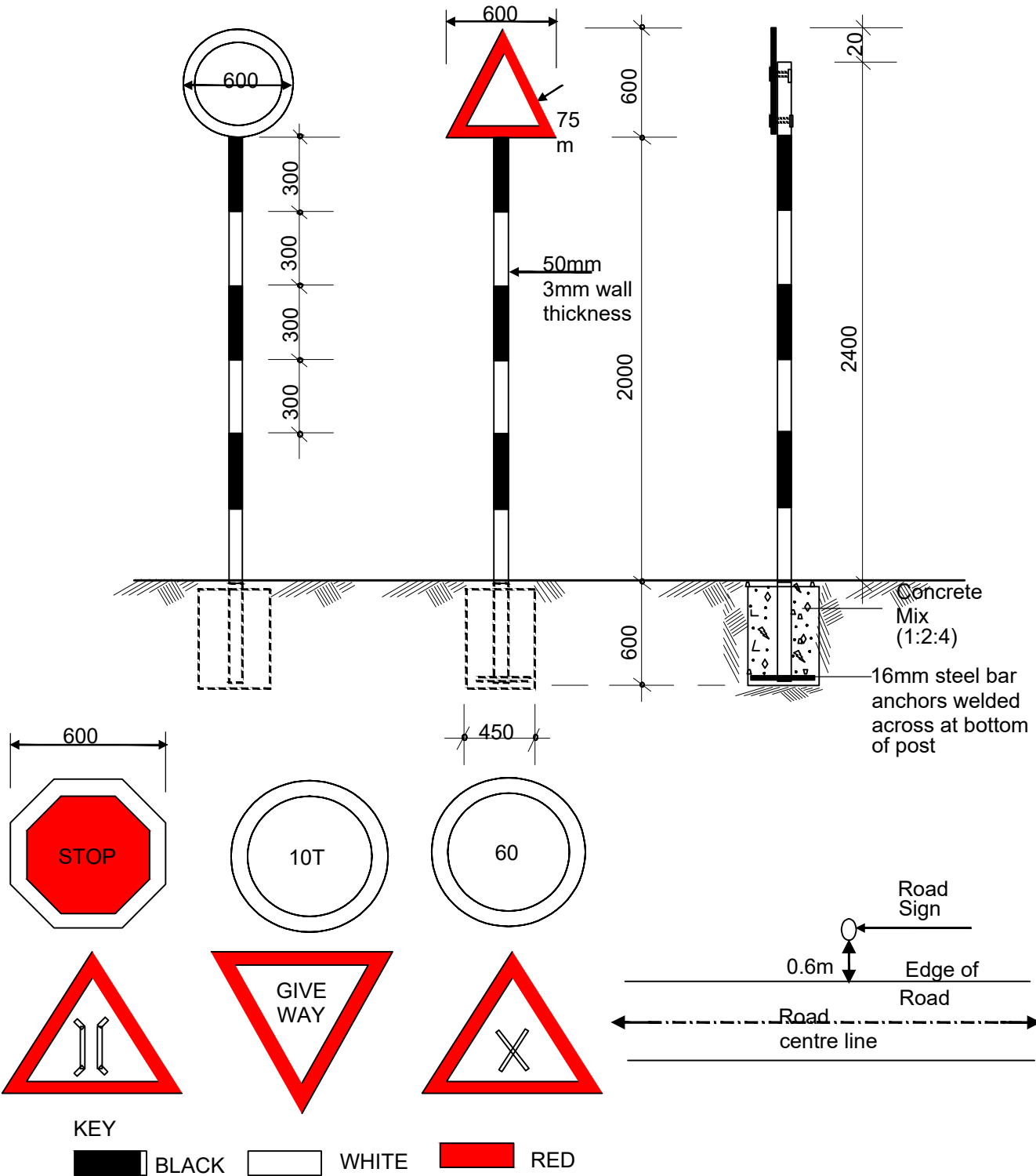
X-SECTION X-X

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

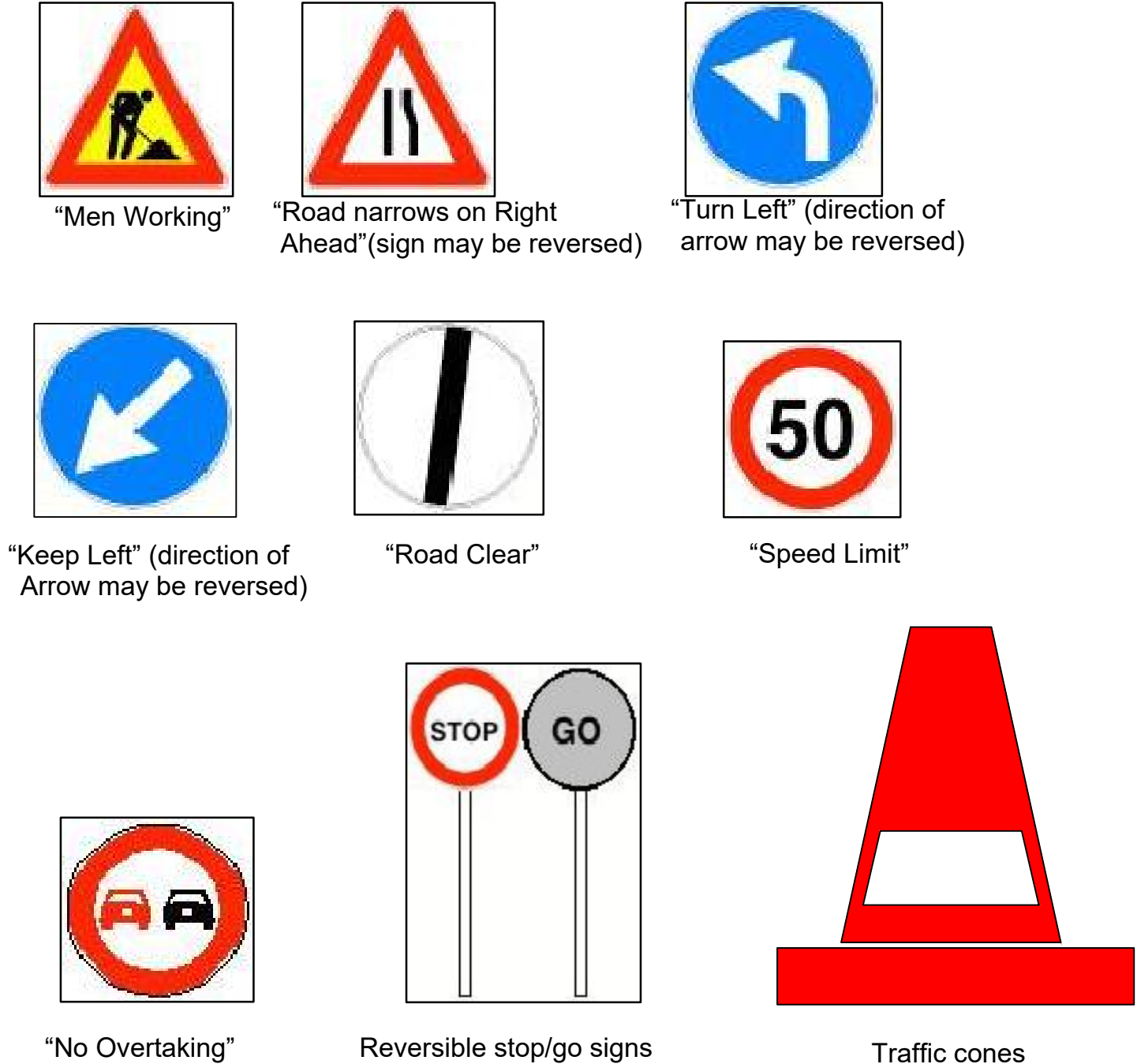
QUANTITIES TABLE								
Cross section	DIMENSIONS					Excavation (m3)	Stone masonry (m3)	150mm Grouted stone pitching (m3)
	A	B	C	D	E			
A	4000	1800	600	1800	4200	7.50	1.30	21.75
	6000	1800	600	1800	4200	10.00	1.60	30.15
B	4000	1400	400	1800	3600	7.00	1.20	18.30
	6000	1400	400	1800	3600	9.00	1.50	25.50

TRAFFIC SIGNS

TRAFFIC SIGNS



TEMPORARY 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.

PUBLICITY SIGNBOARD



- 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.