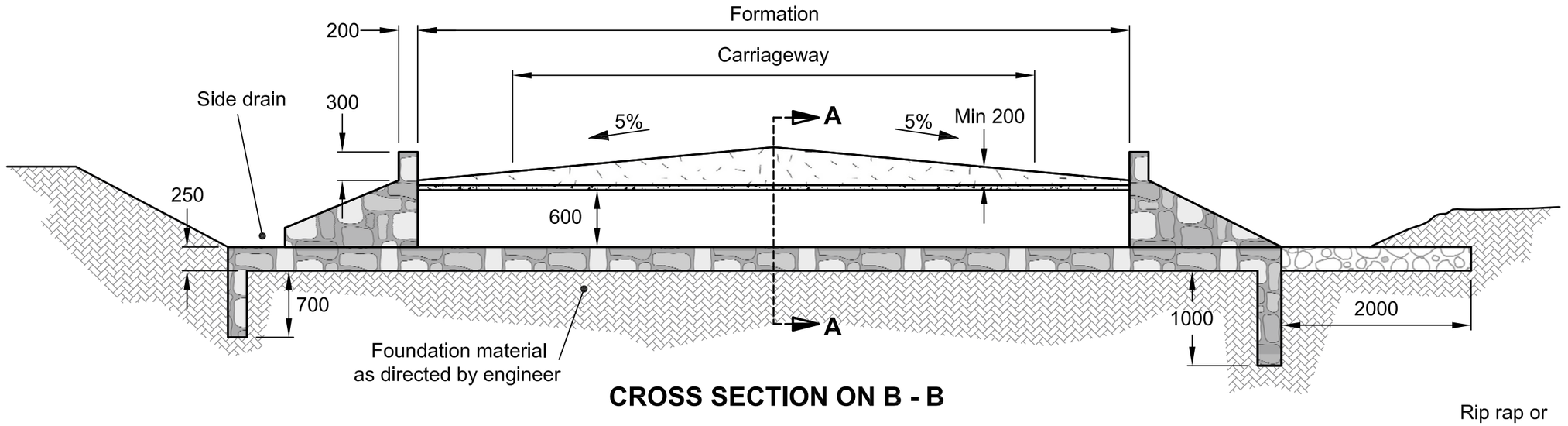
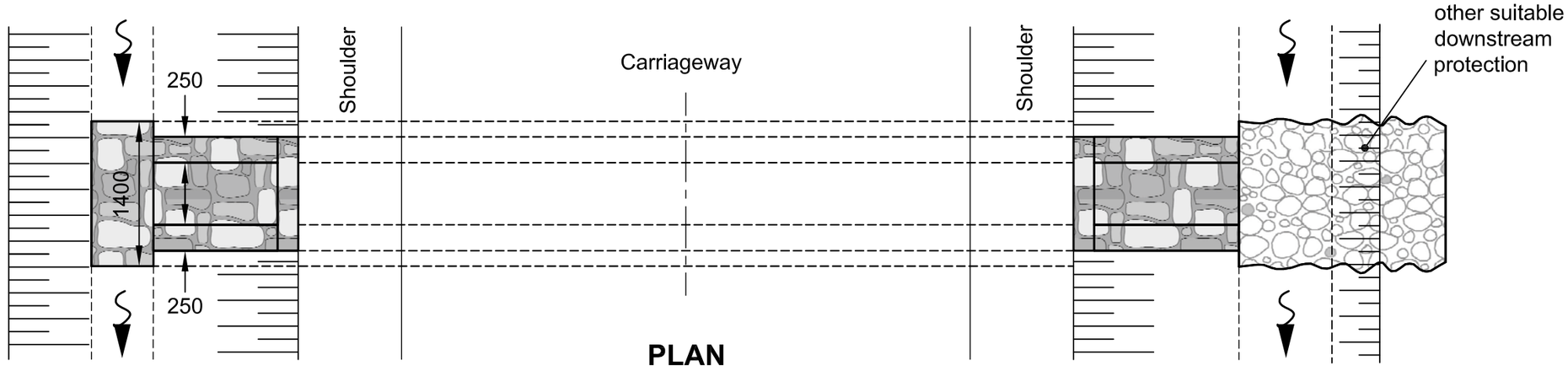


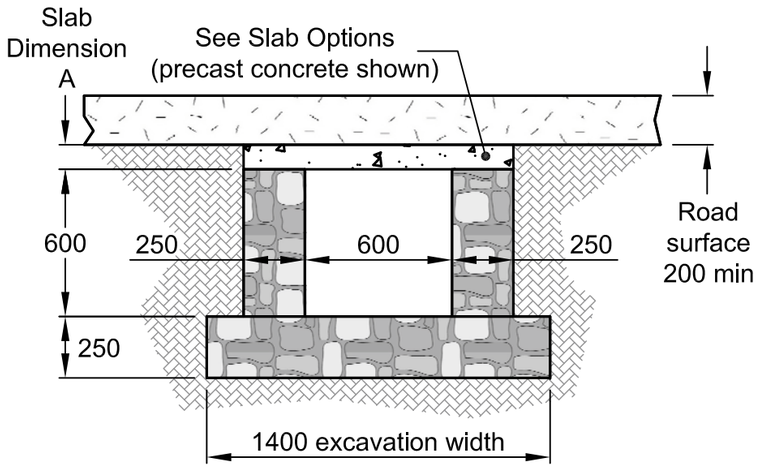
CROSS SECTION ON B - B

KEY

- Concrete
- Masonry
- Road surface
- Firm foundation/ Existing ground

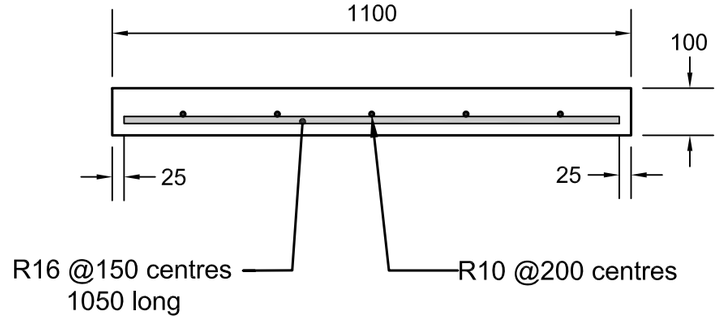


PLAN



CROSS SECTION ON A - A
(Scale: 1 : 25)

1. Timber - heavy hardwood Dim 'A' = 100mm
2. Timber - lighter hardwood Dim 'A' = 150mm
3. Timber - softwood Dim 'A' = 200mm
4. Masonry Slabs Dim 'A' = 100mm
5. Precast concrete planks



Min cover to reinforcing bar to be 25mm

SLAB OPTIONS
(Not to scale)

NOTES: **(1)** All dimensions in mm.
(2) Culvert invert slope min 2% max 5%.
(3) Relief culvert shown, culvert wingwalls may be flared to an opening of 2m if culvert is also accommodating a watercourse.

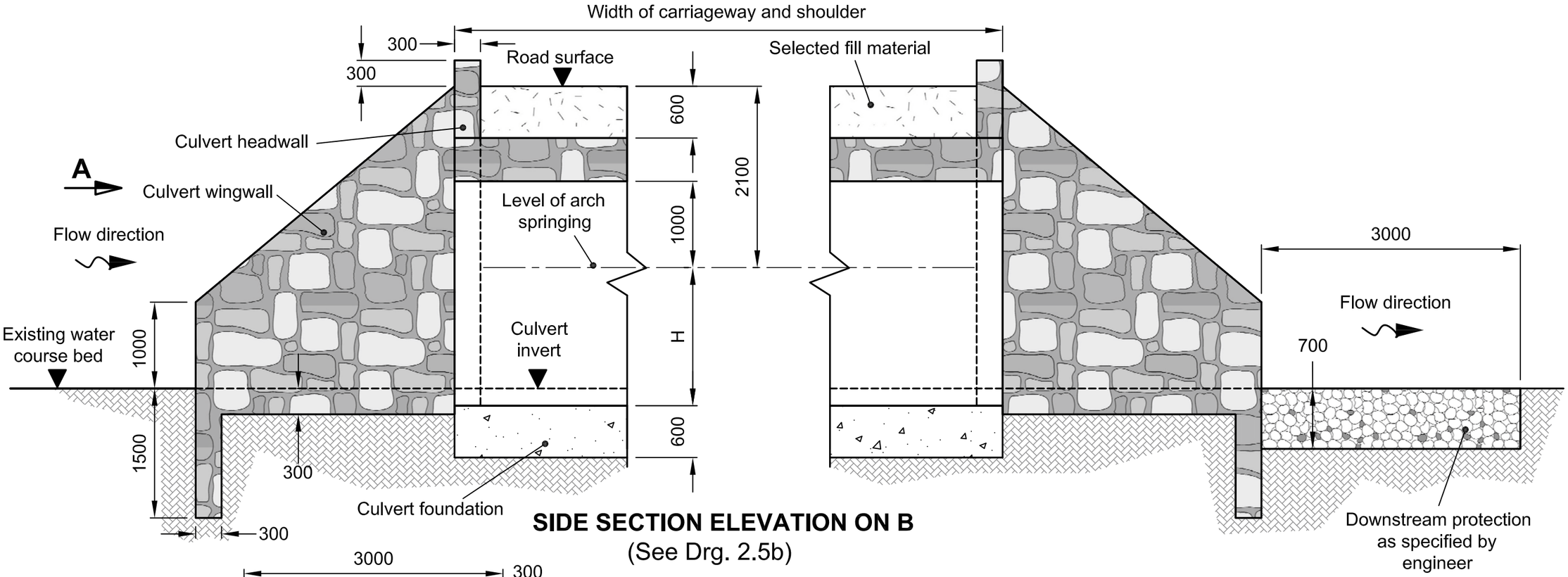
Low cost structures for Rural Roads

Box and Slab Culvert

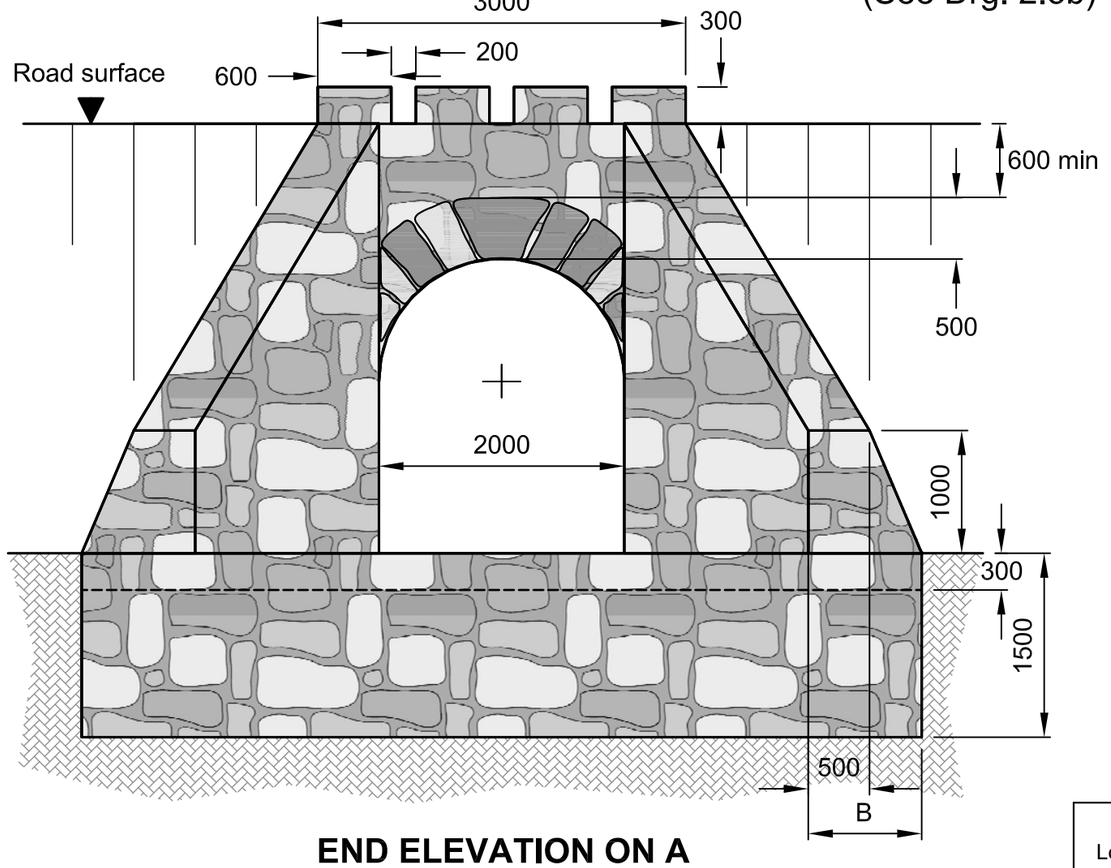
Alternative Culvert Arrangement

Scale: 1 : 50 (at A3)

Drawing No: 2.4



SIDE SECTION ELEVATION ON B
(See Drg. 2.5b)



END ELEVATION ON A

Height from culvert foundation to arch springing	= H
Culvert wall thickness at base	= B = 500 + H/4
Width of foundation	= W = H

NOTES:

(1) All dimensions in mm.
(2) Masonry in arch: Longest dimension of stone/brick to be placed in a radial direction.
(3) Foundation size may be increased for ground with low bearing capacity.
(4) Invert of culvert barrel may be curved to improve low water flows.
(5) Backfill material behind and above arch to be graded material compacted in 300 mm layers.
(6) Culvert wingwalls flare may be altered according to width of watercourse.
(7) Culvert inlet and outlet details are similar.

Please read this drawing together with Drg. No. 2.5b

KEY

- Concrete
- Masonry
- Firm foundation/ Existing ground
- Selected fill material
- Rip rap stone

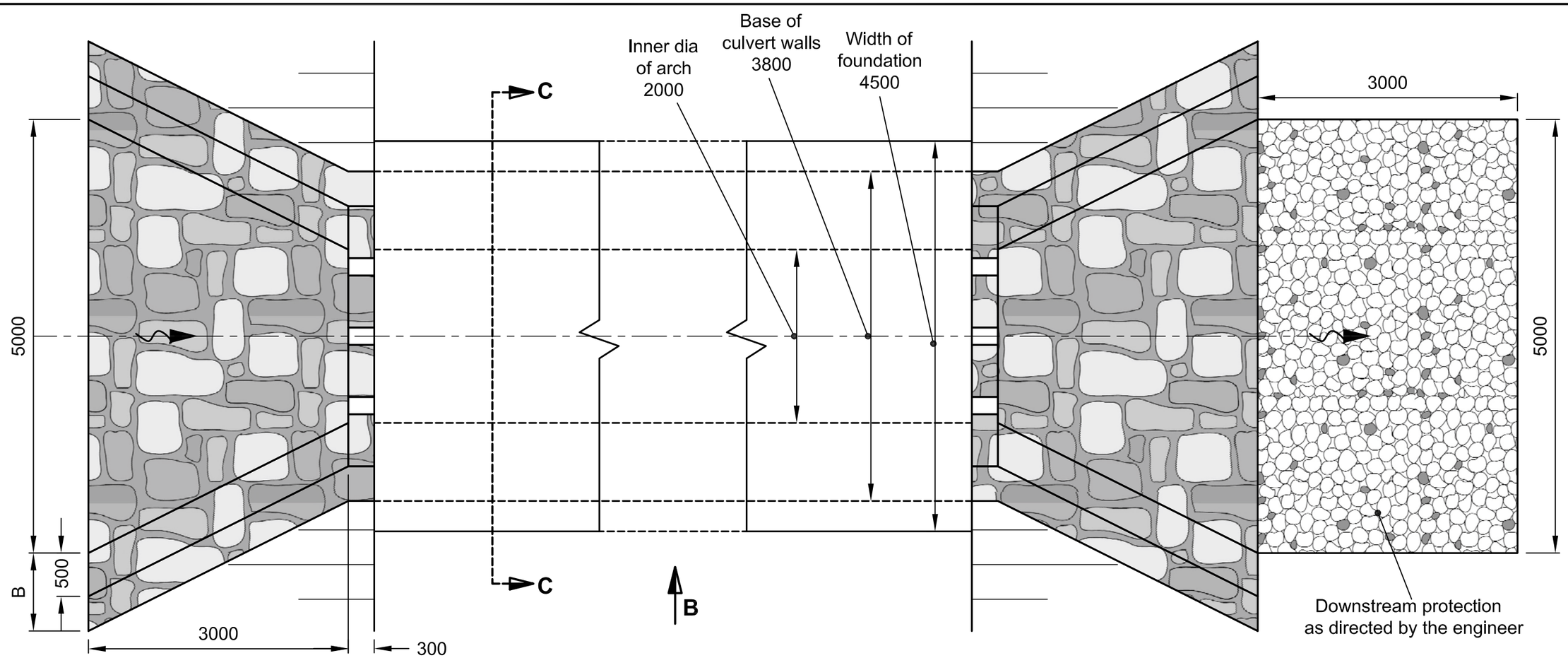
Low cost structures for Rural Roads

Masonry Arch Culvert

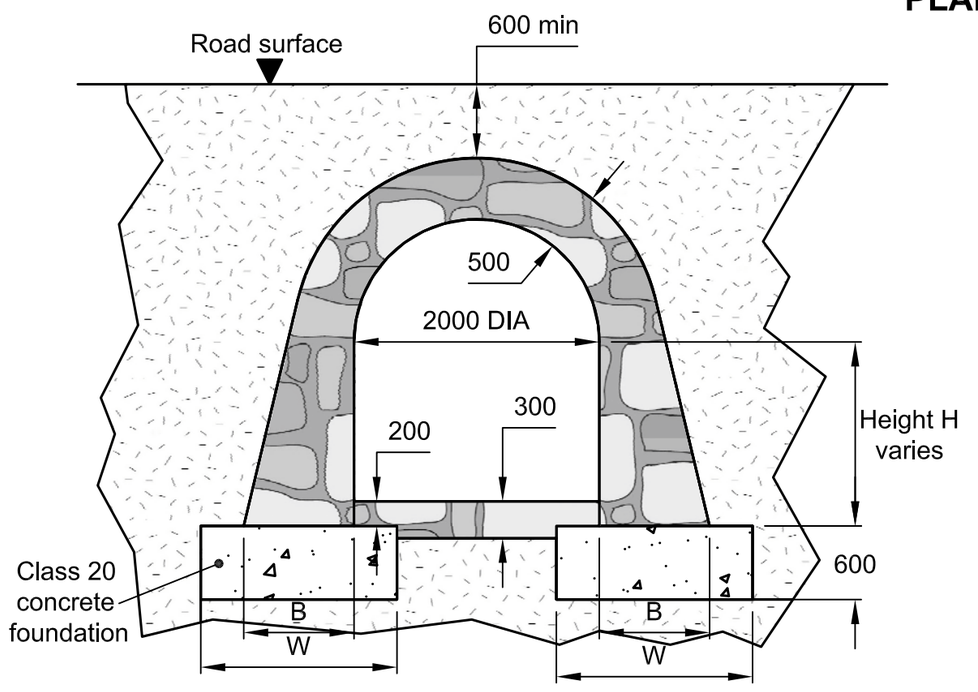
(small watercourses with large flows)

Scale: 1 : 50 (at A3)

Drawing No: 2.5a



PLAN VIEW



SECTION ON C-C

Height from culvert foundation to arch springing	= H
Culvert wall thickness at base	= B = 500 + H/4
Width of foundation	= W = H

NOTES:

(1) All dimensions in mm.

(2) Masonry in arch: Longest dimension of stone/brick to be placed in a radial direction.

(3) Foundation size may be increased for ground with low bearing capacity.

(4) Invert of culvert barrel may be curved to improve low water flows.

(5) Backfill material behind and above arch to be graded material compacted in 300 mm layers.

(6) Culvert wingwalls flare may be altered according to width of watercourse.

(7) Culvert inlet and outlet details are similar.

Please read this drawing together with Drg. No. 2.5a

KEY

- Concrete
- Masonry
- Firm foundation/ Existing ground
- Selected file material
- Rip rap stone

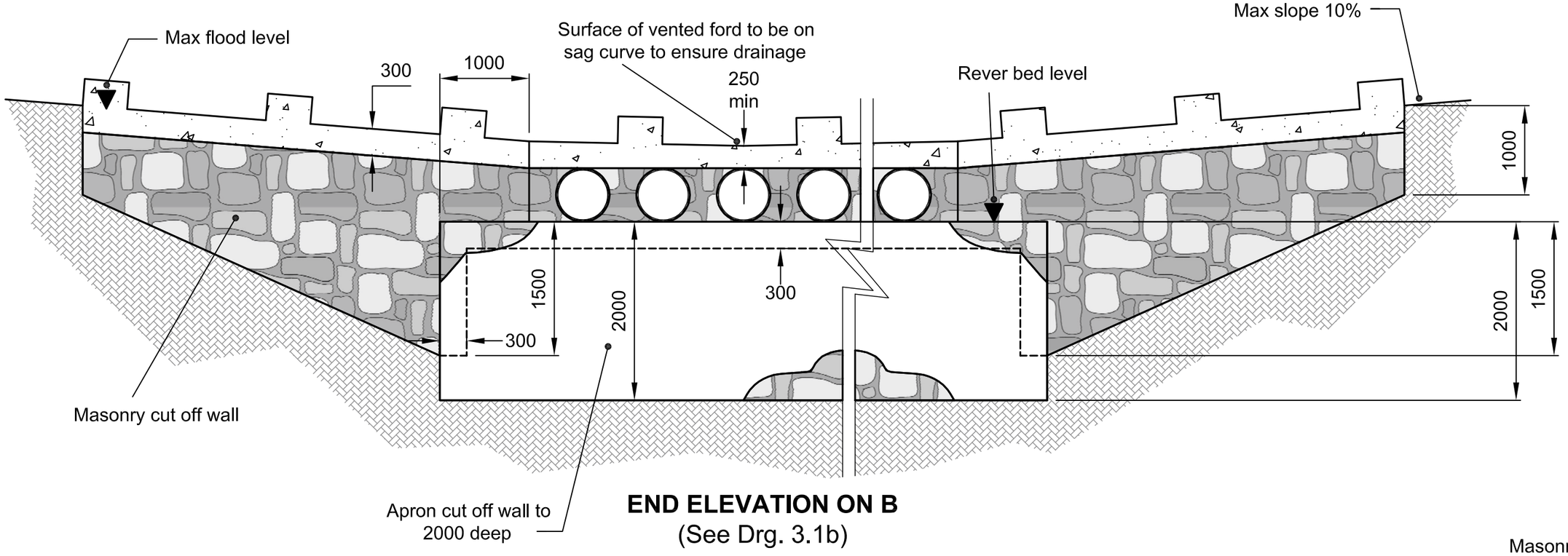
Low cost structures for Rural Roads

Masonry Arch Culvert

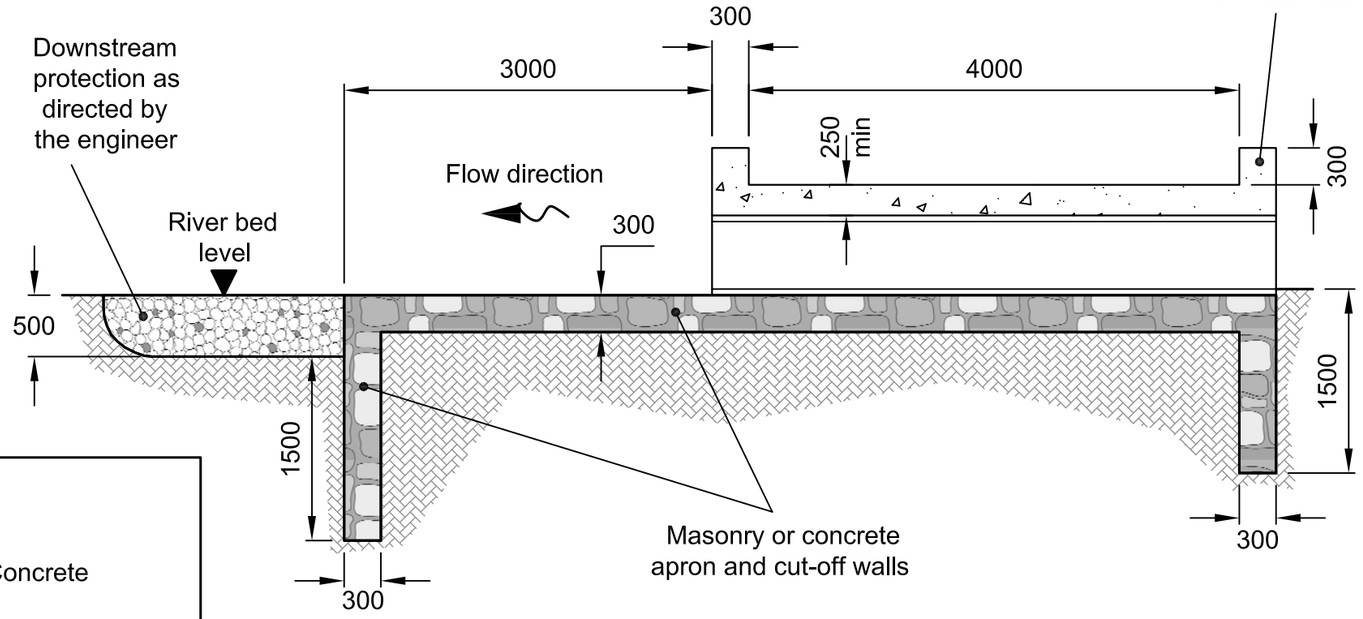
(small watercourses with large flows)

Scale: 1 : 50 (at A3)

Drawing No: 2.5b



END ELEVATION ON B
(See Drg. 3.1b)



CROSS SECTION A - A
(See Drg. 3.1b)

NOTES:

(1) All dimensions in mm.

(2) All concrete to be class 20.

(3) Pipes may be
- concrete with concrete surround.
- reinforced concrete pipes
- cast in situ concrete pipes
- corrigated metal pipes

(4) Width of vented ford to correspond to width of water course.

(5) Number of pipes required depends on water flow.

(6) Carrigeway width may be varied according to national standards.

(7) Approach slabs to extened above design flood level.

(8) Fill material between pipes to be rubble masonry or lean concrete with plumbs
Fill material on approach embankments to be either of the above or sand and gravel.

(9) Downstream protection to be specified by the engineer.

Please read this drawing together with Drg. No. 3.1b

KEY

Concrete

Masonry

Firm foundation/ Existing ground

Rip rap stone

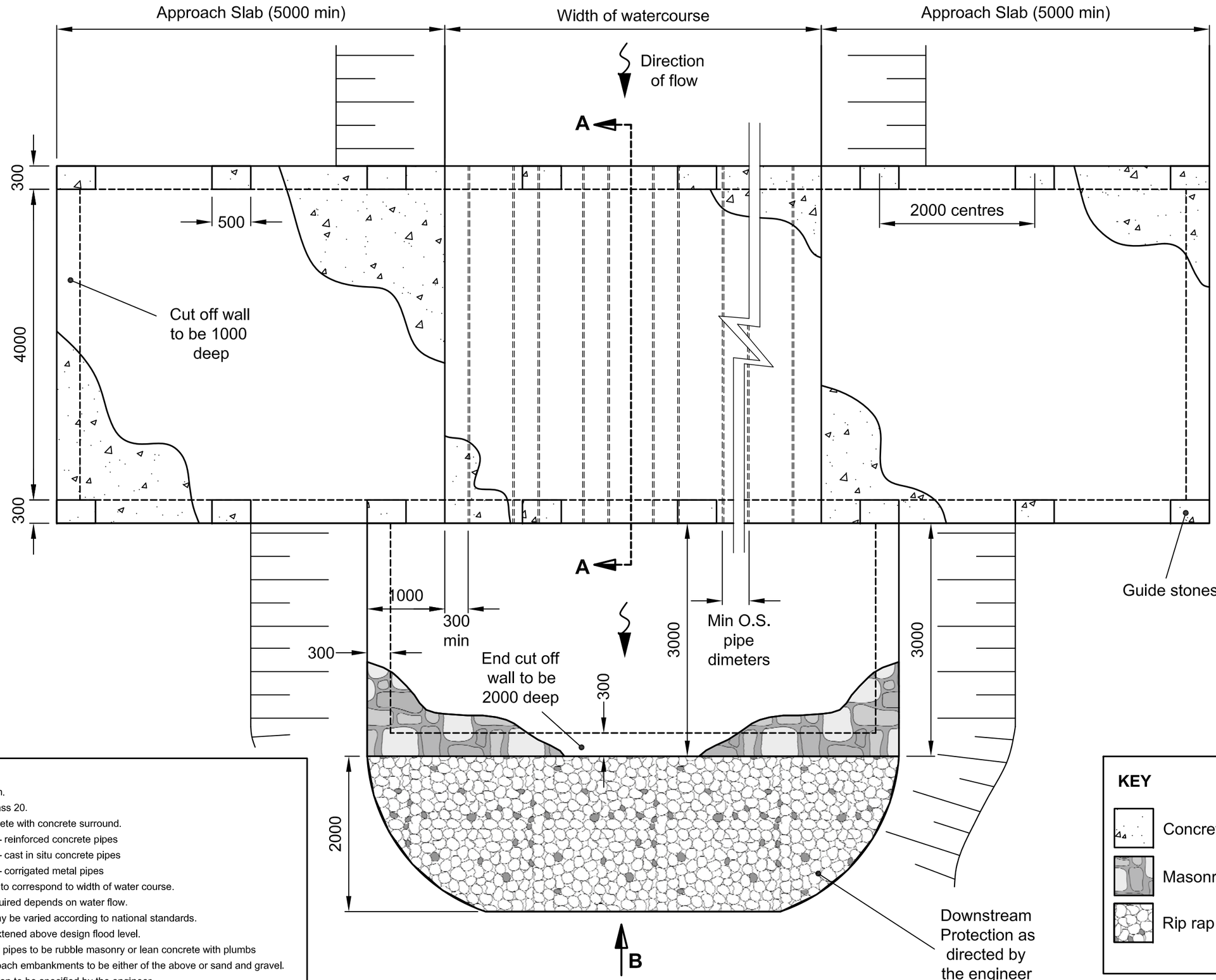
Low cost structures for Rural Roads

Vented Ford

Permanent watercourses with occasional high volume flows

Scale: 1 : 50 (at A3)

Drawing No: 3.1a



NOTES:

(1) All dimensions in mm.
(2) All concrete to be class 20.
(3) Pipes may be- concrete with concrete surround.
- reinforced concrete pipes
- cast in situ concrete pipes
- corrigated metal pipes
(4) Width of vented ford to correspond to width of water course.
(5) Number of pipes required depends on water flow.
(6) Carrigeway width may be varied according to national standards.
(7) Approach slabs to extened above design flood level.
(8) Fill material between pipes to be rubble masonry or lean concrete with plumbs
Fill material on approach embankments to be either of the above or sand and gravel.
(9) Downstream protection to be specified by the engineer.

Please read this drawing together with Drg. No. 3.1a

KEY

Concrete

Masonry

Rip rap stone

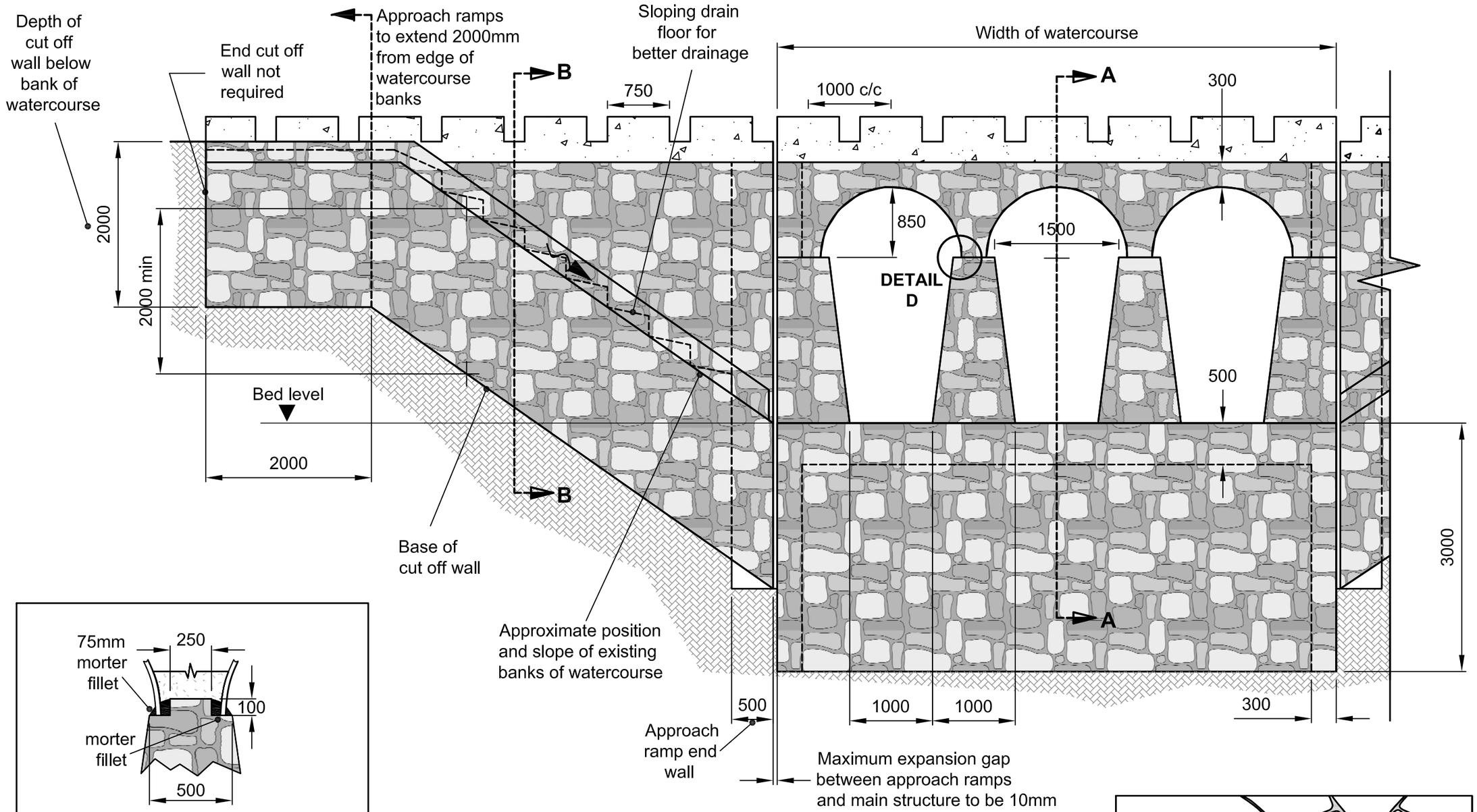
Low cost structures for Rural Roads

Vented Ford

Permanent watercourses with occasional high volume flows

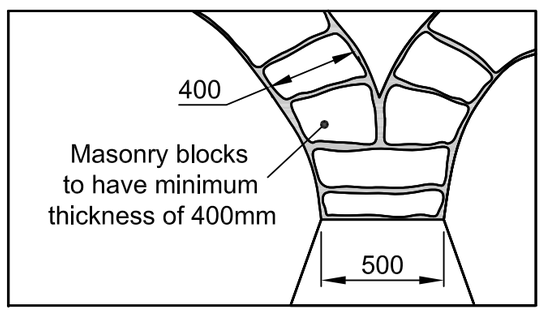
Scale: 1 : 50 (at A3)

Drawing No: 3.1b



DETAIL D
(Armco Arches section through top of pier)
scale 1 : 25

FRONT ELEVATION ON A
(See Drg. 4.1b)



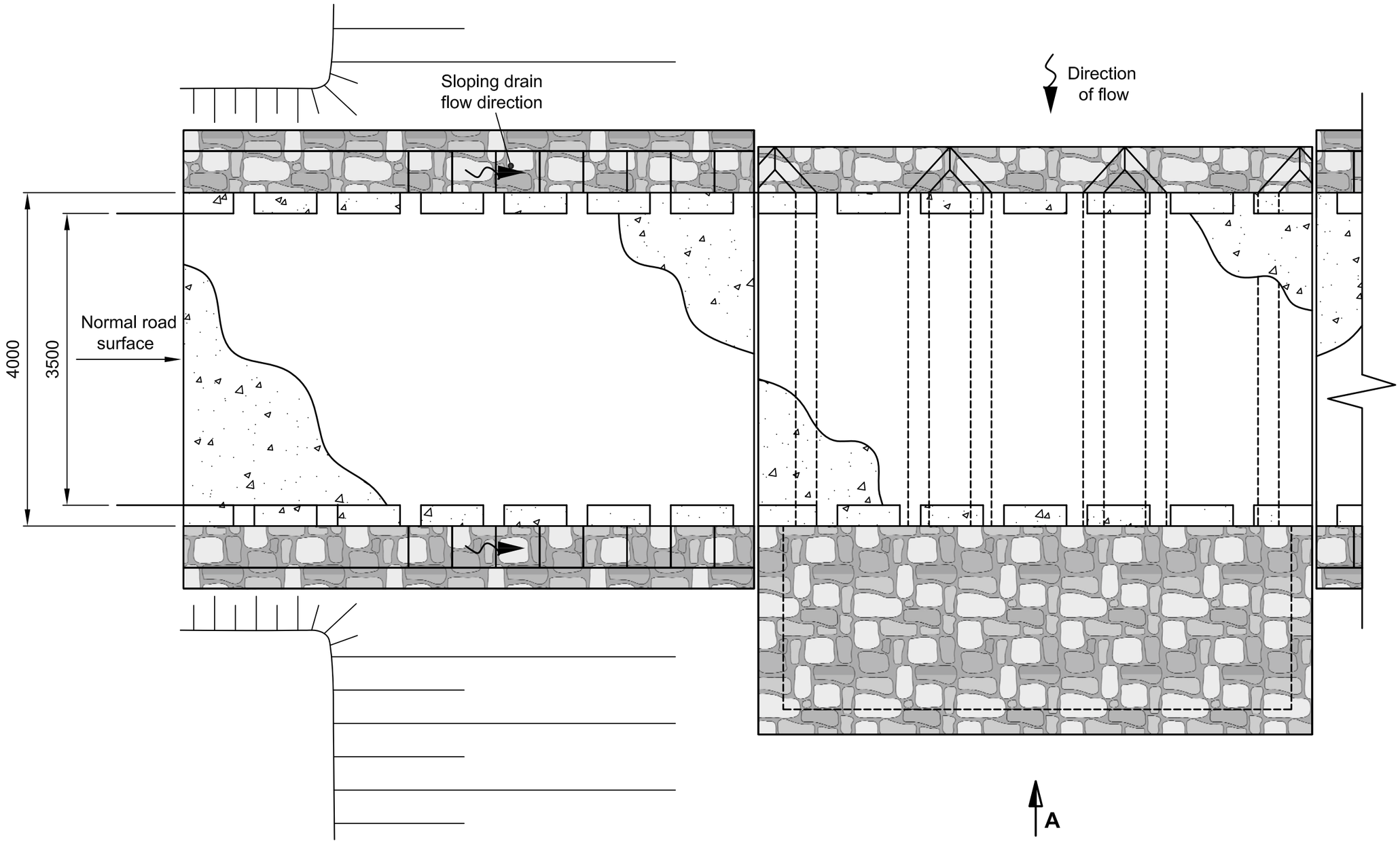
MASONRY ARCH DETAIL
Scale 1 : 25

NOTES:
(1) All dimensions in mm.
(2) Number of arches may be increased for wider watercourse.
(3) Design flood level to be below carrigeway level.
(4) Arches may be constructed from corrugated steel sheets or masonry (corrugated steel shown).
(5) Fill material above arches to be rubble masonry or lean mass concrete with plumbs Fill to be placed and compacted in 300mm layers evenly on each side of arch.
(6) Base slab and downstream apron to be continuous.

Please read this drawing together with Drg. No. 4.1b & 4.1c

KEY
- Concrete
- Masonry
- Firm foundation/ Existing ground

Low cost structures for Rural Roads	**Large multibore culvert**	Scale: 1 : 50 (at A3)
	Institute of Development Engineering Loughborough University, Leicestershire LE11 3TU	**Drawing No: 4.1a**



PLAN VIEW

NOTES:

(1) All dimensions in mm.
(2) Number of arches may be increased for wider watercourse.
(3) Design flood level to be below carrigeway level.
(4) Arches may be constructed from corrugated steel sheets or masonry (corrugated steel shown).
(5) Fill material above arches to be rubble masonry or lean mass concrete with plumbs Fill to be placed and compacted in 300mm layers evenly on each side of arch.
(6) Base slab and downstream apron to be continuous.

Please read this drawing together with Drg. No. 4.1a & 4.1C

KEY

Concrete

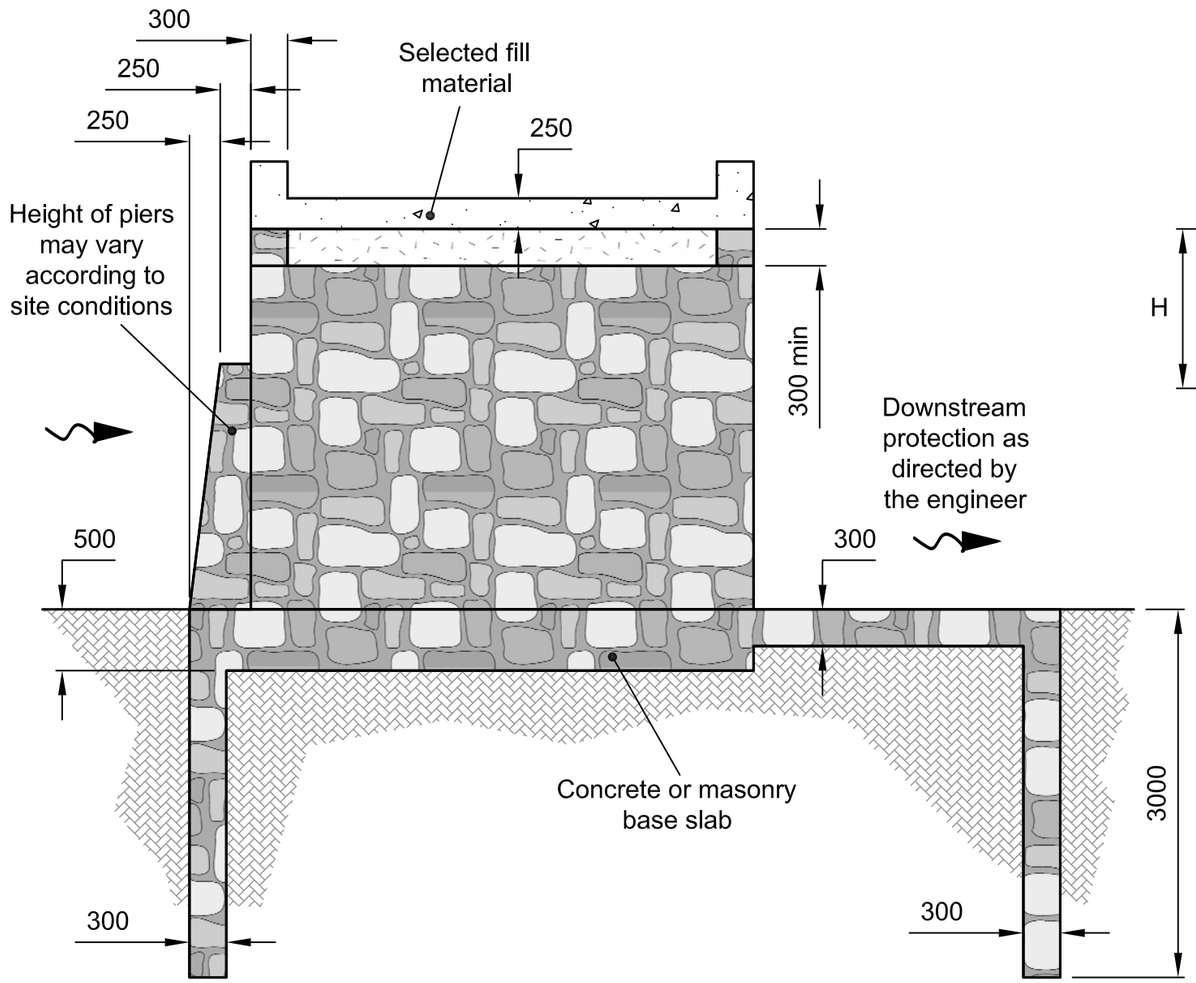
Masonry

Low cost structures for Rural Roads

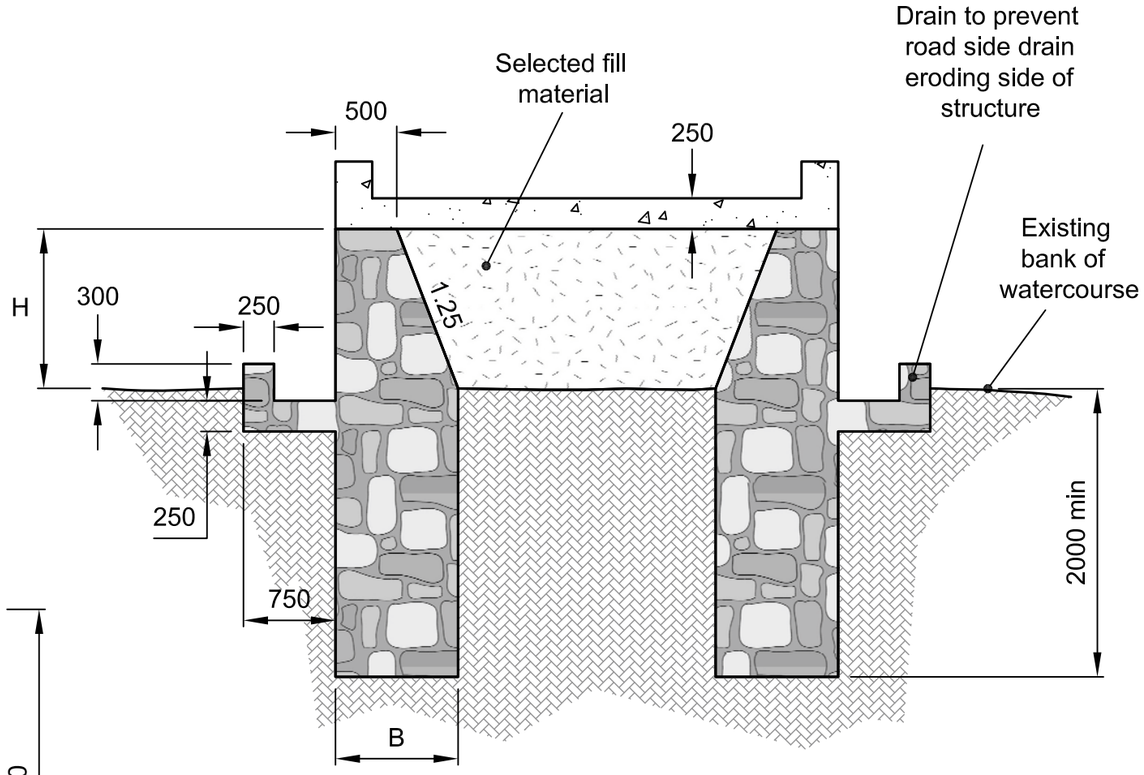
Large multibore culvert

Scale: 1 : 50 (at A3)

Drawing No: 4.1b



CROSS SECTION ON A-A
(See Drg. 4.1a)



CROSS SECTION ON B-B
(See Drg. 4.1a)

NOTES:

(1) All dimensions in mm.
(2) Number of arches may be increased for wider watercourse.
(3) Design flood level to be below carrigeway level.
(4) Arches may be constructed from corrugated steel sheets or masonry (corrugated steel shown).
(5) Fill material above arches to be rubble masonry or lean mass concrete with plumbs Fill to be placed and compacted in 300mm layers evenly on each side of arch.
(6) Base slab and downstream apron to be continuous.

Please read this drawing together with Drg. No. 4.1a & 4.1b

KEY

- Concrete
- Masonry
- Firm foundation/ Existing ground
- Fill material

Low cost structures for Rural Roads

Large multibore culvert

Scale: 1 : 50 (at A3)

Drawing No: 4.1c