
CULVERTS AND BRIDGES

DEFINITION OF TECHNICAL TERMS ABOUT CULVERT

CULVERT

Culvert is a cross drainage structure having a total length of 6m or less between the interface of dirt wall or extreme vent-way boundaries.

MINOR BRIDGE

It is a Bridge having a total length upto 60m.

CONTINUATION,…

SMALL BRIDGE

Small bridge on rural road could be generally taken as a bridge with a length between 6m and 30m and where the vent of the individual span is not more than 10 m.

HIGH LEVEL BRIDGE

It is a bridge having its Bottom of Deck(BOD) fixed above the Maximum Flood Level(MFL) taking into account the vertical clearance.

SQUARE BRIDGE

It is a bridge having its alignment crossing the river at the right angle to the direction of flow.

CONTINUATION,…

SKEW BRIDGE

It is provided where the alignment crosses the river with an angle of more than 900 or less than 900 with reference to the direction of flow. The skew angle is the angle measured between the direction of flow and perpendicular to the alignment of the road.

FOOT BRIDGE

It is a bridge exclusively used for carrying pedestrians, cycles and animals.

SUBMERSIBLE BRIDGE

It is a bridge which gets submerged during high floods in monsoon for some duration but is available for traffic otherwise.

CONTINUATION,…

CAUSE WAY

It is a paved submersible structure with or without openings (vents) which allows flood to pass through and/or over it.

FORD

It is an unpaved shallow portion in a river or stream bed which can be used as a crossing during dry weather/normal flow.

CHANNEL

It means a natural or artificial water course.

CONTINUATION,…

SILL LEVEL

Generally, the bed level at site is fixed as sill level.

CLEARANCE

It is the shortest distance between the boundaries at a specified position of a bridge structure.

VERTICAL CLEARANCE

It is usually the height from the design highest flood level with afflux of the channel to the lowest point of the bridge super structure at the position along the bridge where clearance is being denoted.

CONTINUATION,…

FREE BOARD

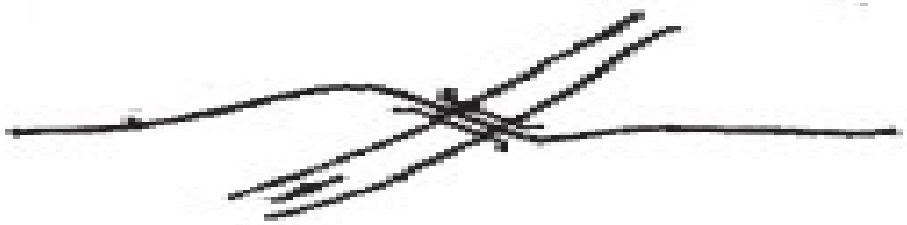
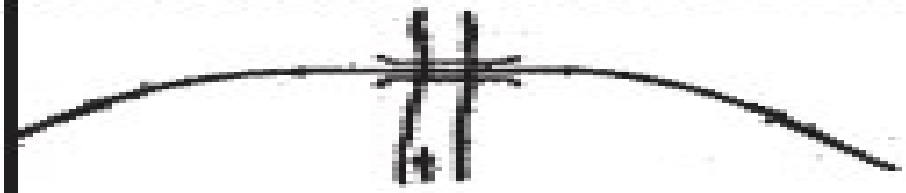
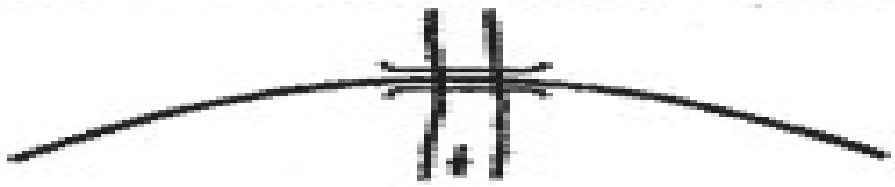
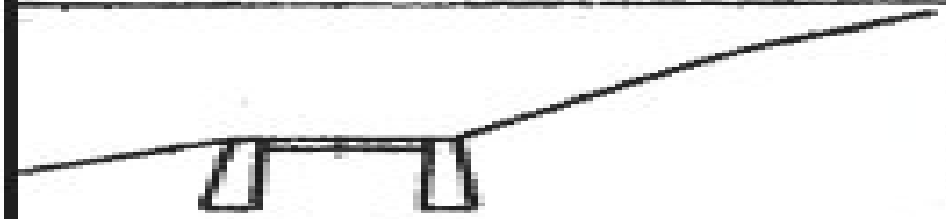
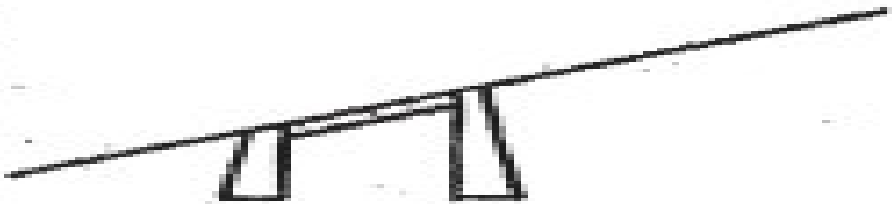
Freeboard at any point is the difference between the highest flood level after allowing for afflux, if any, and the formation level of road embankment on the approaches or top level of the Deck slab.

HIGHEST FLOOD LEVEL

It(HFL) is the level of the highest flood ever recorded or the calculated level for the design discharge, whichever is higher.

ORDINARY FLOOD LEVEL

It (OFL) is the level of flood expected to occur every year. It can be determined by averaging the highest flood levels of seven consecutive years.

UNSATISFACTORY	SATISFACTORY
	 SKEW CROSSING SOLVES THE PROBLEM
 ROKEN - BACK ALIGNMENT	 USE OF SINGLE CURVE
	 RELOCATED CHANNEL
	 PROVIDING SHOCK-FREE CURVES OR FITTING DECK ON VERTICAL CURVE
	 FITTING DECK IN ROAD GRADIENT

CLASSES OF LOADING

Road bridges and culverts shall be divided into classes according to the loadings they are designed to carry.

- I.R.C. Class AA Loading
- I.R.C. Class A Loading
- I.R.C. Class B Loading

I.R.C. Class AA Loading

This loading is to be adopted within certain municipal limits, in certain existing or contemplated industrial areas, in other specified areas, and along certain specified highways, Bridges designed for Class AA Loading should be checked for Class A Loading also, as under certain conditions, heavier stresses may be obtained under Class A Loadings.

I.R.C. Class A Loading

This loading is to be normally adopted on all roads on which permanent bridges and culverts are constructed.

I.R.C. Class B Loading

This loading is to be normally adopted for temporary structures and for bridges in specified areas. Structures with timber spans are to be regarded as temporary structures for the purpose of this Clause.

CLEAR SPAN OF CULVERTS (IRC SP : 20-2002)

Catchment area (in hectares)	Clear span of culvert (in m)
Up to 15	1.5
16 to 25	2.0
26 to 50	3.0
51 to 75	4.0
76 to 100	5.0
101 to 125	6.0
126 to 200 (deep channels)	6.0

WEEP HOLES AND WATER SPOUT

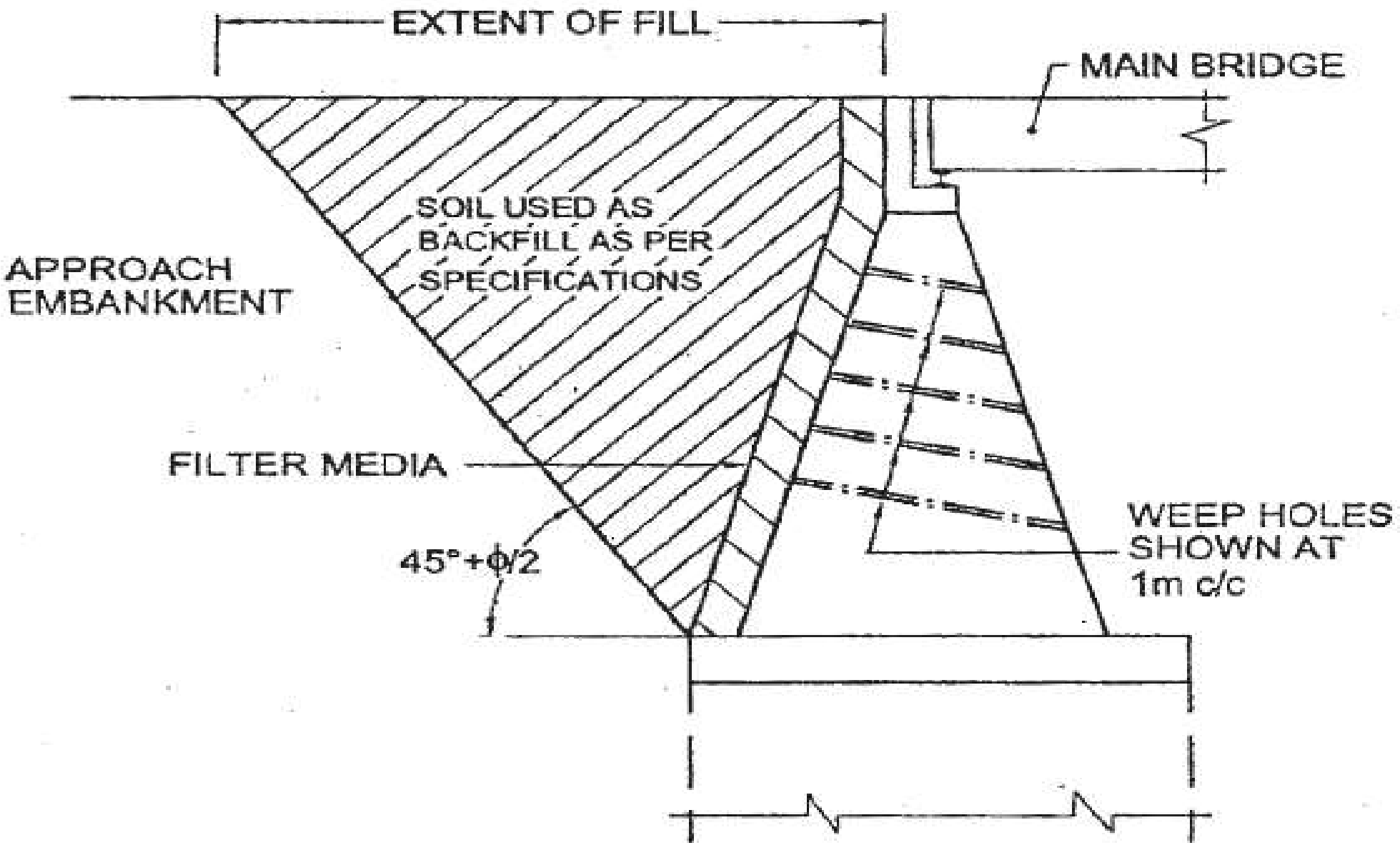
- Weep holes are provided to prevent building up of hydrostatic pressure behind abutments and wing walls.

- There may not be any need for weep holes and waterspouts in small span culverts.

- However, local practices prevail on size and spacing of weep holes, which may be followed.

- If the height of abutment and return over bed level is more than 2m, weep holes should be provided 150 mm above water level (LWL) or ground level (GL) whichever is higher. In case of stone masonry, weep holes of 150 mm dia or 80 x 150 mm size in 1 : 20 slope should be provided at required intervals (Refer: IRC:40)

EXTENT OF BACK FILL



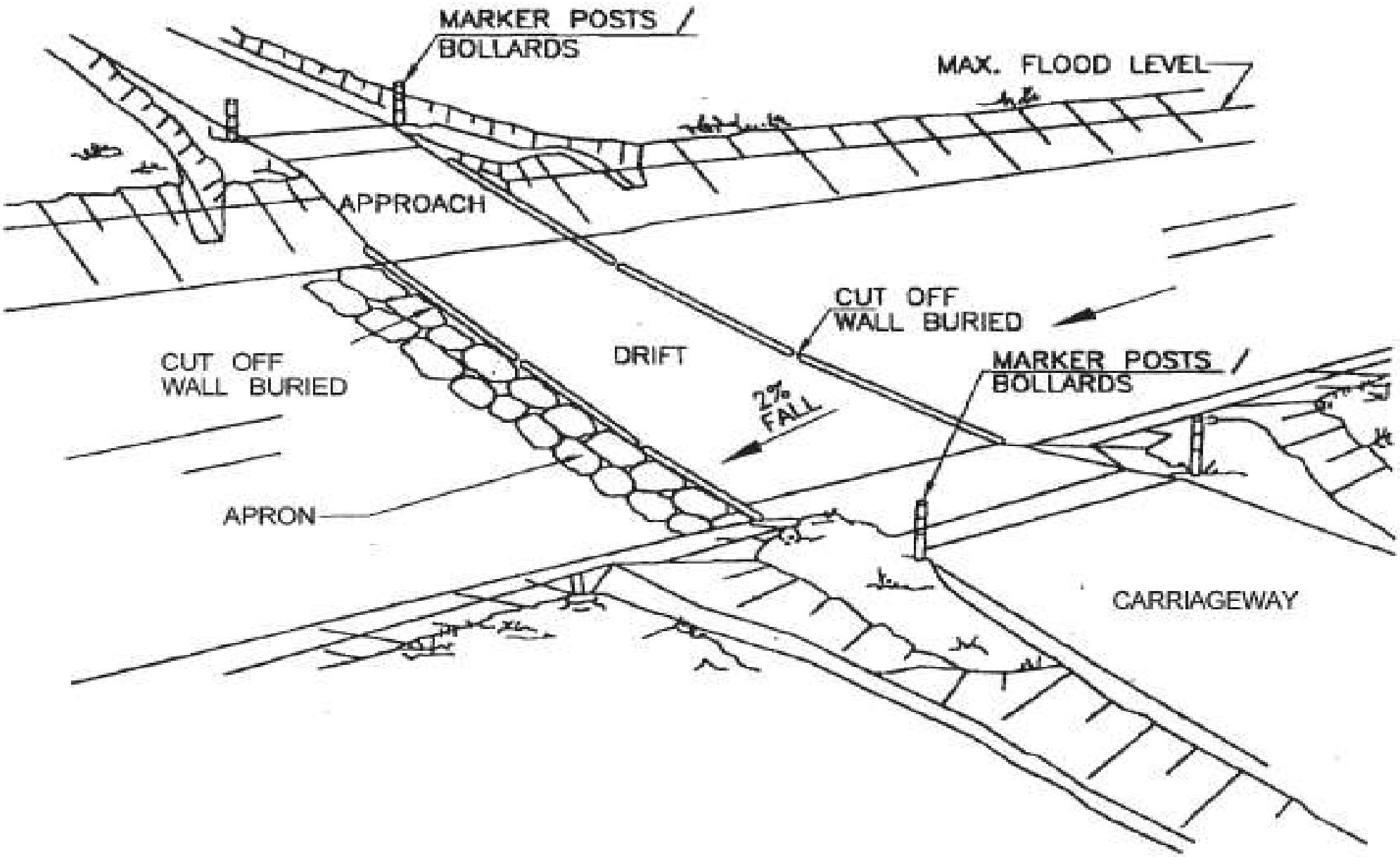
CEMENT CONCRETE CAUSE WAYS

A causeway may not be a small bridge (length less than 30 m) but is a low cost cross drainage work of longer length. These are so built that the period of interruption to traffic during rainy season is short. The outer width of causeway should be equal to roadway width.

TYPES OF CAUSE WAYS

- Flush causeway
- Vented causeway
- Low vented causeway
- High vented causeway

FLUSH CAUSE WAY



CONTINUATION,…

In this type of causeway which is also called paved dip or road dam, the top level of road is kept same as that of bed level of the channel. It is suitable where the crossing remains dry for most of part of year i.e. the stream is not perennial. Flush causeways are not suitable for crossing the streams with steep bed slopes causing high velocity even in low floods. The causeway covers the full width of the channel as shown in Figure.

VENTED CAUSE WAY

A causeway provided with vents to permit normal flow of the stream to pass under the causeway is known as vented causeway.

Causeways may be proposed on streams of flashy nature with high frequency of short duration or at sites where construction of submersible bridge is not economically viable.

TYPES OF VENTED CAUSE WAY

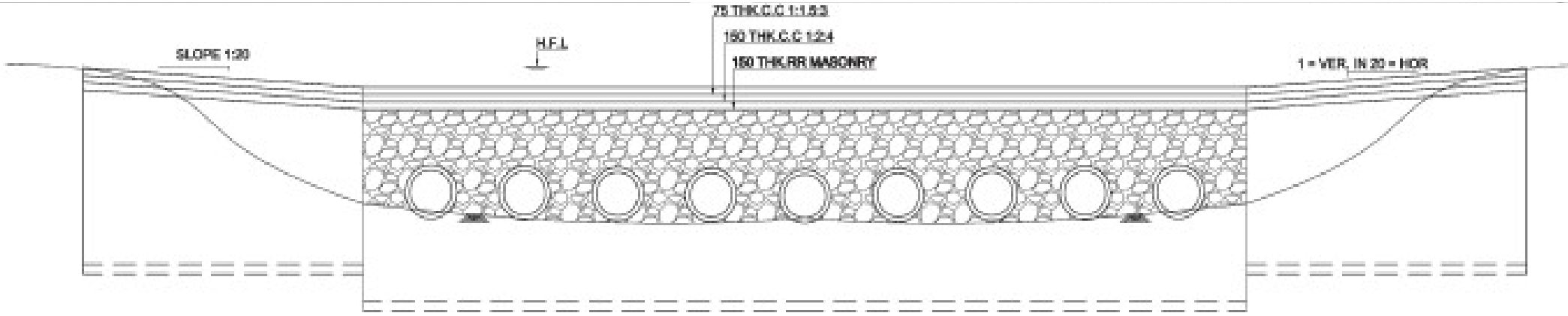
- Low vented causeway

- High vented causeway

LOW VENTED CAUSE WAY

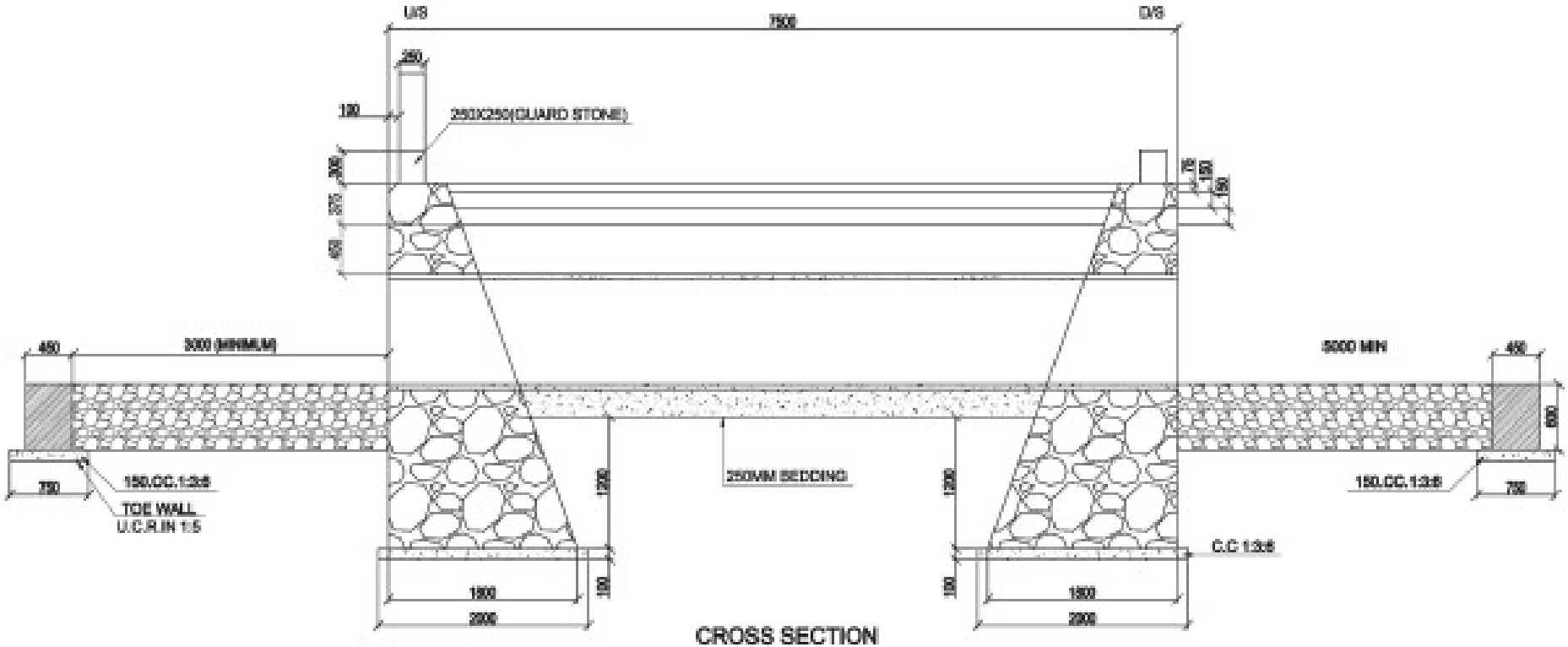
Low vented causeways are provided to cross quasi-perennial streams having sandy beds in areas with annual rainfall less than 1000mm and where the carriageway of a flush causeway would be liable to get slushy due to post monsoon flow in the stream. The height is generally less than 1.20m above the bed of the watercourse.

In exceptional cases, the height may be 1.50m above the bed level. Small size of vents in the form of hume pipes, short span slabs/R.C.C. Box cells are provided in the width of stream. The sill level of vents is kept about 150m-300mm below the average bed level of the stream.



LONGITUDINAL SECTION

SCALE-1:50

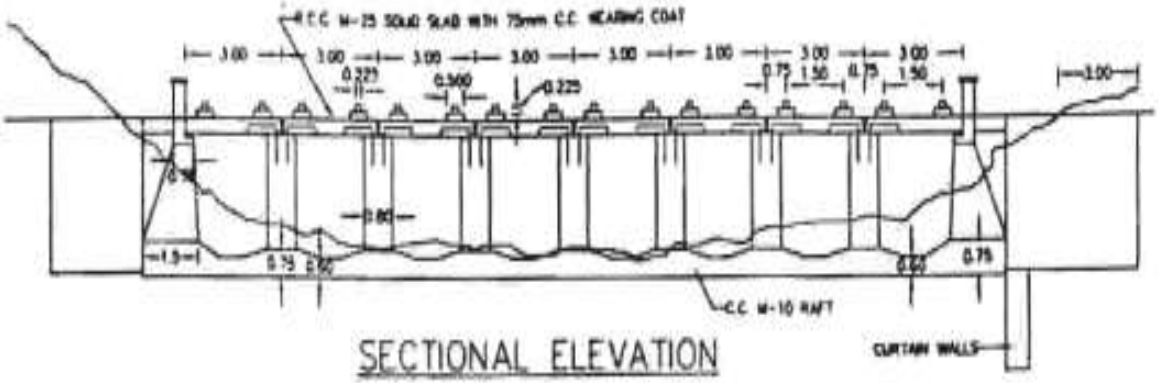


CROSS SECTION

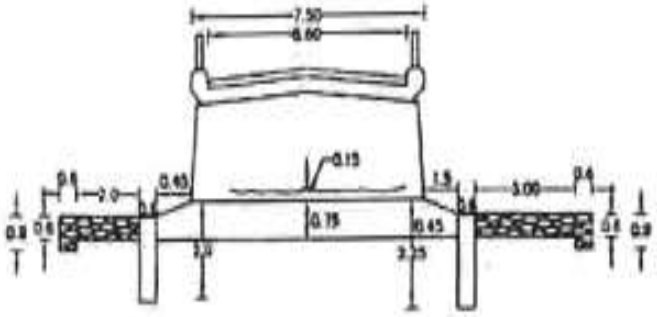
SCALE-1:25

HIGH VENTED CAUSE WAY

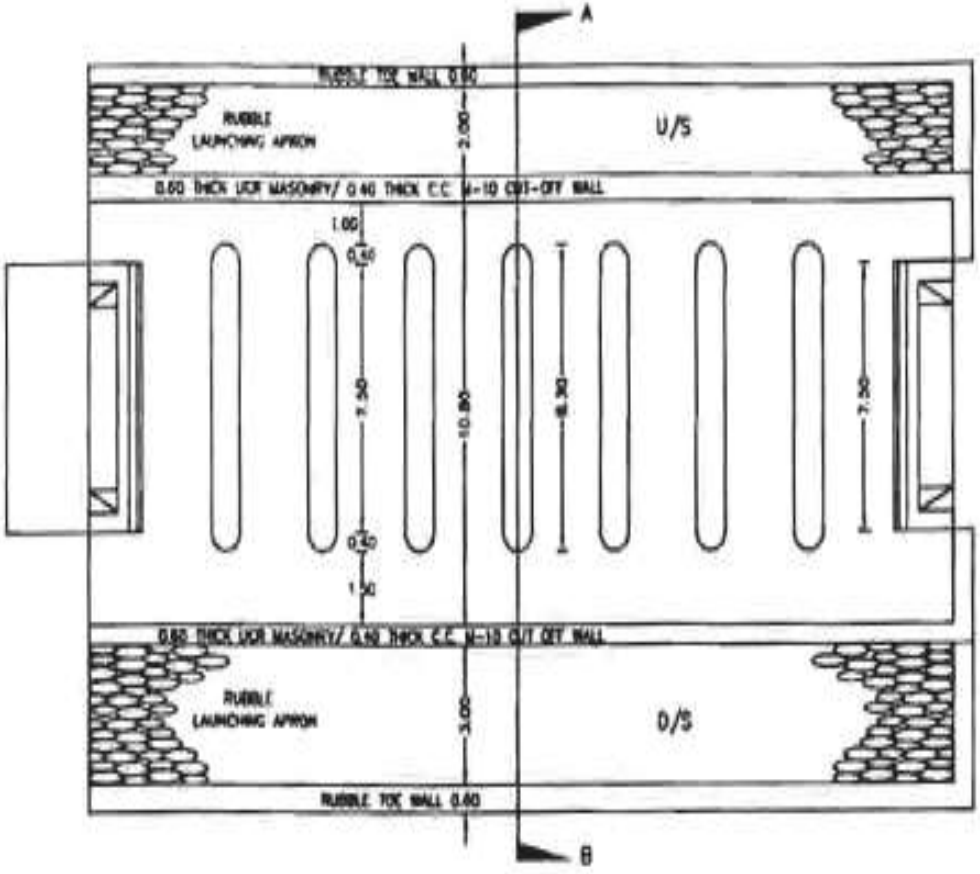
- Sizeable catchment area with annual rainfall more than 1000mm
- Depth of post monsoon flow is more than 900mm
- Flow is perennial but not large
- Banks are low necessitating construction of high embankment in the stream bed from considerations of the free board in non-submersible portion as well as geometric standards of approach roads



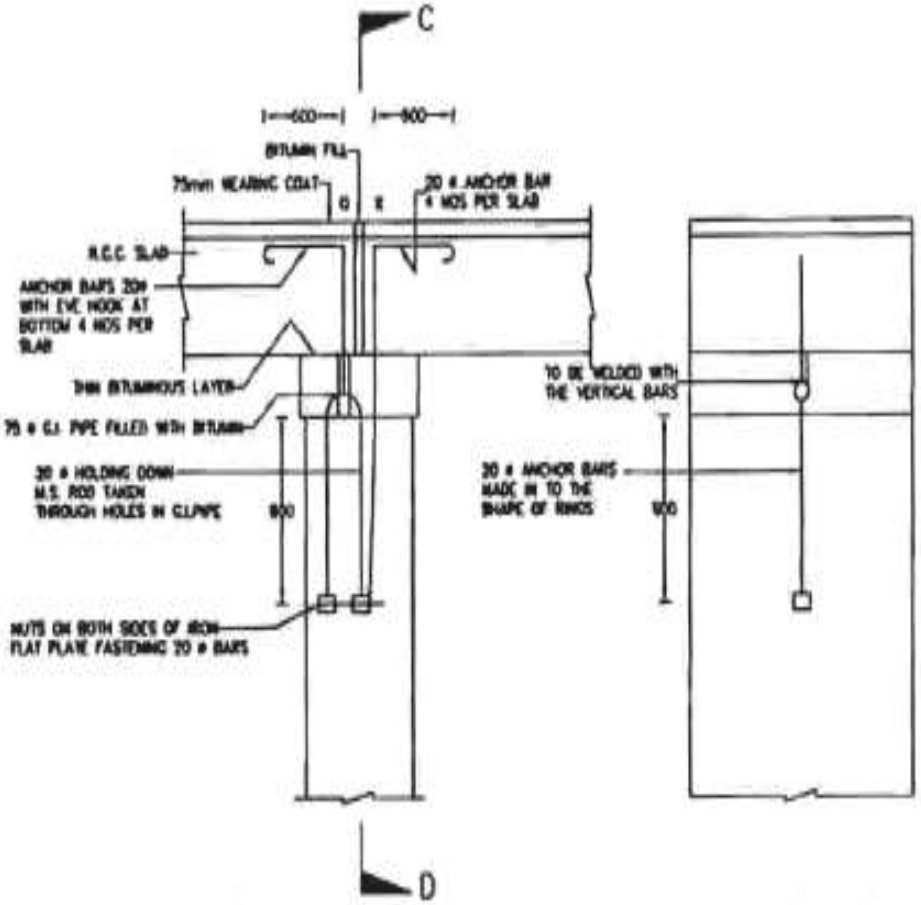
SECTIONAL ELEVATION



SECTION A-B



PLAN



SECTION ELEVATION

SECTION C-D

HIGHER LEVEL CAUSEWAY WITH RAFT FOUNDATION

ANCHOR BAR FOR R.C.C. SLABS OF SUBMERSIBLE BRIDGE

ALL DIMENSIONS IN RC DETAILING ARE IN mm.

DESIGN OF BRIDGES