

## **ANNEX A: SPECIFICATIONS AND DRAWINGS**

## **SPECIFICATIONS FOR ROUTINE MAINTENANCE /SPOT IMPROVEMENT WORKS**

### **Standard Specification**

Whenever reference is made to “The Engineer” in the specification, it shall be construed to be synonymous with “Employer’s duly authorised Representative” as referred to in the Conditions of Contract.

## **SECTION 01 : PRELIMINARY AND GENERAL ITEMS**

Scope:

This section refers to those items that are needed at the start and end of the Works or are provisional items applicable for the duration of the Works.

### **01-40- 001: Mobilization and Establishment of Site**

The Contractor shall provide all equipment, tools, material and temporary stores required to carry out the required Works.

The Contractor shall ensure that all possible means of protection are given to the staff at all times. Such protection shall include provision of high visibility clothing or vests for the workforce, in potentially dangerous locations. The Contractor shall also maintain first aid kits with items included on the advice of the local Medical Officer, or as directed by the Engineer.

Measurement and Payment

No separate payment shall be made for this item. The Contractor shall include the costs in the other rates for other measured items.

### **01-40-002 Clearance on Completion**

On Completion of the Works, all temporary stores, equipment, signs and tools shall be removed from the site, and the Site left in good order to the satisfaction of the Engineer.

Measurement and Payment

The Lump Sum payment shall be made upon the approval of the Engineer that the Clearance has been satisfactorily carried out.

### **01-40-006 Traffic Control**

The Contractor shall provide warning signs, fences, barriers, detours, which shall be properly positioned well in advance so that all traffic is well and safely accommodated for the duration of the Works.

Traffic signs and other traffic control facilities shall be kept in good condition and located in positions where they are visible to road users.

Work Method

The Contractor shall use **Labour** to carry out this item of work

Quality Control

The Engineer shall check regularly that traffic control measures are satisfactory.

#### Measurement and Payment

A Lump Sum shall be paid on a Monthly basis upon the approval of the Engineer that adequate Traffic Control is in place

#### **01-40-007      Drinking Water**

The Contractor shall provide safe drinking water on site for workers at a reasonable distance from all work locations, for the duration of the Works.

#### Quality Control

The Engineer shall check regularly that adequate supplies of water are available throughout the Site.

#### Measurement and Payment

A Lump Sum shall be paid on a Monthly basis upon the approval of the Engineer that adequate supplies have been provided.

## SECTION 04: ROADSIDE CLEARANCE

### Scope

This section covers all routine maintenance works within the road reserve and includes items such as bush clearing, pruning of tree branches, grass cutting, and removal of litter and any other debris.

#### **04-50-002: Grass Cutting (Manual)**

Grass shall be defined as any form of plant growth including small shrubs having a girth of not more than 100mm measured at height of 200mm above ground level.

The grass shall be cut to height of not more than 50 mm above the ground. The width limits shall be as instructed by the Engineer. All cut grass shall be removed from the carriageway, side drains, mitre drains and inlets and outlet drains of structures/culverts and deposited in approved spoil dumps

**EA Burning of the grass shall not be allowed and care shall be taken not to damage roadside fixtures such as signs and marker posts.**

This activity shall be carried out twice, each time before the rainy season or as shall be instructed by the Engineer.

### Work Method

The Contractor shall use **Labour** to carry out this item of work.

### Quality Control

The road width for grass cutting shall be measured at 50-m intervals and shall be free of grass after the operation.

Measurement: m<sup>2</sup>

The measurement shall be area of grass cut, based on the standard width and measured length of clearing.

### Payment

The unit rate shall be full compensation, for labour, materials, tools, and incidental costs required to carry out the work.

**04-50-003 Bush Clearing - heavy**  
**04-50-004 Bush Clearing - light**

#### **04-50-005      Pruning Tree Branches**

This activity involves the removal of small trees, shrubs and bushes all including their root systems, In addition, the Engineer may order the trimming of branches of large trees to improve visibility. The width limits shall be as instructed by the Engineer.

The cut material shall be collected into heaps away from the side drains and where it shall not block or interfere with visibility.

The burning of cut bush and removed trees or branches shall not be allowed.

##### *Work Method*

The Contractor shall use **Labour** to carry out this item of work

##### *Quality Control*

The width for bush clearing shall be measured at 50-m intervals and shall be free of trees or bushes.

Measurement Unit:      m<sup>2</sup>

The measurement shall be the area cleared according to the specified widths and measured length of clearance.

##### *Payment*

The unit rate shall be the full compensation, for labour, materials, tools, and incidental costs required to carry out the work.

#### **04-50-008:      Clearing of Obstructions**

This activity shall involve the following tasks:-

- Inspection of the road section(s) regularly
- Removal of all obstructions such as fallen trees/ branches, rock fall, landslides and broken signs away from the road, side drains, mitre drains and other drains, inlets and outlets of drifts, culverts and other structures and the safe disposal thereof outside the road formation width.
- Removal of dead animals' carcasses away for the carriageway and disposing of them as directed by the Engineer. Liaison with the Police may be necessary.

##### *Work Method*

The Contractor shall use **Labour** to carry out this item of work

#### Quality Control

The road section shall be free of any obstruction.

Measurement Unit: Provisional Sum

The measurement for this item shall be a Provisional Sum paid as necessary on a Dayworks basis.

#### Payment

The unit rate shall be the full compensation for the provision of labour, tools and incidental costs necessary to carry out the tasks.

## SECTION 05: EARTHWORKS

### 05-70- 001: Grassing

This activity involves the protection / repair of erosion on embankment slopes, cut faces, shoulders, and side slopes by filling with suitable soils and compacting using appropriate tamping tools as instructed by the Engineer.

The Contractor shall plant sprigs of approved indigenous 'runner' type grass. The Contractor shall care for and water the grass until it is firmly established.

#### Work Method

The Contractor shall use **Labour** to carry out this item of work.

#### Quality Control

- The width of the slope shall be measured at 50m intervals and shall have maximum tolerances of + / - 100mm.
- The quality of grass and spacing of the sprigs shall be as directed by the Engineer

Measurement Unit                      m<sup>2</sup>

The unit of measurement shall be area calculated as the net area, measured on the slope.

#### Payment

The unit rate shall be full compensation, for labour, materials, tools, and incidental costs required to carry out the work.



## SECTION 08: CULVERT AND DRAINAGE WORKS

### Scope:

This section covers all routine maintenance of the drainage system including the cleaning or desilting of the side drains, mitre drains, catch water drains, culverts, inlets and outlets, and scour checks.

<b>08-50-002</b>	<b>Ditch Cleaning (Manual) - Partially Silted</b>
<b>08-50-003</b>	<b>- Fully Silted</b>

i. Partially silted

Partially silted drains are those that are less than half silted and require only cleaning.

All deposited material, debris, and vegetation shall be removed and the drain shaped to the original cross-section and left in a free-draining condition. Suitable material may be used to fill depressions and potholes on the carriageway. All debris and other unsuitable material removed from the side drains shall be disposed of well clear of the drainage system in approved spoil dumps where it will not cause any obstruction or be washed back.

The side drains, mitre drains and catchwater drains shall be cleaned before the onset of the rains or as directed by the Engineer.

### Work Method

The Contractor shall use **Labour** to carry out this item of work

### Quality Control

- Appropriate drain templates shall be used to check and control the dimensions of the drains.
- The longitudinal profile of the drains shall be checked using boning rods, to ensure free flow.

Measurement Unit: m

The measurement shall be the length of drain desilted or cleaned to the specified cross-section.

### Payment

The unit rate shall be full compensation, for labour, tools, and incidental costs required to carry out the work.

ii. Fully silted

Fully silted drains shall be those that are greater than half-silted and require re-excavation or reshaping.

All deposited material, debris, and vegetation shall be removed and the drain shaped to the original cross-section and left in a free-draining condition. Suitable material may be used to fill depressions and potholes on the carriageway. All debris and other unsuitable material removed from the side drains shall be disposed of well clear of the drainage system in approved spoil dumps where it will not cause any obstruction or be washed back.

The side drains shall be desilted or re-excavated before the onset of the rains, or as directed by the Engineer.

#### *Work Method*

The Contractor shall use **Labour** to carry out this item of work

#### *Quality Control*

- Appropriate drain templates shall be used to check and control the dimensions of the drains.
- The longitudinal profile of the drains shall be checked using boning rods, to ensure free flow.

Measurement Unit:                      m<sup>3</sup>

The measurement shall be the volume of drain re-excavated or re-shaped to the specified cross-section.

#### *Payment*

The unit rate shall be full compensation for labour, tools, and incidental costs required to carry out the work.

### **08- 60 - 001/2/3/4/5:      Culverts Cleaning (Partially blocked)**

08 - 60 - 001	300mm dia;
08 - 60 - 002	450mm dia;
08 - 60 - 003	600mm dia;
08 - 60 - 004	900mm dia;
08 - 60 - 005	1200mm dia

This activity involves the cleaning of culverts of specified sizes including pipe barrels, the outlet/inlet structures, and the outlet drains, keeping them free of all debris, weed, silt and any obstruction to ensure free passage of water at all times. The debris shall be deposited in approved spoil dumps as directed by the Engineer

Partially blocked culverts shall be those with less than half of the barrel blocked.

Correct widths and slopes of the outlet drains shall be maintained. The gradient of the outlet drain shall be not less than 2 %.

All broken culvert barrels discovered in the course carrying out this activity shall be reported to the Engineer.

This activity shall be carried out before the rains, or as directed by the Engineer.

#### Work Method

The Contractor shall use **Labour** to carry out this item of work

#### Quality Control

The culverts shall be checked as free of debris to the satisfaction of the Engineer.

Measurement Unit: **m**

The measurement shall be the length of culvert, including the outlet drain, cleaned

#### Payment

The unit rate shall be full compensation for labour, tools and incidental costs required to carry out the work.

#### **08- 60 - 006/7/8/9/10 : Culvert Cleaning (Fully blocked):**

08 - 60 - 006	300mm dia;
08 - 60 - 007	450mm dia;
08 - 60 - 008	600mm dia;
08 - 60 - 009	900mm dia;
08 - 60 - 010	1200mm dia

This activity involves the cleaning of culverts of specified sizes including pipe barrels, the outlet/inlet structures, and the outlet drains, keeping them free of all debris, weed, silt and any obstruction to ensure free passage of water at all times. The debris shall be deposited in approved spoil dumps as directed by the Engineer

Fully blocked culvert shall be those with greater than half of the barrel blocked.

Correct widths and slopes of the outlet drains shall be maintained. The gradient of the outlet drain shall be not less than 2 %.

All broken culvert barrels discovered in the course of carrying out this activity shall be reported to the Engineer.

This activity should be carried out before the onset of the rains, or as directed by the Engineer.

#### Work Method

The Contractor shall use **Labour** to carry out this item of work.

### *Quality Control*

The culverts shall be checked as free from debris, to the satisfaction of the Engineer.

Measurement Unit:        m

The measurement shall be the length of culvert, including the outlet drain cleaned.

### *Payment*

The unit rate shall be full compensation for labour, tools and incidental costs required to carry out the work.

### **Supply and Installation of Concrete Pipe Culverts**

**08-60-031        600 mm surrounds**

**08 – 60-33 `    900 mm surrounds**

The Contractor shall supply, lay and join concrete pipes to form culverts, including the concrete bedding; haunching or surrounds; and backfilling, in accordance with the Drawings for the Type and diameter specified in the Contract or directed by the Engineer.

The pipes shall be of Class 20/20 concrete, at least 28 days cured, and manufactured on site or procured from a supplier approved by the Engineer and preferably ogee jointed. The pipes shall be laid on a bedding of Class 15/20 concrete of dimensions as shown on the Drawings and jointed with cement mortar 1:4.

The culvert gradient including the outlet shall be a minimum 2%.

The pipes shall be surrounded with Class 15/20 concrete to the dimensions shown on the Drawings or as directed by the Engineer.

Backfilling shall be carried with approved material and compacted in layers not exceeding 150 mm loose depth and placed evenly on each side of the pipe. Ramps shall be shaped to achieve a minimum overfill of 75% of the pipe diameter, and shall be tapered back on the carriageway to provide a gradual approach, as directed by the Engineer.

If the Contractor wishes to construct culverts on site, using inflatable or collapsible forms the Engineer's approval shall first be sought for the proposed working method.

On completion the inside of the culvert shall be smooth, without displaced joints or other obstructions and true to line and level.

The Contractor shall use **Labour** and appropriate compaction **Equipment** to carry out this item work

Work Method:            **LM-MB**

#### Quality Control

- Concrete quality shall be checked for cracks, honey combing, and other defects.
- Before the pipes are laid, the gradient of the concrete bedding shall be checked and shall not be less than 2%
- The joints shall be checked to see that they have been properly made.

Measurement Unit: m

The measurement shall be in linear metres of the installed Type and size of culvert specified, measured net according to the Drawings.

#### Payment

The unit rate shall be the full compensation for labour, tools, materials, equipment and any other incidentals that may be required in carrying out the work.

#### **08-60-030 Excavate in soft material for culverts**

These activities should be done in accordance with Bill 8, sub clauses 8.01 to 8.20 in the Standard Specifications for Roads and Bridges 1986.

The Contractor shall use both **Labour** and appropriate **Equipment** to carry out this item.

Work Method: **LM-MB**

#### Quality Control

- The workability and mix of concrete for the classes 15/20 and 20/25 shall be checked using the slump test and shall have a slump limit as directed by the Engineer.
- The laying and joining of the culverts shall be subject to the approval of the engineer.

Measurement Unit: m

The measurement shall be the length of culvert laid.

#### **Payment**

The unit rate shall be the full compensation for labour, tools, materials, formwork, equipment and other incidentals that may be required in carrying out the work.

#### **08- 70- 001:     Head Wall Repair - Masonry**

This activity involves the repairs to damaged head walls and wing walls built in masonry.

Where directed by the Engineer, the masonry walls shall be inspected and loose or missing stone re-secured or replaced. Damaged pointing shall be repaired with cement mortar 1:4 and finished flush with the stonework.

##### *Work Method*

The Contractor shall use **Labour** to carry out this item of work

##### *Quality Control*

- The stability of the walls and the pointing shall be to the satisfaction of the Engineer.

Measurement Unit:     No

The measurement shall be the number of walls repaired as directed by the Engineer.

##### *Payment*

The unit rate shall be full compensation for labour, materials, tools, and incidental costs required to carry out the work.

#### **08-70-002       Headwall Repair - Concrete**

The activity involves the repairs to damaged concrete headwalls and wingwalls, and to inlet/outlet concrete aprons. Concrete walls shall be inspected and repair works carried out as instructed by the Engineer to include breaking out and replacement of damaged concrete with similar material, and the rendering of open texture areas with cement mortar 1:4. Broken wall sections shall be re-built in 20/20 (1:2:4) concrete within formwork erected on the correct lines and levels in accordance with the Standard Drawings. Areas of new concrete and mortar shall be protected from direct sunlight and kept moist for 3 days.

##### *Quality Control*

The work shall be carried out to the satisfaction of the Engineer.

Measurement Unit:     No

The measurement shall be the number of walls/aprons repaired.

## Payment

The unit shall be full compensation for labour, materials, tools, and incidental costs required to carry out the work.

<b>08 - 70 - 008:</b>	<b>Scour Check Repair - masonry</b>
<b>08 - 70 - 009:</b>	<b>Scour Check Repair - wooden</b>
<b>08 - 70 - 010:</b>	<b>Scour Check Repair - concrete</b>

This activity involves the repair of Scour Checks using stones or wooden stakes or concrete. The construction details shall be shown in the Drawings or as instructed by the Engineer.

Scour checks shall be inspected and the repairs carried out as directed by the Engineer, which shall include replacement of missing or broken stonework and stakes; and the repair of damaged concrete, to the original lines, levels, and Specifications.

## *Work Method*

The Contractor shall use **Labour** to carry out this item work.

## Quality Control

### **EB**

The sizes of the stakes and stones used shall be as the original construction.  
The shape of the scour check shall be checked using the scour check template.

Measurement: No.

The unit rate of measurement shall be the number of scour checks repaired.

## Payment

The unit rate shall be full compensation, for labour, tools, materials, and incidental costs required for carrying out the work.

## **08- 70- 011                      Stone Pitching Repair**

This activity involves the repair of stone pitching on slopes, in inlet/outlet aprons and access drifts. The stone pitching shall be inspected and repairs carried out as directed by the Engineer, including the replacement and re-bedding of missing or loose stones; the repair of mortar jointing; and the cleaning out of weepholes, as required. All work shall be to the lines and levels of the original construction with new stonework and mortar being flush with the adjacent materials.

#### Work Method

The Contractor shall use **Labour** to carry out this work

#### *Quality Control*

The work shall be carried out to the satisfaction of the Engineer.

Measurement Unit:  $m^2$

The measurement shall be the net surface area of the repairs.

#### Payment

The unit rate shall be full compensation, for labour, tools, materials, and incidental costs required to carry out the work.

### **08- 80- 004                      Drift Maintenance – desilting**

This activity involves the removal of debris, silt and any vegetation from drifts and causeways. The debris shall be deposited away from the drift in approved spoil dumps.

This activity shall be carried before the rains, or as directed by the Engineer.

#### Work Method

The Contractor shall use **Labour** to carry out this item of work

#### *Quality Control*

The work shall be carried out to the satisfaction of the Engineer.

Measurement Unit:  $m^3$

The measurement shall be the volume of debris or silt removed calculated as the product of length , width and measured depth of the affected section of drift.

#### Payment

The unit rate shall be full compensation for labour, tools, and incidental costs required to carry out the work.

### **08-80-005                      Drift Repairs – Concrete**

This activity involves the repair of concrete drifts, including the removal of loose or broken concrete, cutting back damaged areas to sound surfaces and repairing with concrete of similar Class to the original.



The drift shall be inspected and necessary repairs shall be instructed by the Engineer. Holes and voids shall be cleared of debris, loose material and dust, and shall be well watered before the new concrete is placed. The new concrete shall be firmly rammed against the existing surfaces and finished flush with the surrounding materials. The surface of the repair shall be protected from direct sunlight and kept moist for 3 days. Concrete shall be Class 20/20 unless otherwise directed by the Engineer.

#### Quality Control

The work shall be carried out to the satisfaction of the Engineer.

Measurement Unit:      m<sup>3</sup>

The measurement shall be the volume of concrete used for the repair.

#### Payment:

The unit rate shall be the full compensation for labour, tools, materials and incidental costs required to carry out the work.

### **08-80-003: Gabions**

The Contractor shall provide and install Gabions as retaining walls and anti-erosion structures at locations shown on the Drawings or as directed by the Engineer.

Gabions shall include mattresses and boxes and for purposes of construction, measurement and payment, no distinction shall be made between them.

Gabions shall be 'Maccaferri' boxes or 'Reno' mattresses or equivalent approved by the Engineer.

The surfaces on which the Gabions are to be laid prior to being filled with rock shall be levelled to the depths and dimensions shown on the Drawings or as directed by the Engineer.

Gabion boxes shall be tied together with 3 mm galvanised binding wire securing all edges at 150mm intervals.

#### Work Method

The Contractor shall use **Labour** to carry out this item.

#### Quality Control

The placing and tying of the Gabions shall be approved by the Engineer before filling commences.

Measurement Unit:      No

The measurement shall be the number of Gabion boxes installed.

## **Payment**

The unit rate shall be the full compensation for labour, materials, and any incidental item costs necessary to carry out the work.

### **08-80-003 : Rockfill to Gabions**

The Contractor shall provide selected rock, crushed if necessary, and carry out the packing and compacting of the rock inside the Gabion boxes.

The boxes shall be filled in layers from the sides towards the middle in an interlocking stone matrix to prevent deformation and bulging. The interior and top layers of the boxes shall be hand packed with smaller stone to form a tightly compact structure and rammed in place. Care shall be taken to ensure that each layer of boxes is filled evenly and to a level surface before the next course of boxes is placed.

#### **Work method**

The Contractor shall use **Labour** to carry out this activity.

#### **Quality Control**

The filling and compaction of the stones in the Gabion boxes shall be approved by the Engineer.

Measurement Unit      m<sup>3</sup>

Rockfill to Gabions shall be the volume of Gabions filled.

## **Payment**

The unit rate shall be the full compensation for labour, tools, materials and incidental costs required for carrying out the work.

## SECTION 10:

### BILL 10: GRADING AND GRAVELLING

#### Scope:

Grading covers the work of reinstating the road carriageway to the correct camber by removing the high points and filling gullies, corrugations, and wheel ruts to restore a smooth running surface.

Grading can either be done by labour (Manual Reshaping) or by Machine (Motorized grading or towed grading).

Manual reshaping is preferable where there is sufficient labour. For existing roads with side drains light manual reshaping should be used as defined in 10-50-004. Heavy manual reshaping should be used for roads that have deteriorated to such an extent that the drains and carriageway need to be re-instated. Heavy Manual Reshaping is defined under Bill 5 – Earth Works.

Light grading is carried out on good and fair roads as a maintenance activity while heavy grading is for re-establishing a road in poor or very poor condition.

Gravelling consists of the excavation; loading, hauling, dumping, spreading and compacting using approved equipment of gravel wearing course material on the formation of the road carriageway. Gravel shall include lateritic gravel, quartzitic gravel, calcareous gravel, decomposed rock, soft stone coral rag, clayey sand and crushed rock.

The material may be obtained from quarries, borrow pits or excavation in cuttings as directed by the Engineer. Gravel material shall conform to the requirement given in Table 10.1

Table 10.1: Requirement for Gravel Wearing Course

GRADING REQUIREMENTS	
Sieve (mm)	% by Weight Passing
40	100
28	95 – 100
20	85 – 100
14	65 – 100
10	55 – 100
5	35 – 92
2	23 – 77
1	18 – 62
0.425	14 – 50
0.075	10 – 40

PLASTICITY INDEX REQUIREMENTS PI		
Zone	Min	Max
WET: Mean annual rainfall > 500mm	5	20
DRY: Mean annual rainfall < 500mm	10	30

BEARING STRENGTH REQUIREMENTS		
Traffic Commercial VPD	CBR	DCP Equivalent mm/Blow
>15	20	11
<15	15	14

For "Quarry Waste" gravel stones of maximum dimension 80mm may be permitted

CBR at 95 % MDD, Modified AASHTO and 4 days soaking
Lower quality material (CBR 15) may be accepted if no better material can be found

The Engineer shall approve quarries and the extent of their exploitation. The possible quarries shall be shown to the Contractor prior to commencement of the Works. The Contractor shall be responsible for the acquisition of the quarry rights and shall conduct respective negotiations with landowners and affected communities.

Alternative sources of gravel material whose quality can be shown to be in compliance with the specification requirements may be used, with the approval of the Engineer. The Contractor is deemed to have included in his rates for the provision of the gravel material.

**10-60-001: Provide Gravel Wearing Course (Excavation, Free haul, spreading and Compaction of Gravel)**

**Excavation of Gravel**

Gravel shall be excavated from quarries approved by the Engineer, and the Contractor shall inform the Engineer if the quality/availability of the gravel changes during the course of excavation.

Stones and boulders with one dimension greater than 80mm shall be removed from the excavated gravel and deposited outside the quarry at locations approved by the Engineer. Such stones and boulders may be reused in other parts of Works with the approval of the Engineer.

Excavation and loading shall normally be by labour unless, at the request of the Contractor, the Engineer allows the use of equipment.

The Contractor shall use **Labour** and/or **Equipment** to carry out this work, as directed by the Engineer.

Work Method: **LB or MB**

Quality Control:

- Oversize stones and boulders shall not be loaded for haulage to the road.
- Areas containing deleterious material shall not be excavated.

**Free haul, spreading and Compaction of Gravel**

Free haul involves the transportation of gravel material for the first 1.5 km from the quarry. The Contractor shall spread and compact gravel material, in a manner to ensure a uniform thickness of the layer across the

full width of the carriageway and shaped to the specified camber. Spreading also includes the removal of any oversized stones or boulders, which cannot be broken down to the required size, to spoil dumps. Gravel shall be spread within 24 hours of off-loading.

Compaction of the gravel material shall be carried out from the carriageway edges to the centerline by overlapping passes of the compaction equipment. The number of passes shall be as directed by the Engineer dependent upon the equipment used and the material being compacted. Unless otherwise instructed the moisture content of the material shall be within  $\pm 2\%$  of optimum

Where additional moisture is required water shall be applied in an even manner and the rate of application shall be such that no transverse or longitudinal flows occur.

The Engineer may instruct the Contractor to carry out density tests on the compacted material to ensure that an acceptable standard has been achieved.

The Contractor shall use Equipment for haulage and **Labour** for spreading unless the Engineer instructs otherwise.

Work Method: **LB-MB**

Quality Control:

- The gravel surface width shall be checked at 100m intervals and shall have a tolerance of  $\pm 50\text{mm}$
- Trial holes shall be dug as directed by the Engineer to check the gravel thickness and shall have a tolerance of  $+ 5\text{mm} / - 0\text{mm}$
- The camber shall be checked at 50m intervals and the maximum tolerance shall be  $\pm 1\%$
- The longitudinal profile shall be checked after the compaction of each load to ensure a smooth surface with no corrugations or depressions, tolerance of  $\pm 10\text{mm}$ .
- Compaction shall show no movement of material under the roller, minimum of 6 passes.
- Compaction test standard shall be 95% MDD (AASHTO T180)

Measurement Unit:  $\text{m}^3$

The measurement shall be the volume of compacted gravel surfacing measured net according to the Drawings and shall include the excavation and the 1.5km 'free' haul distance

Payment

The unit rate shall be the full compensation for labour, tools, equipment and incidental costs required for carrying out the work.

## 10 CARRIAGEWAY REPAIR WORKS (GRAVEL)

Scope:

This section covers all routine maintenance works on the gravel carriageway and includes items such as pothole patching, and reshaping of the carriageway, using labour.

### 10- 50- 006                      Light Manual Reshaping (Potholes, Ruts and Gullies)

Description:

This activity involves the removal of all unsuitable/degraded material from the pothole, rut or gully until firm ground is reached, and filling with approved material and ensuring that the area is free draining.

For earth roads material from the side drains may be used.

For gravel roads the gravel shall be obtained from the stacks placed at intervals along the road for this purpose.

The fill material shall be watered, mixed and compacted using suitable tampers to a finished level 25mm above the surrounding road surface.

This activity shall be carried out before and after the rains, or as directed by the Engineer.

Work Method

The Contractor shall use **Labour** to carry out this work

Quality Control

- The quality of fill material shall be approved by the Engineer
- The minimum compaction to be applied shall be such that no rammer imprint on the surface shall be seen.

Measurement Unit:                      m<sup>3</sup>

The measurement shall be total volume of materials used for the repairs.

Payment

The unit rate shall include full compensation for labour, tools, materials, and incidental costs necessary to carry out the work.

#### **10- 50- 009: Light Manual Reshaping (Grub edge and Reshape Carriageway)**

##### *Description:*

This activity involves trimming the edge of the carriageway, grubbing grass from the carriageway and reshaping of the camber of the road to the original standard and shape. No grass shall be grubbed from the shoulders, but it shall be cut to a maximum height of 50mm.

For earth roads materials from the side drains may be used to reshape the carriageway. Where additional suitable material is required to reinstate the camber to the required shape, this material shall be obtained from approved sources nearest to the final deposition area.

##### *Work Method*

The Contractor shall apply **Labour** methods to carry out this item.

##### *Quality Control*

- The width of the carriageway including the shoulders shall be checked at 100m intervals with tolerance of +50mm or -20mm
- The camber shall be checked using camber board at 50m intervals and shall have a tolerance of +/- 1%

*Measurement Unit:*  $m^2$

The measurement shall be the area of carriageway shaped.

##### *Payment*

The unit rate shall be the full compensation for labour, tools and incidental costs required for carrying out the work.

## SECTION 11: SHOULDER MAINTENANCE AND REPAIR

### 11-50-001: Shoulder Grading

Where directed by the Engineer the Contractor shall reinstate or re-form the shoulders of the road using either a Towed or Motor grader.

Pegs 400 to 500mm long shall be placed at 10 to 20 m intervals on the edge of the carriageway. Suitable material from the front slope of the side drain shall be bladed and spread on the shoulders (and, if appropriate the carriageway), unless otherwise directed by the Engineer, and the shoulders re-formed to the cross-section dimensions, as shown in Table 10.2. Compaction shall be achieved with the wheels of the equipment used, or by other approved means.

Table 10.2: Overall width ditch

Road Category	Carriageway width	Overall width to front of Ditches
A/B/C + Secondary Roads	6.0 m	8.4 m
D/E + Minor Roads	5.4 m	7.8 m
RAR Roads	4.5 m	6.5 m
Minor/RAR roads with insufficient widths or Temporary	3.5 m	5.5 m

#### Work Method

The Contractor shall use Equipment to carry out this item.

Measurement Unit: km

The measurement shall be the length of shoulder reformed.

#### Payment

The unit rate shall be the full compensation for labour, tools, equipment and incidental costs required for carrying out the work.



## SECTION 15: PAVED CARRIAGEWAY MAINTENANCE

- 15 – 50 – 001:            **Pothole Patching - hot mix**  
15 – 50 – 002:            **Pothole Patching - cold mix**

This activity involves the repair of potholes, which have developed on the surface of paved roads where there is no evidence of base failure. Potholes shall be defined as local failures usually round or oval in shape covering less than 4.0 sq. m and less than 100mm in depth. Repair of larger areas shall be defined as surface repairs.

The areas to be repaired shall be marked out into rectangular shapes. All failed areas shall be cut back to sound road material. The hole shall extend to the bottom of the base layer, and the sides shall be cut to form a vertical face. All unsuitable material shall be removed and deposited away from the road to the approval of the Engineer.

A prime coat of 60% cationic spray grade emulsion, shall be applied on all the sides and on the bottom of the prepared hole

Premixed bituminous material, similar to the existing surfacing shall be placed in the hole and compacted in two or more layers of regular thickness depending on the depth involved.

The final layer, prior to compaction, shall be overfilled by 20% of its depth. Compaction shall be carried out using a pedestrian vibrating roller, plate compactor or hand rammer as appropriate until the surface is level, with the surrounding material.

A minimum depth of 50mm shall be provided for the cationic premix bituminous backfill.

Premix proportions shall be as follows:

- |                    |                             |
|--------------------|-----------------------------|
| - Sand             | 38%                         |
| - 6.7mm aggregate  | 57%                         |
| - Bitumen emulsion | 5% (bitumen content 60-65%) |

### Work Method

The Contractor shall use **Labour** and **Equipment** to carry out this item.

### Quality Control

- The quality of the repair material shall be to the approval of the Engineer.
- The patch shall be checked using a straight edge and shall be flush with other parts of the carriageway
- Compaction of the patch shall be checked such that no imprint of the compaction equipment is visible.

Measurement Unit: m<sup>3</sup>

The unit of measurement shall be the volume of material used in the repair.

#### Payment

The unit rate for this item shall include the full compensation, labour, tools, materials, equipment and incidental costs required to carry out the work.

### **15 – 50 – 004: Road Edge Repairs**

This activity involves the repair to the edges of paved carriageways, including the rebuilding of pavement layers and the shoulders.

All soft material along the surface edge shall first be removed. The pavement layers shall be rebuilt and thoroughly compacted, in similar materials to the existing pavement. The pavement shall be similarly rebuilt against sound material of the existing pavement, and thoroughly compacted. The top of the compacted fill shall be between 30mm to 50mm below the estimated new surface level.

A trench (100 mm wide x 100mm deep) shall be dug along the surface edge in order to reinforce the new edge. The trench shall be swept clean of all loose material and primed with bitumen emulsion.

A trench shall be filled with cold premix and compacted in layers of a 50mm maximum thickness, finishing flush with the existing surface and maintaining the cross fall. The repaired edge shall be finished off by sheet patching with a light sand layer to absorb surplus bitumen.

#### Work Method

The Contractor shall use **Labour** and **Equipment** to carry out this item.

#### Quality Control

- The edge repair shall be checked using straight edge to be flush with other parts of the carriageway
- Compaction of the edge repair shall be such that no imprint of the compaction equipment is visible.

Measurement Unit: m<sup>2</sup>

The measurement shall be the area of the repair including the bituminous edge and shoulder.

#### Payment

The unit rate shall be full compensation for labour, tools, materials, equipment, and incidental costs required to carry out the work.

### **15 – 60 – 001 Spot Sealing - (Fine cracks)**

This activity involves the repair of alligator cracking (maximum width 3mm) on the carriageway. The area to be sealed shall be marked in chalk and be clean and dry. The bituminous binder shall be as specified by the Engineer and shall be applied with a spray lance or other approved method. Distribution rates shall be 1.5kg/m<sup>2</sup> for bitumen emulsion.

Coarse sand, up to 5mm, shall then be spread over the whole surface.

Crack sealing shall be carried out during the warm and dry weather.

#### **Work Method**

The Contractor shall use **Labour** and **Equipment** to carry out this item.

#### **Quality Control**

- The quality of the repair work shall be to the approval of the Engineer.
- The area of spot sealing shall be checked to be free of cracks.

Measurement Unit: m<sup>2</sup>

The measurement for this item will be the area of fine cracks repaired.

#### **Payment**

The unit rate shall include full compensation for materials, labour, tools, equipment, and incidental costs required to carry out the work.

### **15-60-002 Crack Sealing**

This activity covers the repair of transverse or longitudinal cracks wider than 3mm on the surface of a surface dressed or bituminous carriageway or shoulder.

The cracks and the surrounding road surface shall be clean and dry. The cracks shall be filled with hot cut back bitumen.

The bitumen shall be distributed using a watering can and shall follow the line of the crack, with the nozzle or spout held close to the road surface, keeping the width of the spread as narrow as possible. Coarse sand, up to 5mm, or crusher dust shall be spread over the strip of the binder.

All crack sealing shall be carried out during the warm and dry weather.

## Work Method

The Contractor shall use **Labour** and **Equipment** to carry out this item.

## Quality Control

- The sealing shall be carried out to the satisfaction of the Engineer.
- The area of sealing shall be checked to be free of cracks.

Measurement Unit: m

The measurement shall be the length of cracks sealed.

## Payment

The unit rate shall include full compensation for materials, labour, tools and incidental costs required to carry out the work.

### **15 – 80 – 001 to 005                      Base repairs**

This activity involves the repair of localised failures of the pavement layers, including the removal of the deformed areas and reconstructing the pavement and surfacing layers including treatment of the bottom of the excavation prior to backfilling.

The areas to be repaired shall be marked and cut out into rectangular shapes. All failed area shall be cut back to sound road material. The sides shall be dressed so that they are at 60° to the horizontal, and the bottom of the hole shall be compacted to a density of 93 % AASHTO T180. All unsuitable material shall be removed and deposited away from the road as directed by the Engineer.

For a bituminous base a prime coat of 60% cationic spray grade emulsion shall be applied to all vertical surfaces and on the bottom of the prepared hole.

The material for the base repair shall be graded crushed stone, dense bitumen macadam or neat gravel, according to the original base material, and shall be compacted in layers as directed by the Engineer.

### **15-80-001:              Graded Crushed Stone**

“Graded crushed stone” shall be crushed stone with a smooth grading curve, which is within the specified envelope. The stone class shall be given in the special Specifications or as directed by the Engineer.

## Work Method

The Contractor shall use **Labour** and **Equipment** to carry out this item of work.

## Quality Control

- The repair shall be carried out to the approval of the Engineer.

- The repair shall be checked with a straight edge and shall be flush with other parts of the carriageway laterally and longitudinally.
- Compaction of the patch shall be checked such that no imprint of the compaction equipment is visible

Measurement Unit                      m<sup>3</sup>

The measurement shall be the volume of graded crushed stone compacted in the repair measured in-site.

#### Payment

The unit rate for this item shall include the full compensation for the materials, tools, labour, equipment and incidental costs, required to carry out the work.

### **15-80-002:      Dense Bitumen Macadam**

Dense bitumen macadam shall be a hot-mixed, hot-laid plant mixture of well-graded aggregate and penetration grade bitumen, as specified for road-base material.

#### Work method

The Contractor shall use **Labour** and **Equipment** to carry out this item.

#### Quality Control

- The repair shall be carried out to the approval of the Engineer
- The repair shall be checked with a straight edge and shall be flush with other parts of the carriageway laterally and longitudinally.
- Compaction of the patch shall be checked such that no imprint of the compaction equipment is visible.

Measurement Unit:                      m<sup>3</sup>

The measurement shall be the volume of dense bitumen macadam compacted on the road measured in-situ.

#### Payment

The unit rate for this item shall include the full compensation for the materials, tools, labour, equipment, and incidental costs required to carry out the work.

### **15-80-005:      Neat Gravel**

“Gravel “ includes lateritic gravel, quartzitic gravel, calcareous gravel, soft stone, coral rag, clayey sands, decomposed rock, crushed rock or a combination of any of these materials.

#### Work method

The Contractor shall use **Labour** and **Equipment** to carry out this item of work

#### Quality Control

- The repair shall be carried out to the approval of the Engineer.
- The repair shall be checked with a straight edge and shall be flush with other parts of the carriageway laterally and longitudinally.
- Compaction of the patch shall be checked such that no imprint of the compaction equipment shall be visible.

Measurement Unit: m<sup>3</sup>

The measurement shall be the volume of gravel compacted on the road measured in-situ.

#### Payment

The unit rate for this item shall include the full compensation for the materials, labour, tools, equipment, and incidental costs required to carry out the work.

### SECTION 17: BRIDGE MAINTENANCE

**17 - 50 - 001: Cleaning and Clearing - Deck**

**17 - 50 - 002: Cleaning and Clearing - Riverbed**

#### Description

This activity involves the following tasks,

- Brooming of the deck and sidewalks to clear all loose soil, dirt, aggregate, debris, and removal of the same from site
- Removal of all dirt and stones lodged between deck planking
- Clearance of weep holes of dirt and debris
- Removal of all dirt and debris in joints between beams and abutments or any point under bridge
- Removal of debris lodged at pier and abutments or any point under the bridge
- Removal of trees and bushes growing under the bridge and directly upstream and downstream and disposing the material away from the bridge and stream
- Cleaning of any signs or reflectors on or at the bridge.
- Removal of termites tunnels in the vicinity of timber bridges and soaking the ground with chemical solutions against wood destroying insects.

#### Work Method

The Contractor shall use **Labour** to carry out this item.

### *Quality Control*

- The bridge deck shall be checked to be clean and free of dirt and debris
- The passage below the deck shall be checked to be free of obstructions

Measurement Unit:                      Provisional Sum

The measurement of work shall be on a Dayworks basis.

### **Payment**

Payment shall be made for the labour and material instructed by the Engineer to be used on the work.

## SECTION 20: ROAD FURNITURE REPAIR AND MAINTENANCE

### 20-50- 001: Traffic Sign Maintenance

This activity involves all the tasks required to ensure that the road signs and signposts are in a clean, properly aligned, vertical and secure condition; the replacement of missing or broken bolts, nuts or other fixings and the tightening of the same. The maintenance shall also extend to securing any loose posts by the re-compacting or removal of any unsuitable material surrounding the posts, importing and compacting of suitable material to render the post secure.

#### *Work Method*

The Contractor shall use **Labour** to carry out this item.

#### *Quality Control*

- The signs shall be clean and in vertical position
- The fixings shall be hand checked to be tight

Measurement Unit: No.

The measurement shall be number of signs maintained.

#### *Payment*

The unit rate shall be the full compensation for labour, tools, material and incidental costs required to carry out the work.

### 20-50- 003: Guardrail Repair

This activity involves the repair of Guardrails (including rails, posts and fixings) to a properly aligned, vertical and secure condition. The repair shall include securing any loose posts by re-compaction or removal of any unsuitable material surrounding the post, importing and compaction of suitable materials to render the posts secure, and the re-fixing of the rails.

#### *Work Method*

The Contractor shall use **Labour** to carry out this item.

#### *Quality Control*

- The guardrails shall be checked as being properly aligned secure and in a vertical position
- The fixings shall be hand checked to be firmly fixed



Measurement Unit: m

The measurement shall be the length of Guardrail repaired  
Payment

The unit rate shall be the full compensation for labour, material, tools, and incidental costs required to carry out the work.

#### **20- 50- 004:     Marker Posts Replacement**

This activity involves the replacement of kilometre stones and culvert marker posts

The Engineer shall determine the location of the marker stones and posts. They shall be set in a simple excavation and backfilled with soil. The depth of the excavation shall be determined on the site, depending on the size and shape of the marker stone or post.

##### *Work Method*

The Contractor shall use **Labour** to carry out this item.

##### *Quality Control*

- The posts shall be vertical and firmly bedded to the approval of the Engineer

Measurement Unit: No

The measurement shall be in number of marker posts.

Payment

The unit rate shall be the full compensation for labour, tools, posts, materials and incidental costs required to carry out the work.

#### **20-50-006:     Sign cleaning and repainting**

This activity involves the cleaning of road signs, reflectors and guideposts and repainting of sign supporting structures, rear panels of signs, kilometre posts and culvert markers. Surfaces to be painted shall be clean, dry and free from loose material.

##### *Work Method*

The Contractor shall use **Labour** to carry out this item of work

##### *Quality Control*

- The cleaning and painting shall be carried out to the approval of the Engineer

Measurement Unit: No

The measurement shall be in number of signs, reflectors, or guideposts cleaned or painted.

Payment

The unit rate shall be the full compensation for labour, materials, tools and incidental costs required to carry out the work.

## **SECTION 25: HIV/AIDS AWARENESS AND PREVENTION CAMPAIGN**

### **Scope:**

This section covers the Contractors obligations with regard to on-site HIV / AIDS awareness campaign and preventive measures that are to be instituted.

#### **25-50-001 HIV / AIDS Awareness Campaign**

The Contractor shall institute an HIV / AIDS awareness campaign amongst the workers for the duration of the Contract.

As part of the campaign the Contractor shall display AIDS awareness posters in all buildings frequented by workers employed on the Contract, where such buildings fall under the control of the Contractor.

In addition at least two of the Contractors vehicles regularly used on site shall display HIV / AIDS awareness posters. The posters shall be printed on gloss paper and shall be at least A1 size on buildings and A3 size or other approved size on vehicles. The message on the posters shall be supplied by the Employer through the Engineer.

Aids awareness shall also be included in the orientation process of all workers employed on the Contract.

Measurement Unit: month

The measurement shall be the calendar month or part thereof, measured over the duration of the campaign.

### **Payment**

The unit rate shall include full compensation for labour and material required for the provision of the item.

#### **25-50-002 AIDS Prevention Campaign**

The Contractor shall institute an HIV / AIDS prevention campaign amongst the workers for the duration of the Contract.

As part of the campaign the Contractor shall make condoms available to the workers. The Employer through the Engineer shall supply the condoms.

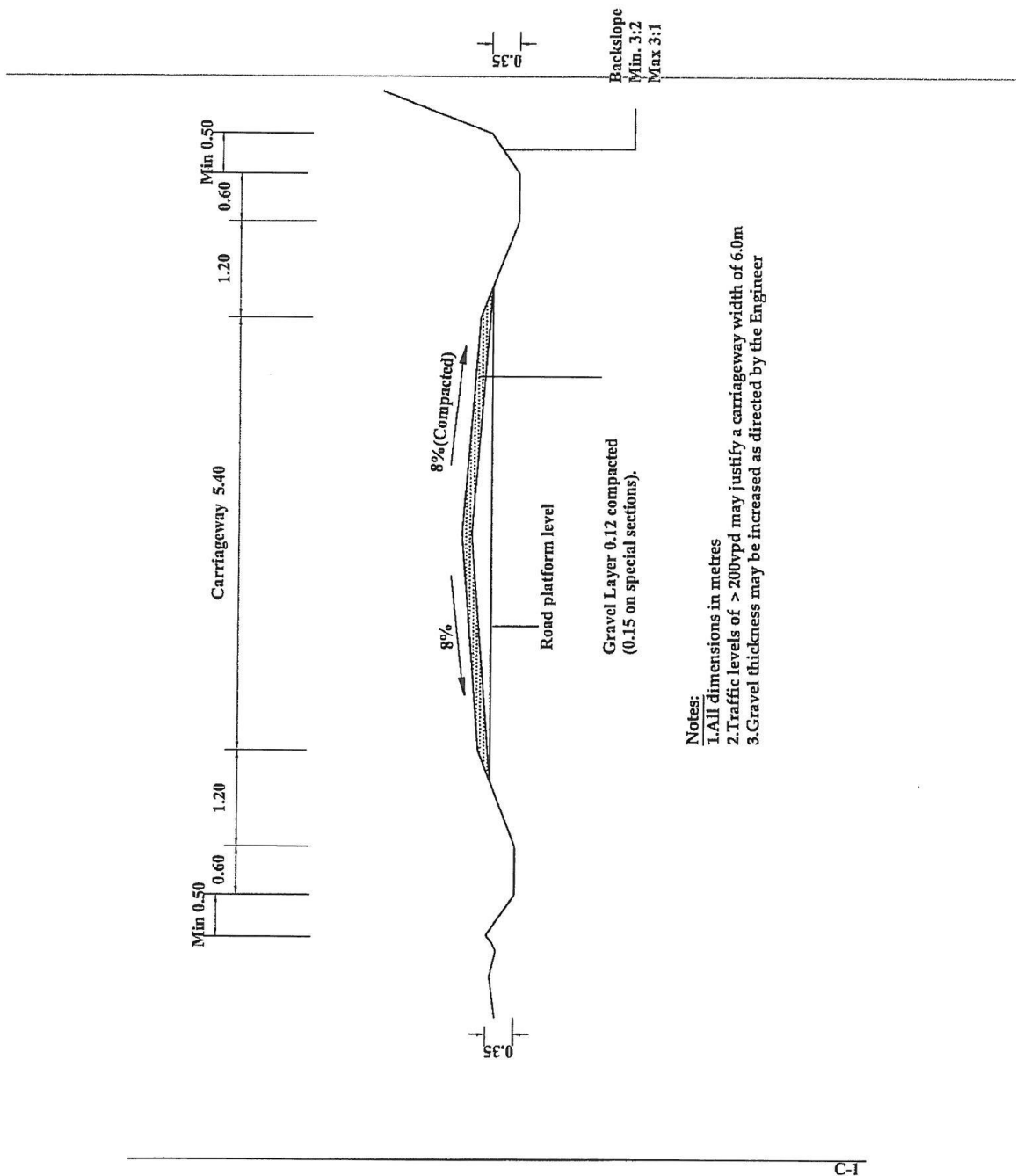
Measurement Unit: month

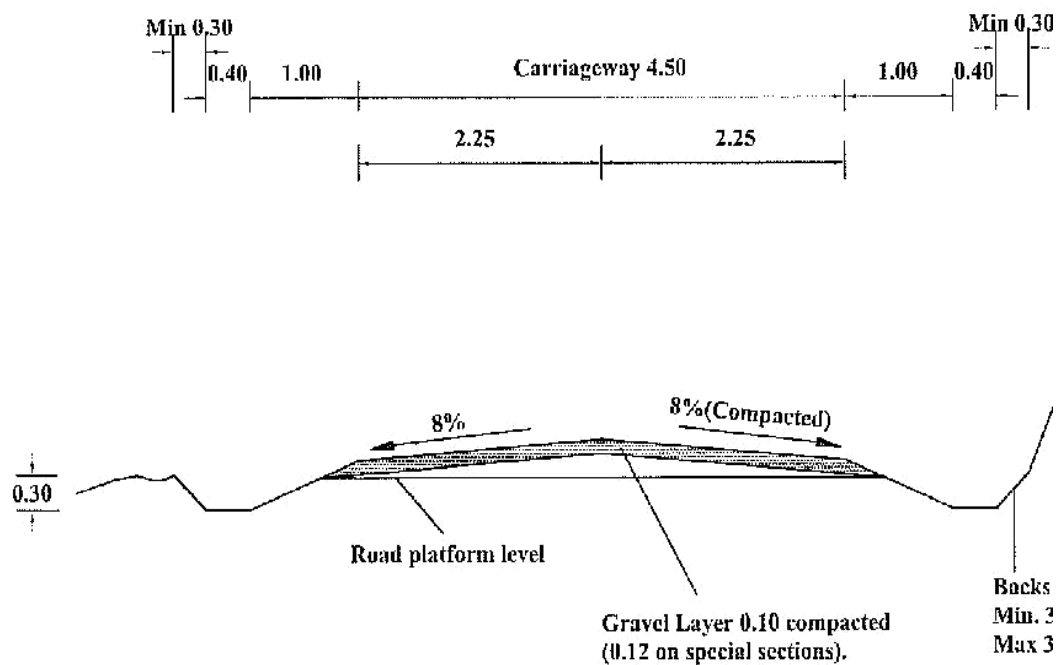
The measurement shall be the calendar month measured over the duration of the campaign.

### **Payment**

The unit rate shall include full compensation for labour and material including the distribution of condoms, required for the provision of the item.

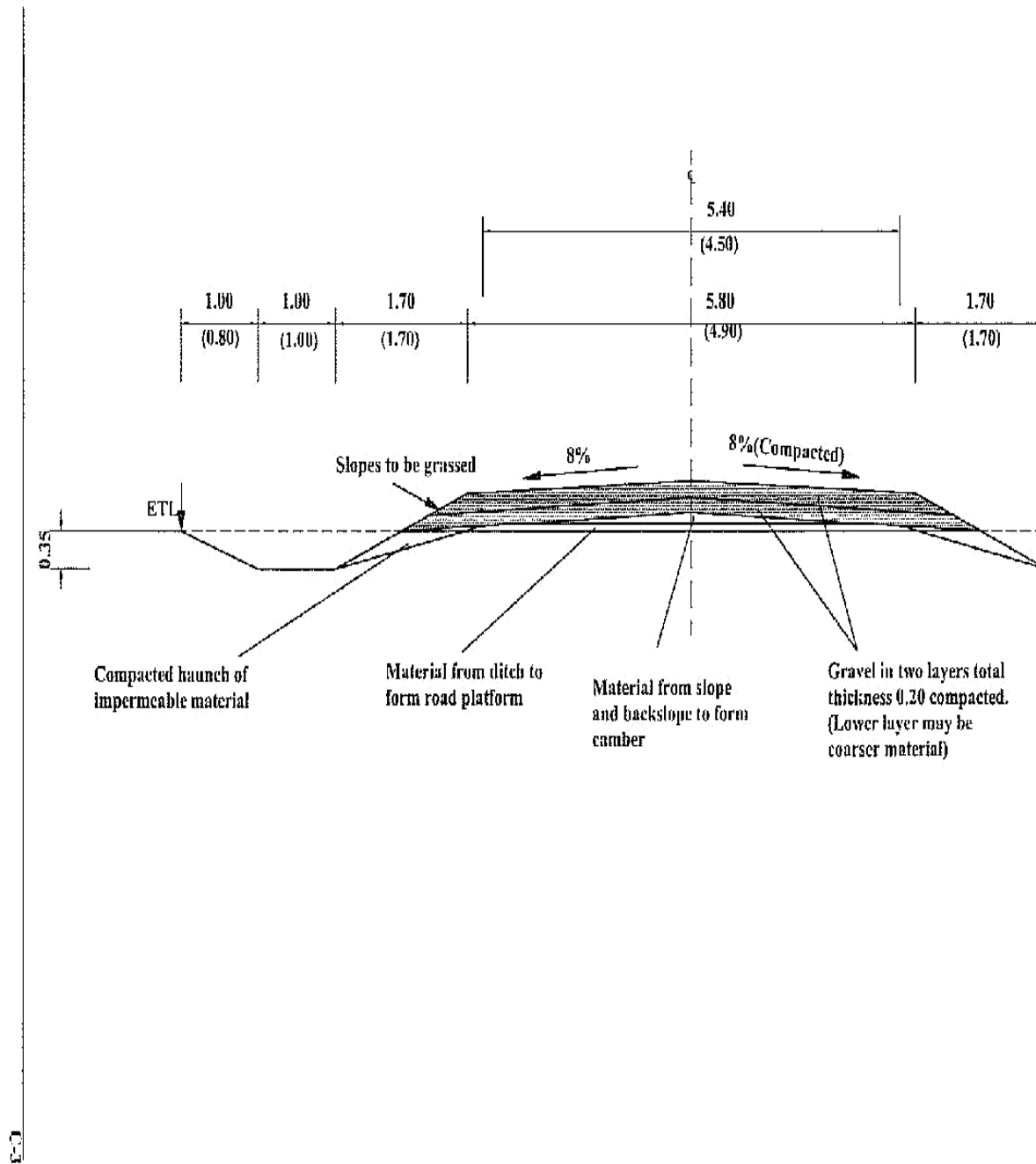
**FIGURE C.1-CROSS SECTION A (MINOR STANDARD CROSS-SECTION)**

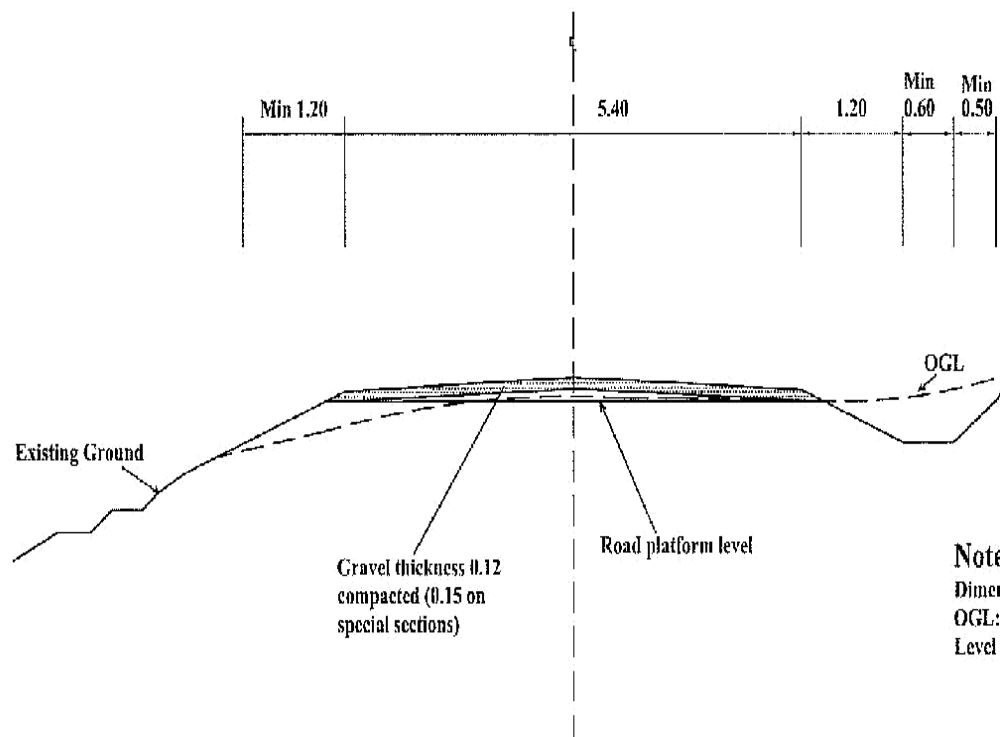


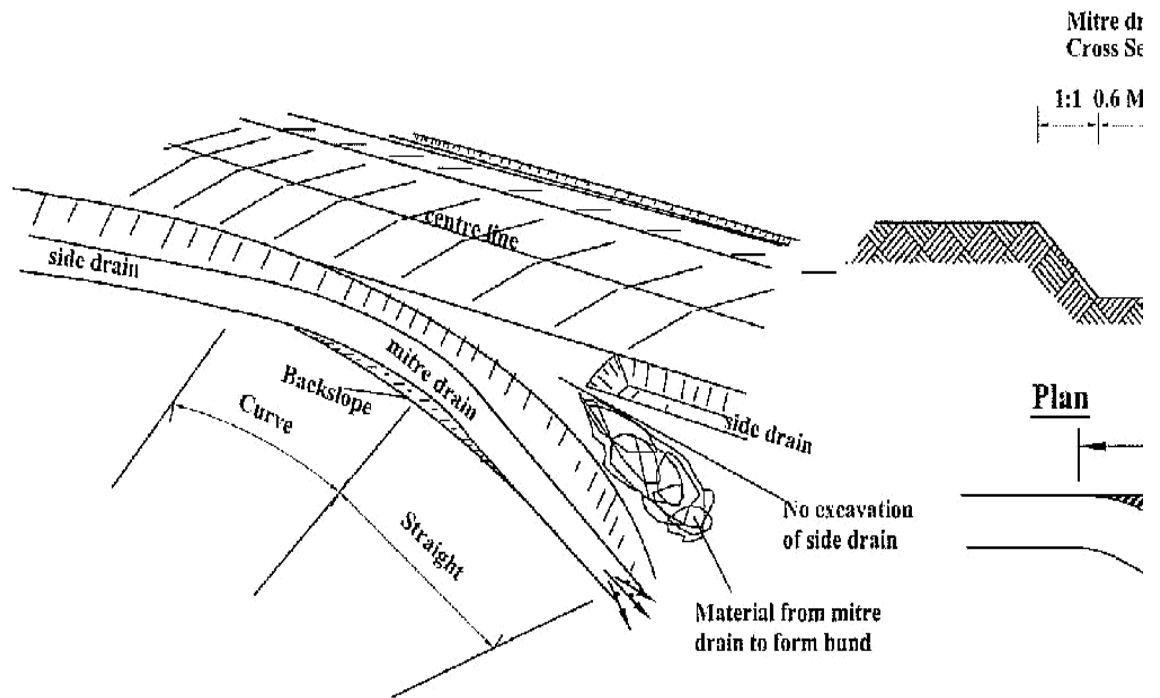


**Notes:**

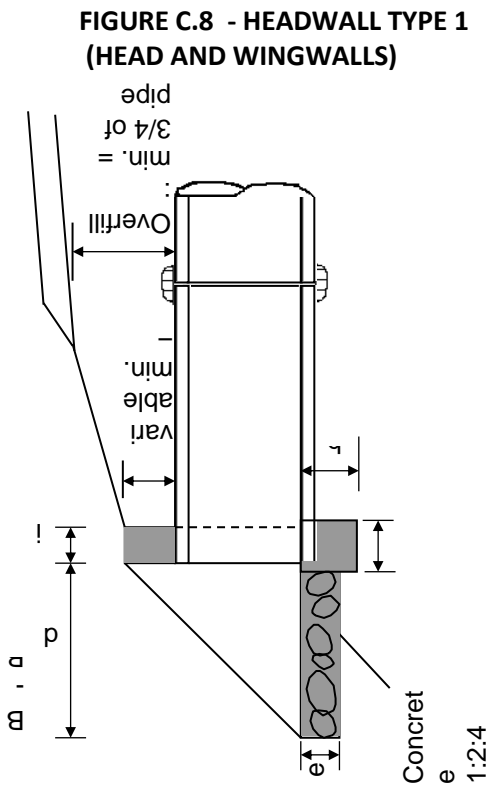
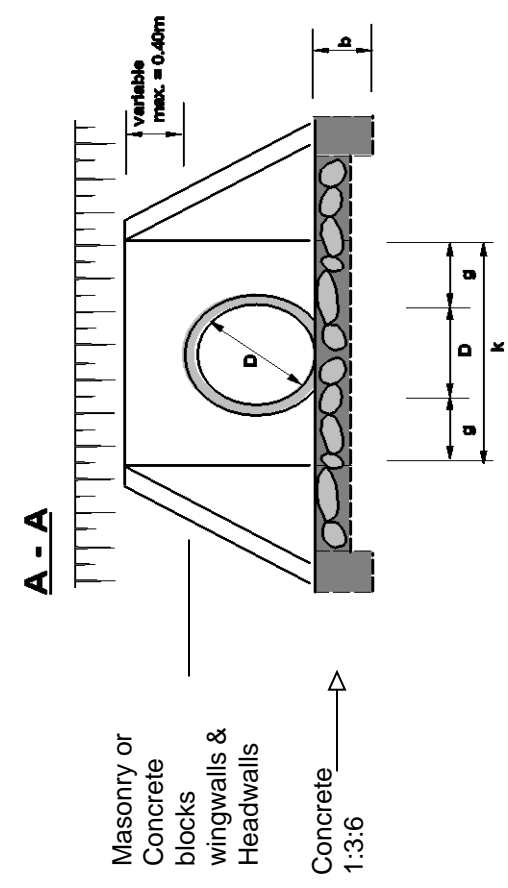
1. All dimensions in metres
2. Gravel thickness may be increased as directed by the Engineer





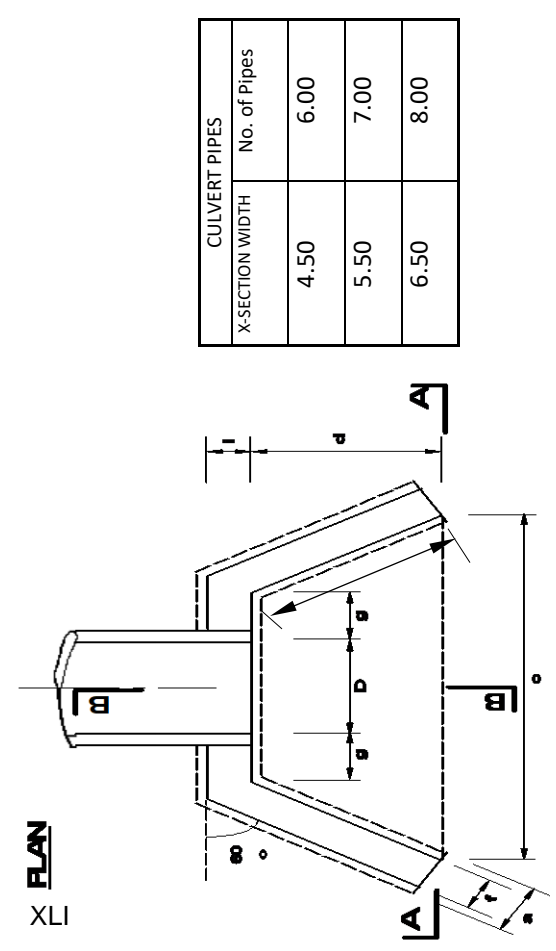






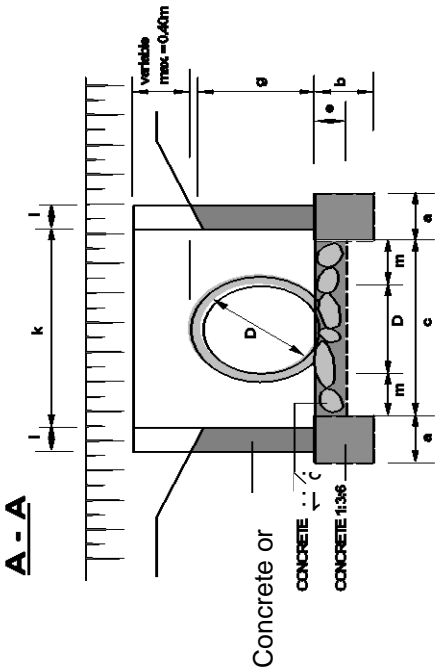
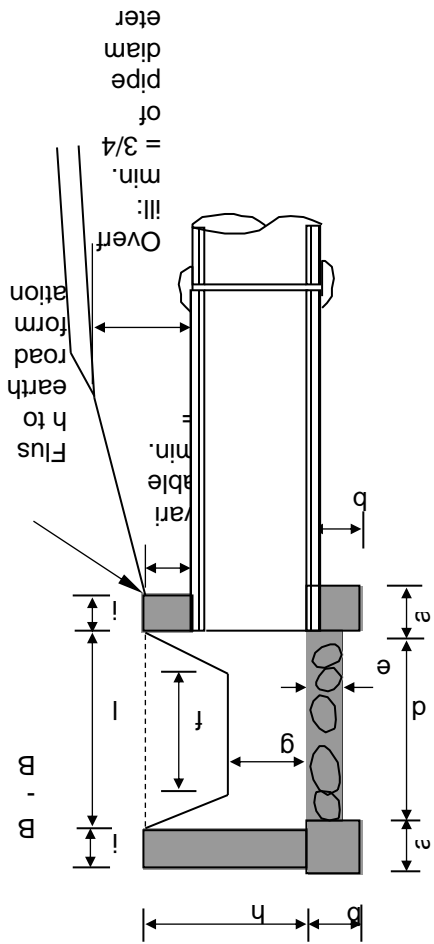
DIMENSIONS AND MATERIAL REQUIREMENTS

PIPE DIAMETER IN (M)	UNIT	TYPE A (CONCRETE BLOCKS)				TYPE B (STONE MASONRY)			
		450	600	900		450	600	900	
a	FOUNDATION	0.30	0.30	0.30		0.40	0.40	0.60	
b	FOUNDATION	0.30	0.30	0.40		0.30	0.30	0.40	
c	FOUNDATION	2.20	2.35	2.89		2.20	2.35	2.89	
d	APRON	1.00	1.00	1.20		1.00	1.00	1.20	
e	APRON	0.20	0.20	0.20		0.20	0.20	0.20	
f	WALL	0.20	0.20	0.20		0.40	0.40	0.40	
g	WALL	0.30	0.30	0.30		0.30	0.30	0.30	
h	WALL	1.15	1.15	1.39		1.15	1.15	1.39	
i	WALL	0.20	0.20	0.20		0.40	0.40	0.40	
k	APRON	1.05	1.20	1.50		1.05	1.20	1.50	
MATERIAL REQUIREMENT									
FOUNDATION									
(Concrete)	m <sup>3</sup>	0.3	0.32	0.51		0.4	0.42	1.03	
HEAD/WINGWALLS									
(Concrete/Masonry)	m <sup>3</sup>	0.4	0.47	0.67		0.8	0.93	1.35	
APRON									
(Concrete)	m <sup>3</sup>	0.33	0.36	0.53		0.33	0.36	0.53	



CULVERT PIPES	
X-SECTION WIDTH	No. of Pipes
4.50	6.00
5.50	7.00
6.50	8.00

FIGURE C.9 - HEADWALL TYPE 2 (DROP INLET)



DIMENSIONS AND MATERIAL REQUIREMENTS

PIPE DIAMETER IN (M)	UNIT	TYPE A (CONCRETE BLOCKS)			TYPE B (STONE MASONRY)		
		450	600	900	450	600	900
a	FOUNDATION	0.30	0.30	0.30	0.40	0.40	0.40
B	FOUNDATION	0.30	0.30	0.30	0.30	0.30	0.30
c	FOUNDATION	1.10	1.10	1.40	1.20	1.20	1.50
d	APRON	0.90	0.90	0.90	1.00	1.00	1.00
e	APRON	0.20	0.20	0.20	0.20	0.20	0.20
f	DROP INLET	0.60	0.60	0.60	0.60	0.60	0.60
g	DROP INLET	0.30	0.40	0.60	0.30	0.40	0.60
h	DROP INLET	0.60	0.80	1.20	0.60	0.80	1.20
i	DROP INLET	0.20	0.20	0.20	0.40	0.40	0.40
k	DROP INLET	1.20	1.20	1.50	1.20	1.20	1.50
l	DROP INLET	1.00	1.00	1.00	1.00	1.00	1.00
m	DROP INLET	0.38	0.30	0.30	0.38	0.30	0.30
MATERIAL REQUIREMENT							
FOUNDATION							
(Concrete)		0.47	0.47	0.52	0.72	0.72	0.79
HEAD/WINGWALLS							
(Concrete/Masonry)		0.53	0.69	1.11	1.24	1.63	2.61
APRON							
(Concrete)		0.24	0.24	0.30	0.24	0.24	0.30

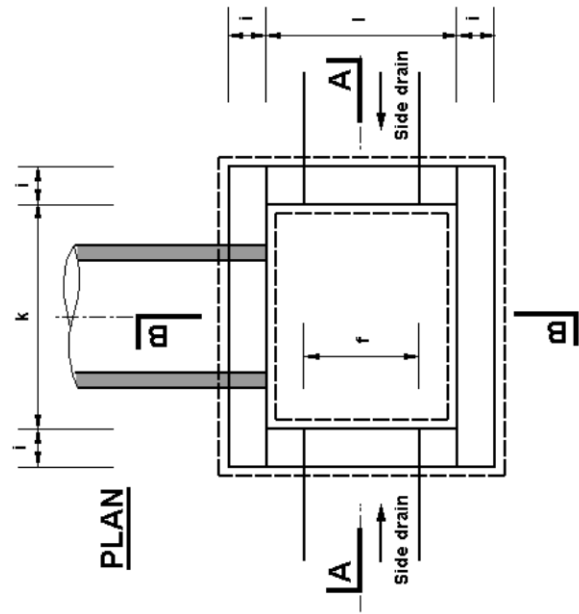
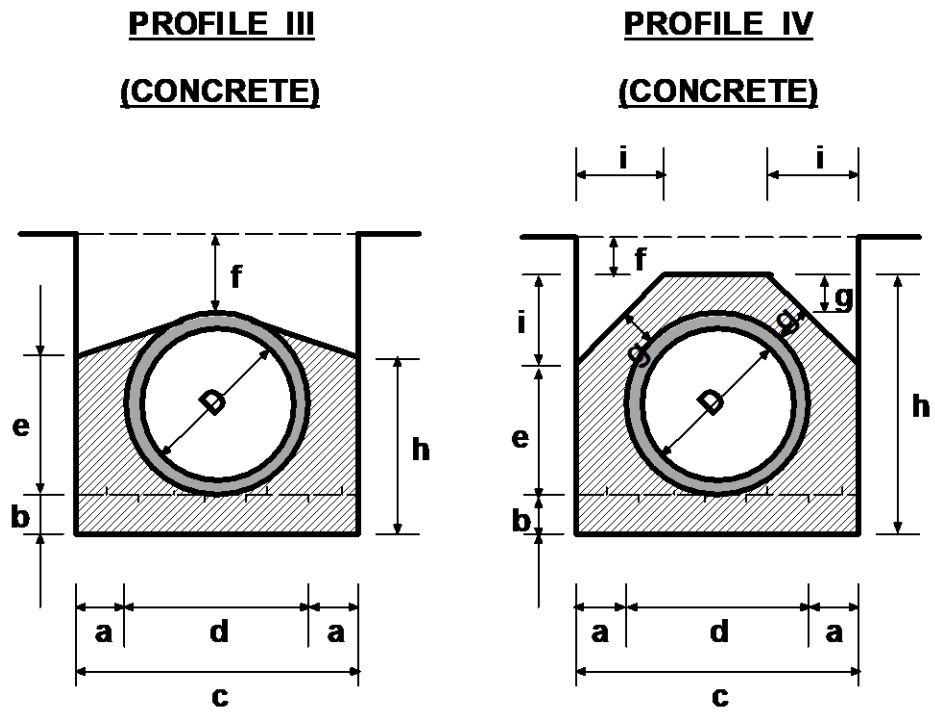


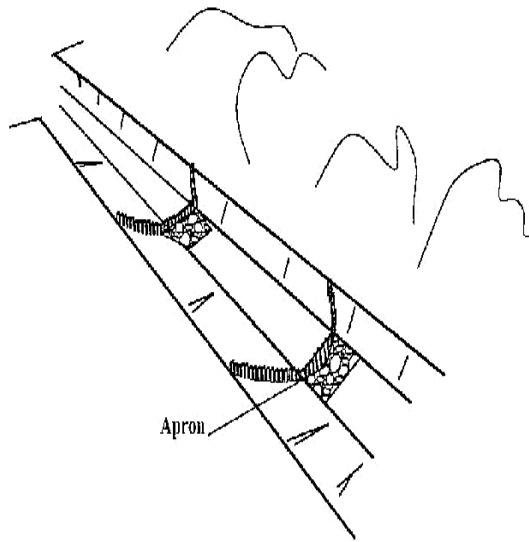
FIGURE C.14 - BEDDING AND HAUNCH PROFILES TYPES III & IV



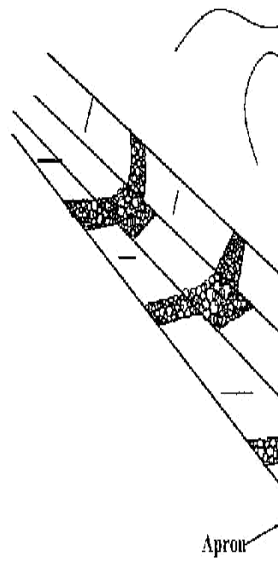
Diameter (D)	450 (mm)	600 (mm)	900 (mm)
	Dimensions in (m)		
a	0.15	0.2	0.2
b	0.1	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.42	0.54	0.81
f (min.)	0.23	0.3	0.45
g	-	-	-
h	0.52	0.69	0.96
i	-	-	-
Concrete	Volume in (m <sup>3</sup> /m)		
	0.26	0.47	0.71
Application	- Fair subgrade condition; - Overfill > $\frac{3}{4}$ Diameter; - Seasonal waterflow only.		
Remarks	- Use gravel material for back/ overfill.		

450 (mm)	600 (mm)	900 (mm)
Dimensions in (m)		
0.15	0.2	0.2
0.1	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 (m <sup>3</sup> /m)		
0.37	0.61	0.92
- Fair to poor subgrade Condition; - Overfill > $\frac{3}{4}$ Diameter; - Seasonal waterflow only.		
- Use gravel material for back/ overfill.		

Scour checks made of wooden stakes

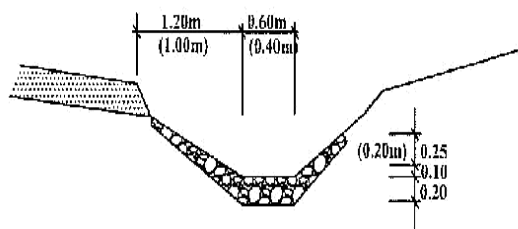


Scour checks made of stones

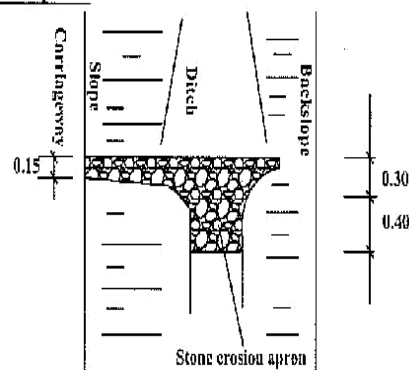


### Scour checks made of stones

#### Cross section



#### Ground plan

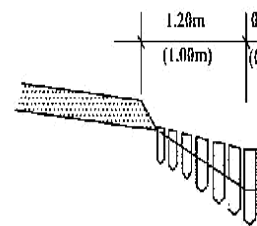


#### NOTE

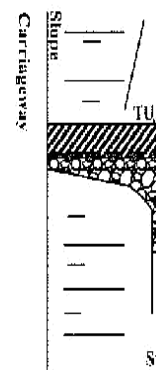
1. Dimensions in metres

### Scour checks made of stakes

#### Cross section



#### Ground plan

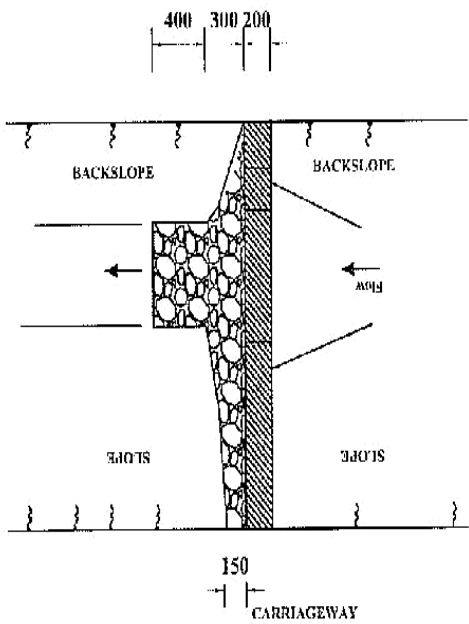


STONE WEIGHT: MIN 10KG  
STAKE DIAMETER: MIN. 0.10



SECTION OF MASONRY SCOUR CHECK

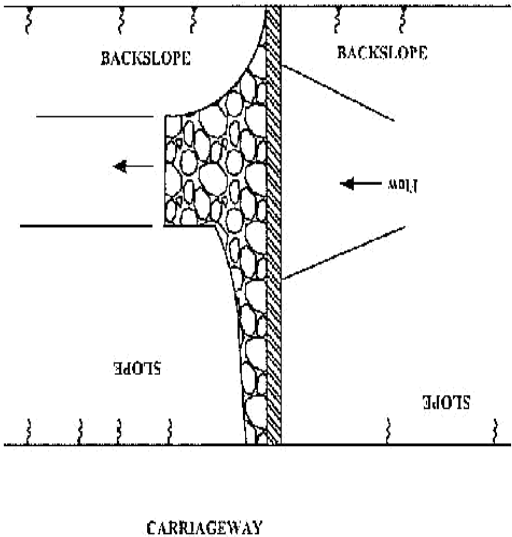
Note  
Dimensions in mm



PLAN OF DRAIN WITH SCOUR CHECK

Cross-Section	Sizes in mm			Earth (m <sup>3</sup> )	Concrete (m <sup>3</sup> )	Apron stone piling (m <sup>3</sup> )
	Length	Width	Depth			
A	2400	300	550	0.22	0.25	0.18
R	2000	200	500	0.18	0.2	0.14

SECTION OF CONCRETE SCOUR CHECK

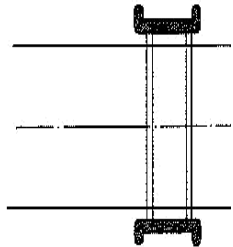
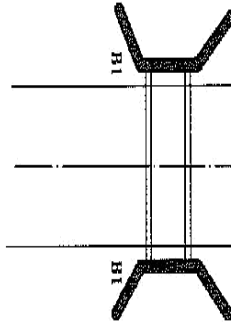


NOTE  
1. Dimensions in mm

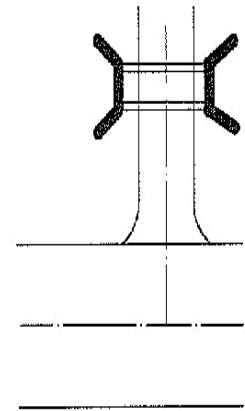
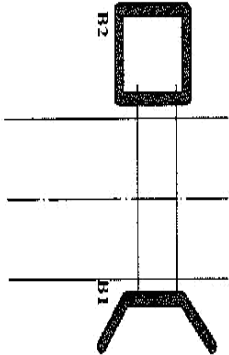
PLAN OF DRAIN WITH SCOUR CHECK

Cross- Section	Sizes in mm			Excav (m <sup>3</sup> )	Concrete (m <sup>3</sup> )	Apron stone pitching (m <sup>3</sup> )
	Length	Width	Depth			
A	2400	100	550	0.13	0.15	0.18
B	2000	100	500	0.10	0.09	0.14





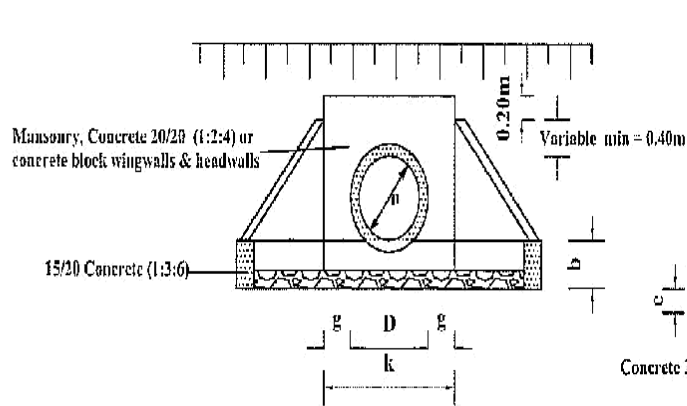
TYPE 2 (ENTRY ONLY)



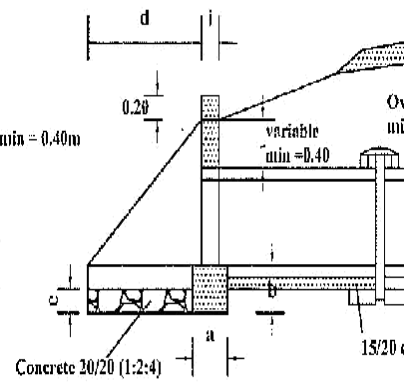
TYPE 4 (ENTRY AND EXIT ON ACCESS)

**NOTE**  
 1. The code numbers specify the shape and function and the code letter denotes the material:  
 A = Concrete block  
 B = Stone masonry  
 C = Concrete

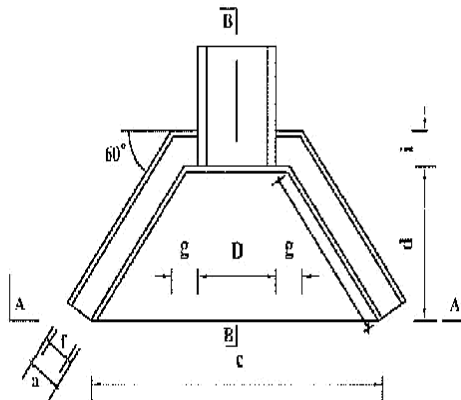
### SECTION A-A



### SECTION B-B



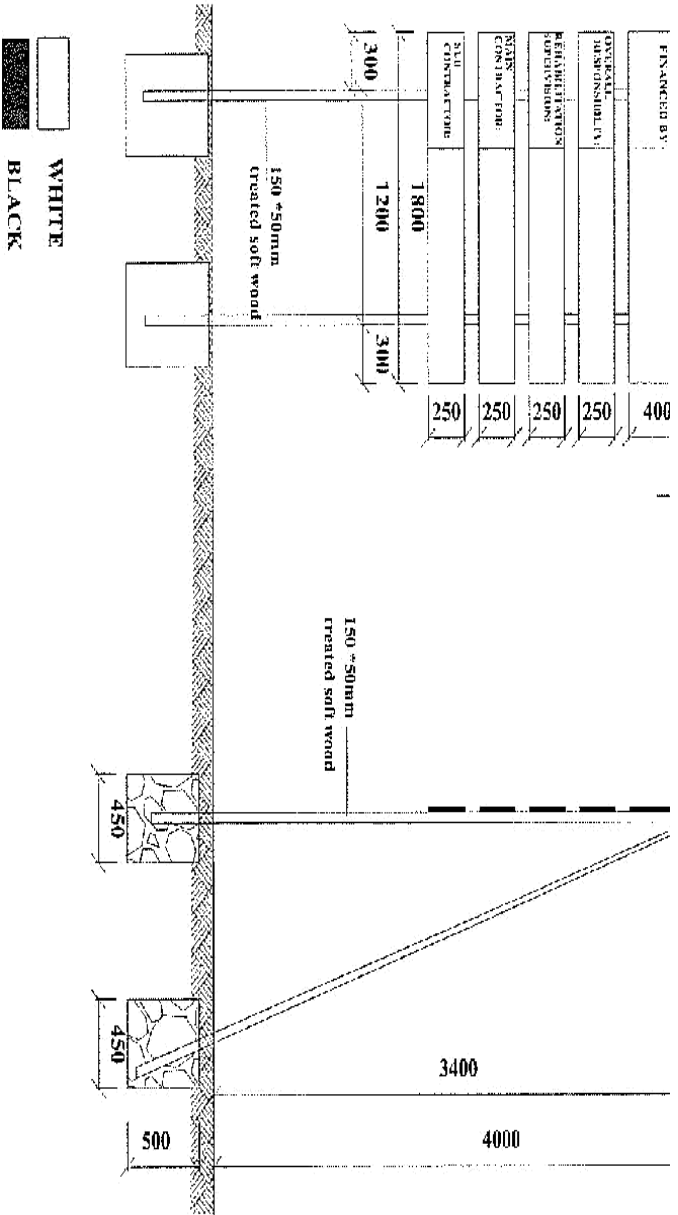
### PLAN



CULVERT TYPES	
X-SECTION WIDTH m	No. of pipes
4.50	6
5.50	7
6.50	8

PIPE DIAMETER IN M	UNIT	TYPE A and C CONCRETE BLOCK	
		450	600
a	FOUNDATION	0.30	0.30
b	FOUNDATION	0.30	0.30
c	FOUNDATION	2.20	2.35
d	APRON	1.00	1.00
e	APRON	0.20	0.20
f	WALL	0.20	0.20
g	WALL	0.30	0.30
h	WALL	1.15	1.15
i	WALL	0.20	0.20
k	APRON	1.05	1.20
MATERIAL REQUIREMENT			
FOUNDATION (concrete)		m <sup>3</sup>	0.30 0.32
HEAD/WINGWALLS (Concrete/Masonry)		m <sup>3</sup>	0.42 0.49
APRON (concrete)		m <sup>3</sup>	0.33 0.36





**NOTES**

1. The wording of the project sign board and the location to be as directed by the Engineer.
2. Materials to be used for fabrication of signboard shall be pressure impregnated treated softwood timber
3. Wording board posts to be attached to the posts with galvanised nails
4. Project board posts and struts to be embedded in concrete class 20/20(1:2:4)