



## District Road Works

VOLUME

2

## Contract Documentation Manuals

### Manual A2:

### Technical Specifications for Rehabilitation, Periodic Maintenance and Minor Works





## ACKNOWLEDGEMENTS

These manuals have been prepared by the Ministry of Works, Housing and Communications, Uganda.

The aim of the manuals is to complement the Ministry's effort in providing guidance and building capacity of Local Governments to enable them handle their mandated roles in planning and management of the road sector development.

This manual is part of a set titled District Road Works. The set consists of 5 Volumes, each volume comprising a series of manuals covering varying aspects under the following headings:

- Volume 1     Planning Manuals
- Volume 2     Contract Management Manuals
- Volume 3     Implementation and Monitoring Manuals
- Volume 4     Technical Manuals
- Volume 5     District Administrative and Operational Guidelines

The Manuals describe in detail the organization and techniques for planning, implementation and administration of a district road network. The manuals support Government strategies on sustainable maintenance of district roads; they encourage community participation, promote use of labour based methods and gender balance, ensure protection of the environment, foster work place safety and health in implementation of road works by adopting appropriate contracting practices and support the local construction industry.

They are primarily aimed at Road Engineers, Planners and Managers involved in the planning and management of district road works.

In line with the topics covered in these manuals, related training modules have been designed and are incorporated in the curriculum of the Mount Elgon Labour Based Training Centre.

The manuals are the property of the Ministry of Works, Housing and Communications, but copying and local distribution is not restricted.

We wish to acknowledge the efforts of COWI Consulting Engineers and Planners AS who assisted in the compilation of the Drafts and the invaluable support of the Danish International Development Agency for the financial assistance extended to the Ministry in preparing the manuals.



L.Lutaaya

**Engineer in Chief / DE**



## **Volume 2 Manual A2**

### **Technical Specifications for Rehabilitation Works, Periodic Maintenance Works & Minor Works**

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# **Section A2-1**

## **General Information**

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# **Section A2-1**

## **General Information**

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## General Information

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- These Technical Specifications, hereinafter referred to as the Specifications, shall be read and construed in conjunction with all other documents forming the Contract, in particular **Clause 2.2** of the Conditions of Contract. The requirements of the Specifications shall be complementary and additional to the requirements of all the other documents of the Contract.
- The Contractor is responsible for the execution of the whole of the Works as defined in the Contract documents.
- The rate and amount given in the Contract shall represent the full cost of executing the whole of the Itemised Works described in the contract documents including the cost of all work of whatsoever nature in any way necessary or ancillary to the execution of the Itemised Works.
- The Contractor is responsible for setting out the whole of the Works according to the Drawings, Specifications and Instructions of the Engineer.
- The Contractor is responsible for the supply of all materials, labour and equipment and every other thing of whatsoever nature required for the correct and proper execution of the Works and no act before or after the making of the Contract shall in any way serve to alter or reduce or negate this liability.
- Measurement and valuation of Works performed under the Contract shall be carried out in accordance with the Specifications.
- Throughout the period of the execution of the Works, testing will be carried out in accordance with the Specifications.
- No work may be covered up and no materials shall be incorporated into the Works until tested and approved to the satisfaction of the Engineer in accordance with the Specifications.
- The Works shall be carried out, in principle, using labour-based methods as specified in **Clause 16.2** of the Conditions of Contract. The Contractor shall comply with the employment conditions for personnel and labourers as specified in **Clause 9** of the Conditions of Contract.
- The Contractor is responsible for the safety of the Works and the health and safety of the workforce as specified in **Clause 19** of the Conditions of Contract.
- The Contractor is responsible for the safety of all members of the public and third parties who may have access to the site. He/She shall provide adequate warning signs, notices, barriers, fences and any other necessary measures to ensure the safety of the public at all times during the course of the Works.
- The Contractor is responsible for the maintenance of the Works until the end of the Defect Liability Period, if any, in accordance with these Specifications and **Clause 35** of the Conditions of Contract.
- Before vacating the site, the Contractor shall keep all sections of the Works neat and tidy. This also applies to adhering to environmental preservation requirements as specified in **Clause 64** of the Conditions of Contract.



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## **Section A2-2**

### **Work Items**

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# Work Items

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## GENERAL

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- The Specifications describe each work Item in accordance with the Bill of Quantities (BoQ) and describes the Work, the Work Method(s) to be applied, the Method of Measurement and Payment, and the required Quality Control measures.
- The Specifications refer to other supporting documentation, the most important of which is the Technical Manual for Labour-Based Road Rehabilitation Works (**Volume 4, Manual B**), describing in detail the activities to be undertaken for each work Item, and the most appropriate methods for performing the Works of the Contract.
- The Specifications are further supported by the Basic Cost Data / Unit Rate Analysis which are designed to assist the Contractor in the preparation of realistic Item unit rates; refer **Volume 2, Manual A4**.
- The Contractor shall provide each labourer with the required hand tools of quality construction standard. The careful selection and proper maintenance of these tools are an essential requirement for the Works; refer **Clause 19.2(c)** of the Conditions of Contract. The Contractor shall also make available the required measuring instruments for the application of labour and/or equipment work methods. The costs of providing hand tools and measuring instruments shall be included in the unit rates.
- The type and use of equipment shall be approved by the Engineer prior to the commencement of the Works; refer **Clause 27** of the Conditions of Contract. The Specifications describe for which Items Labour (**L**), or Equipment (**E**) shall be used, and for which Items there is a Preferred Choice of implementation technology.
- In the case of labour activities, work shall, where possible, be carried out using task work; refer **Clauses 9.3 and 9.4** of the Conditions of Contract. A worker is paid a fixed wage in return for a fixed quantity of work or task, which can be completed within 8 hours. If the task is finished to the satisfaction of the Contractor's site supervisor before the end of the working day, the labourer may be permitted to return home. The Contractor must make sure, however, that the task rates used for each activity are fair and manageable. Task rates may vary depending on the type of terrain, soil and weather condition, level of traffic, etc. Therefore, the Contractor may be required to revise and agree the task rates and corresponding payment procedures with the Engineer from time to time.
- The unit **wd** indicates **workerdays**.
- Indicative task rates for overall planning and estimating purposes are listed in **Table 1** below.
- These rates, however, are not to be taken as standard and need to be adjusted with time and through experience.

**TABLE 1**  
**INDICATIVE LABOUR TASK RATES**

Activity	Unit	Daily Task Range
Setting out	m	100 m/wd
Bush clearing – light	m <sup>2</sup>	350 m <sup>2</sup> /wd
Bush clearing - medium	m <sup>2</sup>	200 m <sup>2</sup> /wd
Bush clearing – heavy	m <sup>2</sup>	100 m <sup>2</sup> /wd
Stripping and grubbing	m <sup>3</sup>	175 m <sup>3</sup> /wd
Tree cutting	No.	-
Stump removal	No.	-
Boulder removal	-	Day work
Excavate ordinary soft soil	m <sup>3</sup>	5.0 m <sup>3</sup> /wd
Excavate ordinary medium soil	m <sup>3</sup>	3.5 m <sup>3</sup> /wd
Excavate hard soil	m <sup>3</sup>	3.0 m <sup>3</sup> /wd
Excavate very hard soil	m <sup>3</sup>	2.0 m <sup>3</sup> /wd
Excavate rock	m <sup>3</sup>	0.8 m <sup>3</sup> /wd
Haul material using wheelbarrows; 0 – 20 m	m <sup>3</sup>	8.5 m <sup>3</sup> /wd
Haul material using wheelbarrows; 20 – 40 m	m <sup>3</sup>	7.0 m <sup>3</sup> /wd
Haul material using wheelbarrows; 40 – 60 m	m <sup>3</sup>	6.5 m <sup>3</sup> /wd
Haul material using wheelbarrows; 60 – 80 m	m <sup>3</sup>	5.5 m <sup>3</sup> /wd
Haul material using wheelbarrows; 80 – 100 m	m <sup>3</sup>	5.0 m <sup>3</sup> /wd
Haul material using wheelbarrows; 100 – 150 m	m <sup>3</sup>	4.5 m <sup>3</sup> /wd
Camber formation	m <sup>2</sup>	120-150 m <sup>2</sup> /wd
Excavate gravel	m <sup>3</sup>	1.5-3 m <sup>3</sup> /wd
Load gravel	m <sup>3</sup>	6-9 m <sup>3</sup> /wd
Off-load and spread gravel	m <sup>3</sup>	15-25 m <sup>3</sup> /wd
Erect scour checks (stone or sticks)	No.	3-5 no/wd
Collect stones and stockpile	m <sup>3</sup>	3-4 m <sup>3</sup> /wd
Mix and place concrete	m <sup>3</sup>	0.5-1 m <sup>3</sup> /wd
Cement masonry work	m <sup>3</sup>	0.5-1.5 m <sup>3</sup> /wd
Dry masonry work	m <sup>3</sup>	1-2 m <sup>3</sup> /wd
Cement bound stone pitching	m <sup>2</sup>	4-8 m <sup>2</sup> /wd

**Reference:** Volume 4, Manual B, Section D.1

## DESCRIPTION OF WORK ITEMS

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The Specifications provide a description for each Work Item detailing the standards and norms to be achieved, the extent of work involved, the required quality control measures and methods for measurement and payment of the Works performed.

## DEFINITION OF WORK METHOD

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The Specifications describe for each Item the work method the Contractor shall apply.

- L** >>> Labour; The Contractor shall use locally employed labourers to carry out the work of the particular Work Item.
- E** >>> Equipment; The Contractor shall use equipment to carry out the work of the particular Work Item.
- PC** >>> For some Work Items, the Contractor may be given a Preferred Choice of the method for carrying out the work of the particular Work Item. In the event the Preferred Choice is the use of equipment, this shall only be undertaken following approval of the Engineer.

Also detailed herein are the principle activities to be performed, their logic sequencing as well as the most appropriate methods to carry out the Works.

## QUALITY CONTROL

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### **PURPOSE**

Quality control provides a check that the Works have been carried in accordance with the Specifications.

To ensure consistency in quality control, various tests are carried out at specified frequencies: for example, at specified intervals along the completed road.

For some tests a minimum technical standard must be achieved. An example would be a test for gravel compaction, which should reach a specified minimum level of compaction.

For other tests, a tolerance is allowed. This is a range within which the results of the test are considered acceptable. An example is the width of the gravel surface, which should be to the width specified in the Drawings and where an allowable deviation above or below the specified width is considered acceptable.

Quality control tests are carried out and measures taken to rectify such Works that fail to meet the required Specifications. The rectification of Works that fail to meet the required Specifications shall be undertaken at the Contractor's own expense.

### **ROLES AND RESPONSIBILITIES**

#### **Role of the Engineer**

The Engineer has the ultimate responsibility for approving the quality of the Works. Where the Works fail to meet the required Specifications, the Engineer will decide on the method of rectification. This may require removing the defective work and carrying out the work again. In such a case, their removal and rectification will be at the Contractor's own expense.

The Engineer is responsible for the following activities:

- The day to day supervision of the Contractor, particularly with regard to the standard of workmanship and the Contractor's obligation to carry out the Works according to the Contract including the Drawings and Specifications.
- Maintenance of site records including the site diary.
- Issuing of Instructions to the Contractor.
- Monitoring the Contractor's Programme and the Works achieved.
- Certification of the quality control tests and measurements carried out on site.
- Promotion of good communications between the Contractor and the Communities, and their representatives, in which the Works are being performed, and ensuring that both the Contractor and the Communities are meeting their mutual obligations.

### Role of Contractor

The Contractor is responsible for overall good quality of the Works as specified in the Contract and the resources required in achieving the Specifications. All materials, equipment and workmanship are subjected from time to time to such tests as the Engineer may require. The Contractor is to provide labour, fuel, stores, apparatus and instruments as are required for examining, measuring and testing any materials, and to supply samples of the material, for testing before the work is carried out.

### TEST FACILITIES AND EQUIPMENT

The facilities and equipment, which are used to carry out the tests, should be simple and cost effective. The test equipment shall be provided by the Contractor and made available to the Engineer at any time required. The main tests, facilities and relevant equipment are detailed in **Table 2** below.

**TABLE 2**  
**QUALITY CONTROL - TESTS, FACILITIES & EQUIPMENT**

<b>Test</b>	<b>Facilities</b>	<b>Equipment</b>
<b>Road Dimensions</b>	- Using tape for dimensions of width of carriageway - Using tape and template for drain dimensions	- Tapes, 3m and 30 m - Ditch-slope template
<b>Road Profile</b>	- Using camber board to measure the completed earth or gravel carriageway cross-fall - Using boning rods or profile boards to check the longitudinal alignment - Using line and level for drain gradients	- Camber board/straight edge with spirit level - Boning rods or profile boards - Line and level
<b>Gravel Source</b>	- Using gravel identification chart and bottle test for gravel identification	- Identification chart and test charts (bottle)
<b>Gravel Surfacing</b>	- Using tape for dimensions of width and depth of gravel layer - Counting passes of compactor (method specification)	- Tapes, 3m and 30 m
<b>Structure Dimensions</b>	- Using tape for dimensions (from profile boards as reference) - Using line levels and straight edges for levels	- Tapes, 3m and 30 m - Straight edge with spirit level
<b>Concrete Slump</b>	- Using slump cone to check the workability of the concrete.	- Slump cone and tape



## DEFINITION OF METHOD OF MEASUREMENT

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In accordance with the nature of the Work Items and work methods applied it shall be necessary to carry out measurements at different times; measurement as planned, measurement before and after the actual Works are performed.

The following methods of measurement shall apply in the Specifications.

- MAP** >>> Measurement as Planned, based on the Drawings.
- MBC** >>> Measurement Before Construction, based on measurements taken at regular intervals. Both the Contractor and the Engineer, before the start of the Works, shall sign of for these measurements.
- AWD** >>> Actual Work Done. Quantities measured on site during and after completion of the Works.

## GUIDELINE FOR DETERMINATION OF DEFECTS LIABILITY PERIOD

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The purpose of the Defects Liability Period is to make certain that the Contractor undertakes the Works according to these Specifications and that a suitable period of time is provided during which all defects shall be corrected by the Contractor thereby ensuring the Employer obtains full value for money.

During the preparation of contract documentation, it is necessary to determine the Defects Liability Period appropriate to the types of Works performed in the Contract; refer **Clauses 1.16** and **35** of the Conditions of Contract and **Clause 13** of the **Contract Data**.

**Table 3** below, proves a guideline regarding the most appropriate duration, in weeks, of the Defects Liability Period for each major type of Works as described in these Specifications for all Work Items included in Bills 1 through 6.

TABLE 3

**DEFECTS LIABILITY PERIOD - TYPE OF WORKS & DURATION**

<b>Type of Works</b>	<b>Duration</b>
Bill 1 - Site Preparatory Works:	nil
Bill 2 - Setting Out and Site Clearance Works:	nil
Bill 3 - Earth Works: Item 3.1 - Rehabilitation of existing road formation	nil
Bill 3 - Earth Works: Item 3.2 - (Re-) construction of road formation	nil
Bill 3 - Earth Works: Item 3.3 - Excavation, hauling, placing, water and compact fill materials in embankments and low spots	12 weeks
Bill 3 - Earth Works: Item 3.4 - Excavation of rock	nil
Bill 4 - Drainage Works: Item 4.1 - Provide and install scour checks	12 weeks
Bill 4 - Drainage Works: Item 4.2 - Excavation of foundations for drainage structures	nil
Bill 4 - Drainage Works: Item 4.3 - Supply and install concrete pipe culvert rings	12 weeks
Bill 4 - Drainage Works: Item 4.4 - Supply and install steel pipe culvert rings	12 weeks
Bill 4 - Drainage Works: Item 4.5 - Demolish existing structures and remove debris	nil
Bill 4 - Drainage Works: Item 4.6 - Provide material and build cement bound masonry	12 weeks
Bill 4 - Drainage Works: Item 4.7 - Provide stones and build dry stone masonry walls	12 weeks
Bill 4 - Drainage Works: Item 4.8 - Provide, erect and remove formwork for concrete	nil
Bill 4 - Drainage Works: Item 4.9 - Provide and fix steel reinforcement	nil
Bill 4 - Drainage Works: Item 4.10 - Provide, place and compact hardcore layer	nil
Bill 4 - Drainage Works: Item 4.11 - Provide, cast and cure concrete	16 weeks
Bill 4 - Drainage Works: Item 4.12 - Provide Gabion baskets, stones, place and fill	12 weeks
Bill 4 - Drainage Works: Item 4.13 - Provide material and build grouted stone pitching	12 weeks
Bill 4 - Drainage Works: Item 4.14 - Provide select material and backfill structures	12 weeks
Bill 4 - Drainage Works: Item 4.15 - Excavate water diversions / construct barriers	nil
Bill 4 - Drainage Works: Item 4.16 - Clear swamps for structures	nil
Bill 4 - Drainage Works: Item 4.17 - Other drainage erosion protection works	as required
Bill 5 - Gravelling & Completion Works: Item 5.1 - Preparation of quarry site(s)	nil
Bill 5 - Gravelling & Completion Works: Item 5.2 - Excavation, hauling, placing, water and compact gravel materials	12 weeks
Bill 5 - Gravelling & Completion Works: Item 5.3 - Restoration of Site(s), quarries and borrow pits	nil
Bill 6 - Preliminary and General (P&G) Items	nil

Section A2-1 : General Information

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**Section A2-3**  
**The Specifications**

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## **Section A2-3**

### **The Specifications**

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# The Specifications

The Specifications for all Work Items relevant to the performance of District Road Rehabilitation Works using, where feasible, labour-based technology, including the most appropriate work methods, quality control measures and methods of measurement and payment follow below.

A listing of the Works Items included in each of the Bills of Quantity follow –

Bill 1 - Site Preparatory Works:

Bill 2 - Setting Out and Site Clearance Works:

Bill 3 - Earth Works: Item 3.1 - Rehabilitation of existing road formation

Bill 3 - Earth Works: Item 3.2 - (Re-) construction of road formation

Bill 3 - Earth Works: Item 3.3 - Excavation, hauling, placing, water and compact fill materials in embankments and low spots

Bill 3 - Earth Works: Item 3.4 - Excavation of rock

Bill 4 - Drainage Works: Item 4.1 - Provide and install scour checks

Bill 4 - Drainage Works: Item 4.2 - Excavation of foundations for drainage structures

Bill 4 - Drainage Works: Item 4.3 - Supply and install concrete pipe culvert rings

Bill 4 - Drainage Works: Item 4.4 - Supply and install steel pipe culvert rings

Bill 4 - Drainage Works: Item 4.5 - Demolish existing structures and remove debris

Bill 4 - Drainage Works: Item 4.6 - Provide material and build cement bound masonry

Bill 4 - Drainage Works: Item 4.7 - Provide stones and build dry stone masonry walls

Bill 4 - Drainage Works: Item 4.8 - Provide, erect and remove formwork for concrete

Bill 4 - Drainage Works: Item 4.9 - Provide and fix steel reinforcement

Bill 4 - Drainage Works: Item 4.10 - Provide, place and compact hardcore layer

Bill 4 - Drainage Works: Item 4.11 - Provide, cast and cure concrete

Bill 4 - Drainage Works: Item 4.12 - Provide Gabion baskets, stones, place and fill

Bill 4 - Drainage Works: Item 4.13 - Provide material and build grouted stone pitching

Bill 4 - Drainage Works: Item 4.14 - Provide select material and backfill structures

Bill 4 - Drainage Works: Item 4.15 - Excavate water diversions / construct barriers

Bill 4 - Drainage Works: Item 4.16 - Clear swamps for structures

Bill 4 - Drainage Works: Item 4.17 - Other drainage erosion protection works

Bill 5 - Gravelling & Completion Works: Item 5.1 - Preparation of quarry site(s)

Bill 5 - Gravelling & Completion Works: Item 5.2 - Excavation, hauling, placing, water and compact gravel materials

Bill 5 - Gravelling & Completion Works: Item 5.3 - Restoration of Site(s), quarries and borrow pits

Bill 6 - Preliminary and General (P&G) Items



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**Bill 1**  
**Site Preparatory Works**

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**BILL 1**

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# Bill 1

## Site Preparatory Works

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Item 1.1	Construction of access roads to quarry sites including maintenance throughout the working period .....	Page	3.1-1
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**BILL 1: SITE PREPARATORY WORKS****ITEM 1.1 Construction of access roads to quarry sites including maintenance throughout the working period****DESCRIPTION:**

- Access roads shall be opened in areas where quarries, approved by the Engineer for materials including surfacing aggregates, selected fill and other materials, are located away from the road to facilitate the ease of movement for haulage equipment from the Site(s) of the Works to the quarry site(s).
- The access roads, their routes and alignment shall be approved by the Engineer.
- Where such access roads cross community owned land/private property, agreement for the access roads shall be obtained from the local authorities/owners by the Contractor and confirmed in writing by the Engineer.
- In the case of supply of required construction material (gravel, hardcore, culverts, etc.) to make the access roads passable, the Rate quoted for this Item by the Contractor shall be full compensation for all activities performed under this Item.

**WORK METHOD:****Refer Volume 4, Manual B, Sections F2.2 and E3.4**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works.
- The Item consists of the following activities:
  - Setting out (alignment and width)
  - Clearing (bushes, trees, grass)
  - Levelling (fill potholes, remove humps)
  - Opening of the drainage system
  - Maintaining throughout the working period.

**QUALITY CONTROL:**

- Allow for easy and undisturbed hauling.
- No tests required.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
1.1	Construction of access roads to quarry sites including maintenance throughout the working period	Lump Sum	MBC

**Payment:** The Engineer shall effect payment for this Item in proportion to the total value of the Works performed at the time of preparation of the next Payment Certificate and following completion of the access road(s) and upon approval of the works.

**BILL 1: SITE PREPARATORY WORKS**

**ITEM 1.2 Construction of detours including maintenance throughout the working period**

**DESCRIPTION:**

- Deviations shall be opened and constructed where traffic cannot be accommodated on the road or road section due to the nature of the Works.
- Deviations are required until the road or road section on which Works are being performed can be reopened for normal traffic.
- Deviations, their standard, length and alignment, shall be approved by the Engineer.
- In the case of supply of required construction material (gravel, hardcore, culverts, etc.) to make the deviations passable, the Rate quoted for this Item by the Contractor shall be full compensation for all activities performed under this Item.
- Traffic signs and traffic control measures for deviations are not part of this Item but are covered under Preliminary and General **Item 6.3**, Traffic Accommodation.

**WORK METHOD:**

**Refer Volume 4, Manual B, Section H 1.5**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works.
- The Item consists of the following activities:
  - Setting out (alignment and width);
  - Clearing (bushes, trees, grass);
  - Levelling (fill potholes, remove humps);
  - Maintaining throughout the working period;
  - Drainage system

**QUALITY CONTROL:**

- Allow for easy and undisturbed traffic.
- No tests required.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
1.2	Construction of deviations including their maintenance throughout the working period	Lump Sum	MBC

**Payment:** The Engineer shall effect payment for this Item in proportion to the total value of the Works performed at the time of preparation of the next Payment Certificate and following completion of the deviation(s) and upon approval of the works.

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**Bill 2**  
**Setting Out and Site Clearing Works**

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**2**  
**BILL**

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## **Bill 2**

### **Setting Out and Site Clearing Works**

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Item 2.1	(Re) Establishment of road alignment and setting out of road works ..	Page	3.2-1
Item 2.2	Clear site of all grass, bushes and boulders (up to 1.5m maximum girth) and Grub all roots of grass and bushes including excavation of topsoil from road formation .....	Page	3.2-2
Item 2.3	Cut and remove from site trees (up to 1m girth), including removal of stumps and roots .....	Page	3.3-3

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**BILL 2: SETTING OUT AND SITE CLEARING WORKS****ITEM 2.1 (Re) Establishment of road alignment and setting out of road Works****DESCRIPTION:**

- This Item consists of the setting out of the geometric alignment of the centre line of the road at 10 metre intervals by using appropriate methods as described in reference **Volume 4, Manual B, Section E.1**
- Chainage reference pegs shall be placed at 20 metre intervals at both edges of the area to be cleared from bush. Refer **Volume 4, Manual B, Section E.1 and E 2.1**
- This Item also consists of setting out working and material deposit and disposal areas for all activities as described in **Volume 4, Manual B, Sections E and F**
- This Item also consists of setting out of the alignment, dimensions and levels for drainage structures.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- Setting out shall be done using simple measuring aids, including tape measure, ranging rods, line and level, strings and pegs, templates and profile boards.
- The Contractor shall use the Drawings provided by the Employer and the reference points, lines and levels provided by the Engineer to determine the location of the road centreline and measures related to structural works.
- For structural works, profile boards with strings outlining the outer dimensions and reference levels shall be placed.

**QUALITY CONTROL:**

- Centre line pegs set at 10 metre intervals → to be approved by the Engineer
- Chainage reference pegs set and marked at 20 metres intervals on both sides of the road way 1 metre outside the clearing width → to be checked by the Engineer
- Profile boards with outline dimensions and reference levels for structures placed → to be approved by the Engineer

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
2.1	(Re) Establishment of road alignment and setting out of road Works	Linear Metre (m) → of road length	AWD

**Payment:** The Engineer shall effect payment for this Item in proportion to the total value of the Works performed at the time of preparation of the next Payment Certificate and following completion of the setting out and upon approval of the works.

**BILL 2: SETTING OUT AND SITE CLEARING WORKS**

**ITEM 2.2 Clear site of all grass, bushes and boulders (up to 1.5m maximum girth) and Grub all roots of grass and bushes including excavation of top soil from road formation**

**DESCRIPTION:**

- This Item consists of:
  - Bush clearing including grass cutting in accordance with **Volume 4, Manual B, Section E 2.1**
  - Grubbing in accordance with **Volume 4, Manual B, Section E 2.2**
  - Boulder removal (up to 1.5m maximum girth). Refer **Volume 4, Manual B, Section E 2.4**
  - Excavation of topsoil including anthills and other unsuitable materials and depositing in approved locations. Refer **Volume 4, Manual B, Sections E 2.2 and E 2.5**
- The above material shall be deposited well outside the cleared area at locations approved by the Engineer.
- In side-long ground, the above material shall be deposited well outside the cleared area on the lower side (valley side) of the road.
- Neither protected flora nor historical relics shall be damaged. The Engineer shall be informed if these are encountered who will then direct the Contractor as to the appropriate action to be taken.
- Burning of cut grass and shrubs shall only be allowed if explicitly approved by the Engineer.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Item consists of cutting the vegetation, digging out the roots, excavating the topsoil, loading into wheelbarrows all material and other surface litter, hauling and disposing the same away from drains and the cleared area.
- Boulders with a maximum girth of not more than 1.5m can be loaded into wheelbarrows and deposited outside the cleared area. In cases where structures and scour checks are to be constructed using rubble stones, the Contractor is advised to stockpile boulders neatly so that these stones may be available for use.

**QUALITY CONTROL:**

- Cleared areas to be free of organic materials and boulders as specified in **Volume 4, Manual B, Section E 2**. All works to be checked by the Engineer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
2.2	Clear site of all grass, bushes and boulders (up to 1.5m maximum girth) and Grub all roots of grass and bushes including excavation of top soil from road formation	Linear Metre (m) → of road length	AWD

**Payment:** The Engineer will effect payment of any cleared road length in the following Payment Certificate upon approval of the works.

**BILL 2: SETTING OUT AND SITE CLEARING WORKS****ITEM 2.2.1 Extra over Item 2.2 for boulders over 1.5m maximum girth****DESCRIPTION:**

- This Item consists of removing boulders over 1.5m maximum girth in accordance with **Volume 4, Manual B, Section E 2.4**
- The boulders or boulder pieces shall be deposited well outside the cleared area at locations approved by the Engineer.
- In side-long ground, the material shall be deposited well outside the cleared area on the lower side (valley side) of the road.
- This Item, paid as Day Work, shall be carried out only upon the explicit and written instruction of the Engineer who will, together with the Contractor, estimate the number of required worker and/or equipment days.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works.
- The Item may be carried out using any of the following methods:
  - Rolling the boulder to the edge of the roadway
  - Burying the boulder in dug hole (below the subgrade level)
  - Splitting the boulder using fire and water method
  - Splitting the boulder using wedges and feathers
  - Towing/pushing the boulder using labour and/or equipment
  - Blasting the boulder with explosives.
- Care must be taken when using explosives and the relevant rules and regulations strictly adhered to and all unauthorised persons banned from the Site.
- Split boulder pieces can be loaded into wheelbarrows and deposited outside the cleared area. In cases where structures and scour checks are to be constructed using rubble stones, the Contractor is advised to stockpile boulders neatly so that these stones may be available for possible later use.

**QUALITY CONTROL:**

- Cleared areas to be free from boulders as specified in **Volume 4, Manual B, Section E 2** and to be checked by the Engineer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
2.2.1	Extra over Item 2.2 for boulders over 1.5m maximum girth.	Day Work	AWD

**Payment:** The Engineer will, firstly, approve this Work to be performed, and secondly, effect payment of any cleared road length in the following Payment Certificate upon completion and approval of the works.

**BILL 2: SETTING OUT AND SITE CLEARING WORKS****ITEM 2.3 Cut and remove from site trees (up to 1 m girth), including removal of stumps and roots.****DESCRIPTION:**

- This Item includes the felling of trees **up to 1 m girth** within previously cleared areas including removal of their stumps in accordance with **Volume 4, Manual B, Section E 2.3**
- The girth measurement shall be taken 1 m above the ground.
- The cut material shall be deposited well outside the cleared area at locations approved by the Engineer.
- Burning of felled trees and tree cuttings shall only be allowed if explicitly approved by the Engineer.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work.
- Trees may be cut using handsaw, bow saw, axe or chain saw.
- Care must be taken when felling trees. Unauthorised persons shall not be allowed within the vicinity of the Site.
- Timber from trees can be loaded into wheelbarrows and deposited well outside the cleared area.
- Timber from cut trees may be used for scour checks, setting out pegs and for the construction of water barriers and deviations.

**QUALITY CONTROL:**

- Cleared area to be free from trees as specified in **Volume 4, Manual B, Section E 2.3** and to be checked by Engineer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
2.3	Cut and remove from site trees (up to 1 m girth), including removal of stumps and roots.	<b>Number (No.)</b> → of trees	<b>MBC</b>

**Payment:** The Engineer will effect payment for the actual number of trees felled and cleared for any cleared road length in the following Payment Certificate upon approval of the works.



**BILL 2: SETTING OUT AND SITE CLEARING WORKS****ITEM 2.3.1 Extra over Item 2.3 for trees over 1 metre in girth.****DESCRIPTION:**

- This Item includes the felling of trees **above 1 m girth** within the area previously cleared including removal of their stumps in accordance with **Volume 4, Manual B, Section E 2.3**
- The girth measurement shall be taken 1 m above the ground.
- The cut material shall be deposited well outside the cleared area in locations approved by the Engineer.
- Burning of cut trees and tree cuttings may only be allowed if explicitly approved by the Engineer.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work.
- Trees may be cut using handsaw, axe or chain saw.
- Great care must be taken when felling trees. Unauthorised persons are not allowed to be present within the vicinity of the work site.
- Timber from trees can be loaded into wheelbarrows and deposited outside the cleared area.
- Timber from cut trees may be used for scour checks, setting out pegs and for the construction of water barriers and deviations.

**QUALITY CONTROL:**

- Cleared area to be free from trees as specified in **Volume 4, Manual B, Section E 2.3** and to be checked by Engineer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
2.3.1	Extra over Item 2.3 for trees over 1 metre in girth.	Number (No.) → of trees	MBC

**Payment:** The Engineer will effect payment for the actual number of trees felled and cleared for any cleared road length in the following Payment Certificate upon approval of the works.



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**Bill 3**  
**Earth Works**

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**3**  
**BILL**

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## **Bill 3**

### **Earth Works**

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**BILL 3: EARTH WORKS****ITEM 3.1 Rehabilitation of existing road formation****ITEM 3.1.1 Reshaping of existing road formation including watering and compaction****DESCRIPTION:**

- This Item shall be applied when the existing road formation requires reshaping only; not to disturb the already existing formation (not new construction). The Works shall be carried out as detailed in **Volume 4, Manual B, Section 3.1.3**
- The cross-section(s) and measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual B, Section B 2**, as specified in the Drawings for this contract, and as instructed by the Engineer.
- The Works for this Item shall be carried out in combination with **Items 3.1.2 and 3.1.3**
- The longitudinal profile shall have a maximum tolerance of + / - 15 mm when checked with a three-metre straight edge.
- Fill material required for the camber formation shall be taken from the side drains, if suitable and approved by the Engineer. Widening and/or deepening of the side drains may be required to obtain sufficient fill material.
- Compaction shall be carried out with a self propelled or towed roller with approved total weight and dimension. A minimum of six (6) passes for compaction shall be applied or until no further roller imprint on the surface can be recognised. The fill layers to be compacted shall not exceed 15cm loose and the soil shall be watered before compaction takes place.
- The camber of the compacted formation shall have a cross fall of no less than 8% and a maximum tolerance of + / - 1% when checked with a camber board.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works. **Compaction**, however, shall be carried out using approved compaction **equipment**.
- Using **Labour method** for reshaping includes:
  - establishing road formation levels using profile boards or boning rods,
  - establishing profile guides at 10m intervals,
  - reshaping of formation and filling of depressions using approved borrow material from the side drains or if necessary from approved quarries, and spread material from road centre to shoulder break point to required levels and camber cross-fall,
  - watering and compacting the formation with towed or self-propelled roller.
- Using **Equipment method** for reshaping includes:
  - establishing road formation levels using profile boards or boning rods,
  - scarifying of existing formation to a minimum depth of 10cm with grader (towed or self propelled),
  - add extra fill material borrowed from side drains as required using labour,
  - spreading to required levels and camber cross-fall with grader,
  - watering,
  - compacting the formation with towed or self-propelled roller.

**QUALITY CONTROL:**

- Quality control tests for this Item shall be carried out together with the tests required for **Item 3.1.2** and consist of:

Test	Method	Frequency	Tolerance
Width of formation (carriageway + shoulders)	Tape	every 100 m	+50 / -20 mm
Camber (cross-fall)	Camber Board	every 50 m	+ / - 1%
Longitudinal profile	Three-metre straight edge or by surveying instrument	every 20 m	+ / - 15 mm
Drain dimensions	Template / Tape	every 100 m	+ / - 25 mm
Mitre drains; numbers, location, dimensions and gradient	Counting, tape, line-level	all	0
Compaction	Counting passes, checking imprint of roller	completed road section	0

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.1.1	Reshaping of existing road formation including watering & ompaction	Linear Metre (m) → of formation	<b>AWD</b>

**Payment:** The Engineer will effect payment of any completed road length in the following Payment Certificate upon approval of the works.

**BILL 3: EARTH WORKS****ITEM 3.1 Rehabilitation of existing road formation****ITEM 3.1.2 Opening of / re-excavation of side, mitre, catch water and other specified drains****DESCRIPTION:**

- This Item shall be applied when the existing road formation requires reshaping only (not new construction). The Works shall be carried out as detailed in **Volume 4, Manual B, Section 3.1.3**
- The Item includes opening and/or re-excavation of side drains, mitre drains, catch water drains and other specified drains.
- The Works for this Item shall be carried out in combination with **Item 3.1.1** and **3.1.3**
- The measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual B, Sections B 2 and B 4**, as specified in the Drawings for this Contract, and as instructed by the Engineer.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Item consists of the following labour activities:
  - Opening / re-excavation of side drains,
  - Shaping of inner slopes (check both with ditch – slope template),
  - Shaping of back slopes,
  - Opening / re-excavation of mitre drains (additional mitre drains may be required as instructed by the Engineer) to the correct dimensions and gradient,
  - Opening / re-excavation of catch water drains,
  - Opening / re-excavation of other specified drains,
  - All excavation material to be deposited on the lower side of the drains.

**QUALITY CONTROL:**

- Quality control tests for this Item shall be carried out together with the tests required for **Item 3.1.1** regarding drain dimensions.
- Visual inspections of all of these Works and their approval by the Engineer are required to ensure full restoration of the drainage system.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.1.2	Opening / re-excavation of side drain, mitre drain and catch water drains.	Linear Metre (m) → of drains	AWD

**Payment:** The Engineer will effect payment of any completed road length in the following Payment Certificate upon approval of the works.

**BILL 3: EARTH WORKS****ITEM 3.1 Rehabilitation of existing road formation****ITEM 3.1.3 Opening of culverts****DESCRIPTION:**

- This Item shall be applied when the existing road formation requires reshaping only (not new construction). The Works shall be carried out as detailed in **Volume 4, Manual B, Sections E 4.5 and G 4**
- The Item includes opening of blocked or silted culverts including their inlets and outlets.
- The Works for this Item shall be carried out in combination with **Item 3.1.1 and 3.1.2**
- The measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual A**, as specified in the Drawings for this Contract, and as instructed by the Engineer.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Item consists of the following labour activities:
  - Opening of blocked culverts including inlets and outlets,
  - All excavation material to be deposited on the lower side of the drains.

**QUALITY CONTROL:**

- Visual inspections of all of these Works and their approval by the Engineer are required to ensure full restoration of the drainage system.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.1.3	Opening of culverts.	Linear Metre (m) → of culverts	<b>AWD</b>

**Payment:** The Engineer will effect payment of any completed road length in the following Payment Certificate upon approval of the works.



**BILL 3: EARTH WORKS****ITEM 3.2 (Re-) Construction of road formation****ITEM 3.2.1 Excavation to level****DESCRIPTION:**

- This Item shall be applied when the road formation requires full (re-) construction.
- Excavation to level comprises the cutting of material to form a level road bench or platform and placing the excavated material as fill, or in spoil areas approved by the Engineer.
- When using **labour**, the works shall be carried out as detailed in **Volume 4, Manual B, Section E 3.1.1**
- When using **equipment**, cut and fill shall be balanced to avoid spoil as much as possible.
- In the case where material has to be borrowed this shall only be done from borrow areas approved by the Engineer and included in **Item 3.3.2**
- The Cross-section(s) and measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual B, Section E 3.1**, as specified in the Drawings for this Contract, and as instructed by the Engineer.
- The terrace shall be horizontal in the cross-sectional direction and the longitudinal profile shall have a maximum tolerance of + / - 15 mm when measured with a three-metre straight edge.
- The compaction of the fill areas shall be carried out with a self propelled or towed roller with approved total weight and dimension. A **minimum** of six (6) passes of compaction shall be applied or until no roller imprint on the surface can be recognised.
- The fill layers to be compacted shall not exceed 15cm loose and the soil shall be watered before compaction takes place.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work. **Compaction**, however, must be carried out using approved compaction **equipment**.
- Using **Labour method** of (re-) construction includes:
  - cutting and/or filling of slots at 10 m intervals,
  - cutting and filling as guided by the slots to construct a level road terrace or road sub-base,
  - in case of missing material, excavate in approved borrow areas, haul with wheelbarrows and fill; this work included in **Item 3.3.2**
  - watering and compacting the fill layers not exceeding 15 cm loose with towed or self-propelled roller.
- Using **Equipment method** of (re-) construction includes:
  - cut and fill to construct a level road terrace (road sub-base),
  - in case of missing material, excavate in borrow areas, haul and fill,
  - watering and compacting the fill layers not exceeding 15 cm loose with towed or self-propelled roller.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Width of level terrace	Tape	every 100 m	+ / - 50 mm
Longitudinal profile	Three-metre straight edge or by surveying instrument	every 20 m	+ / - 15 mm
Compaction	Counting passes, checking imprint of roller	completed road section	0

**Note:** Excavation of drains, **Item 3.2.2** may only be started **after** the Works covered by this Item have been approved by the Engineer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.2.1	Excavation to level	Cubic Metre (m <sup>3</sup> ) → of cut to fill	<b>MBC</b>

**Payment:** The Engineer will effect payment of the earthwork quantities completed for any completed road length in the following Payment Certificate upon approval of the works.

**BILL 3: EARTH WORKS****ITEM 3.2 (Re-) Construction of road formation****ITEM 3.2.2 Excavation of side, mitre, catch water and other specified drains****DESCRIPTION:**

- This Item shall be applied when the road formation requires full (re-)construction. The Works shall be carried out as detailed in **Volume 4, Manual B, Sections E 3.2 and E 3.3**
- The Item includes excavation of side drains, mitre drains, catch-water and other specified drains.
- The material from the side drains shall, where approved suitable by the Engineer, be thrown to the centre of the road and used for the formation of the camber. Where additional material is required to achieve the required camber, and following approval by the Engineer, the side drains may be increased in width and depth to provide this additional material.
- The material from mitre and catch-water drains shall be neatly heaped along the lower side (valley side) of the drains.
- The measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual B, Sections B 2 and B 4**, as specified in the Drawings for this contract, and as instructed by the Engineer.
- This Item shall commence only after approval of **Item 3.2.1** (Excavation to level) by the Engineer.

**WORK METHOD:**

- The Contractor shall apply Labour method of work for this Item.
- Excavation of side drains consists of excavating the drain (rectangular profile), sloping from the ditch bottom to the shoulder break point, and back sloping from outer ditch bottom line to the in-situ soil slope. Where approved, the excavation material is thrown to the centre of the road to be used for the formation of the camber.
- Excavation of mitre drains consists of excavating mitre drains at the established locations with the correct outlet direction and gradient. The excavated material is deposited at the lower (valley side) of the drain.
- Excavation of catch-water drains consists of excavating the drains at the established locations with the correct outlet direction and gradient. The excavated material is deposited at the lower (valley side) of the drain.
- The correct size and shape of drains is checked and controlled using templates of their respective size. The gradient of drains is checked using boning rods or line level.

**QUALITY CONTROL:**

- Quality control tests for this Item shall be carried out together with the tests required for Item 3.2.3.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.2.2	Excavation of side, mitre, catch water and other specified drains.	Linear Metre (m) → of drains	AWD

**Payment:** The Engineer will effect payment of any completed length of drains in the following Payment Certificate upon approval of the works.

**BILL 3: EARTH WORKS****ITEM 3.2 (Re-) Construction of road formation****ITEM 3.2.3 Form, water and compact road bed****DESCRIPTION:**

- Under this Item the camber is formed using primarily the material excavated from the side drains and deposited in the road centre as outlined under **Item 3.2.2**.
- If using labour method of construction, the Works shall be carried out as detailed in **Volume 4, Manual B, Section E 3.2**
- If using equipment method of construction, the formation shall be prepared in layers of loose material not exceeding 15 cm.
- The Cross-section(s) and measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual B, Section B 2**, as specified in the Drawings for this Contract, and as instructed by the Engineer.
- The longitudinal alignment of the completed formation shall have a maximum tolerance of + / - 15 mm when measured with a three-metre straight edge.
- The compaction shall be carried out with a self propelled or towed roller with approved total weight and dimension. A minimum six (6) passes of compaction shall be applied or unless no more roller imprint on the surface can be recognised. The fill layers to be compacted shall not exceed 15cm loose and the soil shall be watered before compaction takes place.
- The camber of the compacted formation shall have a cross fall of not less than 8%.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a Combination of both** to carry out this Item depending on the degree of difficulty of the Work. **Compaction**, however, must be carried out using approved compaction **equipment**.
- When using **Labour method** of construction, this Item has to be carried out in combination with the side drain excavation (**Item 3.2.2**) and includes:
  - establish material pegs in the road centre; **Volume 4, Manual B, Section E 3.2.1**
  - spread material, water and compact; **Volume 4, Manual B, Section E 3.2.1**
  - spread material from side drain slopes and back slopes and form camber; **Volume 4, Manual B, Section E 3.2.2**
  - water and compact; **Volume 4, Manual B, Section E 3.2.2**
- Using **Equipment method** of construction includes:
  - establish material pegs in the road centre,
  - spread material from side drains in the centre of the road using a grader, water and compact,
  - spread material from side drain slopes and back slopes and form camber using a grader,
  - water and compact.
- Check the camber cross-fall frequently with the camber board.

**QUALITY CONTROL:**

- Quality control tests for this Item shall be carried out together with the tests required for **Item 3.2.2** and consist of:

Test	Method	Frequency	Tolerance
Width of formation (carriageway + shoulders)	Tape	every 100 m	+50 / -20 mm
Camber (cross-fall)	Template	every 20 m	+/- 1%
Longitudinal profile	Three-metre straight edge or by surveying instrument	every 20 m	+ / - 15 mm
Drain dimensions	Template / Tape	every 20 m	+ / - 25 mm
Mitre drains; numbers, location, dimensions and gradient	Counting, tape, line-level	all	0
Compaction	Counting passes, checking imprint of roller	completed road section	0

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.2.3	Form, water and compact road bed.	Linear Metre (m) → of formation	<b>AWD</b>

**Payment:** The Engineer will effect payment of any completed road length in the following Payment Certificate upon approval of the works.

**BILL 3: EARTH WORKS****ITEM 3.3 Provision of fill materials****ITEM 3.3.1 Preparation of borrow pit(s) consisting of clearing from vegetation and removing topsoil****DESCRIPTION:**

- The Engineer shall approve quarries and their extent of exploitation.
- The Contractor shall carry out respective negotiations with landowners and communities.
- Before gravel can be excavated, quarry areas and adjacent areas where topsoil will be stockpiled have to be cleared from all vegetation. Topsoil has to be removed and deposited in order to use it again to reinstate the quarry at the end of Work.
- The Item consists of removing vegetation, crops, trees, roots, stumps, boulders, etc., from the gravel excavation area and topsoil (overburden) to deposit areas as shown in the Drawings and/or as directed by the Engineer. Waste material shall be dumped at places approved by the Engineer. Burning of waste material shall only take place upon approval of the Engineer.
- The Item also consists of excavation of topsoil (overburden) including loading, hauling and stockpiling at approved location(s).

**WORK METHOD:****Refer Volume 4, Manual B, Section E 3.4**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works.
- The Works for this Item may be carried out consisting of the following activities:
  - remove fences and structures from quarry and topsoil deposit areas,
  - cut grass and bushes,
  - cut trees and remove stumps,
  - grub roots,
  - haul and deposit cut vegetation and debris outside the cleared areas at approved locations,
  - burn deposited material if approved by the Engineer,
  - excavate topsoil layer,
  - load topsoil and haul to approved stockpile locations,
  - stockpile topsoil neatly so that it can be reused for reinstatement of the quarry.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions (cleared quarry area)	Tape	all	+ 200 / - 200 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.3.1	Preparation of quarry site consisting of clearing vegetation and removing topsoil	Square Metre (m <sup>2</sup> ) → of clearing quarry	AWD

**Payment:** The Engineer will effect payment of completed quarry clearing work in the following Payment Certificate upon approval of the works.

**BILL 3: EARTH WORKS****ITEM 3.3 Provision of fill materials****ITEM 3.3.2 Excavation, hauling, placing, watering and compaction of approved fill material in embankments and low spots to create a level road bench****DESCRIPTION:**

- This Item shall be applied where an embankment (fill) has to be constructed to achieve the desired road or formation level. The Works shall be carried out as detailed in **Volume 4, Manual B, Section E 3.1.2**
- The Item includes excavation of fill material from approved borrow areas, loading and hauling, filling in layers not exceeding 15cm loose, watering and compacting.
- The measurements to be applied shall be in accordance with the design standards of **Volume 4, Manual B, Section B 2**, as specified in the Drawings for this Contract, and as instructed by the Engineer.
- Fill material required for the embankment shall be taken from borrow areas as specified in the contract and approved by the Engineer.
- The compaction shall be carried out with a self propelled or towed roller with approved total weight and dimension. A minimum six (6) passes of compaction shall be applied or unless no more roller imprint on the surface can be recognised. The fill layers to be compacted shall not exceed 15cm loose and the soil shall be watered before compaction takes place.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works. **Compaction**, however, must be carried out using approved compaction **equipment**.
- Using **Labour method** of construction includes:
  - establish profiles and levels; **Volume 4, Manual B, Section E 3.1.2**
  - excavate and stockpile material in borrow pit,
  - load into wheelbarrow or hauling equipment,
  - haul to site, offload and spread in equal layers of not more than 15cm loose,
  - water and compact using towed or self propelled roller.
- Using **Equipment method** of construction includes:
  - establish profiles and levels,
  - excavate and stockpile material in borrow pit,
  - load onto hauling equipment,
  - haul to site, offload and spread in equal layers of not more than 15cm loose,
  - water and compact using towed or self propelled roller.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions of embankment	Tape, Profiles	every 20 m	+50 / -20 mm
Longitudinal profile	Three-metre straight edge or by surveying instrument	every 20 m	+ / - 15 mm
Compaction	Counting passes, checking imprint of roller	completed road section	0

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.3.2	Excavation, hauling, placing, watering and compaction of approved fill material in embankments and low spots to create a level road bench	Cubic Metre (m <sup>3</sup> ) → of embankment fill	AWD

**Payment:** The Engineer will effect payment of earthwork quantities completed for any completed road length in the following Payment Certificate upon approval of the works.



**BILL 3: EARTH WORKS****ITEM 3.4 Excavation of Rock****DESCRIPTION:**

- This Item consists of excavating rock and depositing the split rock pieces outside the cleared area.
- Stones from rock excavation may be used for stone masonry or sour checks.
- Any cracked or loose pieces of rock along the edges of the excavated area shall be removed as they may constitute a safety hazard.

**WORK METHOD:****Refer Volume 4, Manual B, Section E 2.4**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works.
- The Item may be carried out using any of the following methods:
  - excavating soft rock using picks,
  - splitting using fire and water method,
  - splitting using wedges and feathers,
  - ripping using equipment,
  - drilling and blasting with explosives.
- Strict safety regulations must be adhered to when excavating rock.
- Care must be taken when using explosives and the relevant rules and regulations strictly adhered to. All unauthorised persons shall be banned from the Site.
- Split boulder pieces can be loaded into wheelbarrows and deposited outside the cleared area. In cases where structures and scour checks have to be built using rubble stones, the Contractor is advised to stockpile stones neatly for future use at locations approved by the Engineer.

**QUALITY CONTROL:**

- Rock excavation areas and excavation edges to be free from loose stones and splitters.
- Excavated stones removed and deposited at locations approved by the Engineer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
3.4	Excavation of rock	Day Work	AWD

**Payment:** The Engineer will firstly, approve this Work to be performed, and secondly, effect payment for the Work in the following Payment Certificate upon completion and approval of the Work.



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**Bill 4**  
**Drainage Works**

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**4**  
**BILL**

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## Bill 4

### Drainage Works

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**BILL 4: DRAINAGE WORKS****ITEM 4.1 Provide and install scour checks****ITEM 4.1.1 Using stones****ITEM 4.1.2 Using sticks****DESCRIPTION:**

- Where longitudinal drain gradients exceed 4%, water flows at a speed that can cause erosion. Scour checks are small dams or steps in the drain, which reduce the velocity of the water flow.
- The Works shall be carried out as detailed in **Volume 4, Manual B, Section E 4.1 (Technical Manual)**
- Scour checks are built using either stones or sticks, as instructed by the Engineer.
- Intervals at which scour checks are constructed depends on the gradient of the drain:

Gradient of Road	4% or less	5%	6%	7%	8%	9%	10%	>10%
Scour Check Spacing	not required	20m	15m	10m	7.5m	6m	5m	4m

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- **Constructing scours checks using stones** consists of:
  - collect stones of adequate size and haul to site,
  - stones to be of minimum 20 kg weight,
  - excavate foundation trench and apron bottom,
  - place stones, backfill and compact with hand rammer or sledgehammer. Use scour check template for correct shape; **Volume 4, Manual B, Section E 4.1**
- **Constructing scours checks using sticks** consists of:
  - cut sticks of adequate size and timber quality and haul to site,
  - sticks to have minimum diameter of 5 cm and minimum 40 cm length,
  - excavate apron bottom,
  - ram sticks into the ground using a sledgehammer. Use scour check template for correct shape; **Volume 4, Manual B, Section E 4.1**

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Spacing of scour checks	Tape	all	+ / - 20 cm
Shape	Template	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.1.1	Provide and install scour checks using stones	Number (No.)→ of checks	AWD
4.1.2	Provide and install scour checks using sticks		

**Payment:** The Engineer will effect payment of the number of scour checks installed in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.2 Excavation of foundation for drainage structures****ITEM 4.2.1 In soil not more than 1m deep****ITEM 4.2.2 In soil more than 1m deep****DESCRIPTION:**

- This Item consists of excavating foundation trenches for culvert head and wing walls, other minor structures, retaining walls and gabion structures.
- The depth and width of excavation shall be carried out as specified in the Drawings and/or as directed by the Engineer.
- The bottoms of excavations shall be hand finished to provide a uniform and smooth footing.
- The excavated material shall be deposited well outside the trench and spoil material shall be deposited as and where directed by the Engineer. Excavated material may, where suitable, be utilised for backfill as approved by the Engineer.
- Suitable and effective drainage shall be provided for foundation trenches to prevent ingress of water into excavations and to keep the trenches dry.
- **No foundation work shall be paid before the excavation dimensions, depth and finishing has been approved by the Engineer.**
- The Contractor shall take all necessary precautions to safeguard the stability and safety of the excavations.

**WORK METHOD:****(FC)**

- The Contractor may choose Labour, Equipment or a combination of both to carry out this Item depending on the degree of difficulty of the Work.
- The Work for this Item may be carried out consisting of the following activities:
  - set out trench width and length ,
  - excavate using labour or equipment and deposit material well outside the trench,
  - in case of spoil, haul material to approved dumping locations,
  - hand finish excavation to the required level(s) and dimensions,
  - provide drainage for trench(s) if required to keep them dry.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ / - 50 mm
Trench bottom; level(s), uniformity	Line level, Straight edge and spirit level	all	+ / - 10 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.2.1	Excavation of foundation for drainage structures: In soil not more than 1m deep	<b>Cubic Metre</b> (m <sup>3</sup> ) → of excavation	<b>AWD</b>
4.2.2	In soil more than 1m deep		

**Payment:** The Engineer will effect payment of completed foundation excavation in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.3 Supply and install concrete culvert pipe rings****ITEM 4.3.1 600 mm diameter****ITEM 4.3.2 900 mm diameter****ITEM 4.3.3 1200 mm diameter****DESCRIPTION:**

- The culvert is a cross drain built under the road and its function is to lead water from the upper to the lower side of the road.
- This Item consists of supplying the concrete pipe rings, excavating the trench including inlet and outlet, laying and joining the rings, backfilling the trench and, if required, constructing a ramp over the culvert.
- Culvert **head and wing walls and aprons are not included in this Item** but are covered in **Items 4.6 and 4.7**.
- The Works shall be carried out as detailed in **Volume 4, Manual B, Section E 4.5** and **Volume 4, Manual A**
- The pipe rings shall be of plain concrete with ogee joints of concrete Class 20, at least 28 days cured and, where possible, manufactured on site. If the pipe rings are not manufactured on site the supplier must be approved by the Engineer.
- The culvert gradient including the outlet shall be minimum 2%.
- Sealing of joints shall be done with mortar 1 : 4
- Backfilling shall be done with approved material and compacting in layers not exceeding 15 cm loose.
- Ramps shall be shaped to achieve a minimum overfill of 3/4 of the pipe diameter.
- The disposal of surplus material shall be done at locations approved by the Engineer.
- On high traffic roads, excavation of trench(s) and lying of pipe rings shall be carried out in stages to allow vehicles to pass. Installation work shall wherever possible start from the outlet side. Adequate traffic signs shall be provided.

**WORK METHOD: Refer Volume 4, Manual B, Section E 4.5 and Volume 4, Manual A**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - supply plain concrete culvert pipe rings,
  - excavate trench including Inlet and outlet with minimum 2% gradient → establish levels,
  - shape culvert bed,
  - place pipe rings and join them,
  - *build head, wing walls and aprons (Items 4.6 and 4.7) → as specified in Drawings,*
  - backfill and compact in layers not exceeding 15 cm loose,
  - shape ramp over culvert.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Culvert ring quality	Visual	randomly	
Culvert length	Tape	all	+ / - 10 mm
Inlet level	Line level, Boring rods	all	+ / - 10 mm
Gradient	Line level, Boring rods	all	+ / - 1%
Sealed Joints	Visual	all	

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.3.1	Supply and install concrete culvert pipe rings 600 mm diameter	Linear Metre (m)→ of culvert pipe	AWD
4.3.2	900 mm diameter		
4.3.3	1200 mm diameter		

**Payment:** The Engineer will effect payment of completed culvert lines in the following Payment Certificate upon approval of the works.



- BILL 4: DRAINAGE WORKS**
- ITEM 4.4 Supply and install steel culvert pipe rings**
- ITEM 4.4.1 600 mm diameter**
- ITEM 4.4.2 900 mm diameter**
- ITEM 4.4.3 1200 mm diameter**
- ITEM 4.4.4 > 1200 mm diameter**

**DESCRIPTION:**

- The culvert is a cross drain built under the road and its function is to lead water from the upper to the lower side of the road.
- This Item consists of supplying the steel culvert pipe rings, excavating the trench including inlet and outlet, laying and joining the rings, backfilling the trench and, if required, constructing a ramp over the culvert.
- Culvert **head and wing walls and aprons are not included in this Item** but are covered in **Items 4.6 and 4.7**.
- The Works shall be carried out as detailed in **Volume 4, Manual B, Section E 4.5** and **Volume 4, Manual A**
- The culvert pipe rings shall be of steel. The Engineer shall approve the type of steel culvert pipe rings and the supplier. A sample culvert may be provided prior to the commencement of works for approval by the Engineer.
- The culvert gradient including the outlet shall be minimum 2%.
- Backfilling shall be done with approved material and compacting of layers not exceeding 15 cm loose.
- The ramp shall be shaped to achieve a minimum overfill of 3/4 of the pipe diameter.
- The disposal of surplus material shall be done at locations approved by the Engineer.
- On high traffic roads, excavation of trench and lying of pipe rings shall be carried out in stages to allow vehicles to pass. Installation work has to start from the outlet side. Adequate traffic signs shall be provided.

**WORK METHOD: Refer Volume 4, Manual B, Section E 4.5 and Volume 4, Manual A**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - supply steel culvert pipe rings,
  - excavate trench including Inlet and outlet with minimum 2% gradient → establish levels,
  - shape culvert bed,
  - place pipe rings and join them,
  - *build head, wing walls and aprons (Items 4.6 and 4.7) → as specified in Drawings,*
  - backfill and compact in layers not exceeding 15 cm loose,
  - shape ramp over culvert.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Culvert length	Tape	all	+ / - 10 mm
Inlet level	Line level, Boring rods	all	+ / - 10 mm
Gradient	Line level, Boring rods	all	+ / - 1%
Steel pipe rings – assembly including correct use of nuts and bolts	Visual	all	

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.4.1	Supply and install steel culvert pipe rings 600 mm diameter	<b>Linear Metre</b> (m)→ of culvert pipe	<b>AWD</b>
4.4.2	900 mm diameter		
4.4.3	1200 mm diameter		
4.4.4	> 1200 mm diameter		

**Payment:** The Engineer will effect payment of completed culvert lines in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.5 Demolish existing structures and cart away debris****DESCRIPTION:**

- This Item consists of demolishing existing structures or parts of structures as directed by the Engineer, and carting away the debris.
- Stones or concrete blocks of good quality from demolished structures may be re-used for new structure works.
- The debris shall be dumped at a place approved by the Engineer.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work.
- This Item consists of:
  - demolishing the existing structure or structure parts, either using labour or equipment,
  - separating of good quality stones or concrete blocks from debris to be re-used for other structure works,
  - loading of debris and hauling to approved dumping locations.

**QUALITY CONTROL:**

- Demolishing work and dumping as instructed.
- Where the structure is to be replaced with a new structure, the equivalent volume of excavation performed in this Item shall be taken into account when determining the unit rates for **Items 4.3 and/or 4.4**.
- Where the demolished structure is not to be replaced, the equivalent volume of excavation performed in this Item shall be filled in accordance with **Item 3.3**.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.5	Demolishing of existing structures and cart away debris	Lump Sum	MBC

**Payment:** The Engineer will effect payment of demolished structures or structure parts as a Lump Sum in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.6 Provide material and build cement bound masonry work in****ITEM 4.6.1 Stones****ITEM 4.6.2 Concrete blocks****DESCRIPTION:**

- This Item consists of providing all the required material, including cement, sand, stones or concrete blocks, and building cement bound masonry walls and aprons as specified in the Drawings and directed by the Engineer.
- The workmanship shall be in accordance with **Volume 4, Manual B, Section E 4.4.3**
- The mortar mix shall be of 1:4; refer **Volume 4, Manual B, Section C 3**
- Joints do not require pointing but must be trowled off flush with the surface.
- The joints shall be between 10 and 40 mm thick and bonding shall allow a minimum overlap of 1/4 stone length.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The work for this Item may be carried out consisting of the following activities:
  - supply sand and cement,
  - collect stones of minimum 20kg weight and of good quality or concrete blocks as required by the Drawings or as directed by the Engineer,
  - mix mortar of mix 1:4 ,
  - build masonry walls or aprons as per the Drawings and/or as directed by the Engineer,
  - protect completed work from direct sunshine for at least 14 days and keep wall crowns and aprons wet for at least 7 days.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ / - 10 mm
Levels	Line level, Straight edge and spirit level	all	+ / - 10 mm
Mortared joints to be fully filled	Visual	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.6.1	Provide material and build cement bound masonry work in: Stones	<b>Cubic Metre</b> (m <sup>3</sup> ) → of masonry work	<b>MAP/AWD</b>
4.6.2	Concrete blocks		

**Payment:** The Engineer will effect payment of completed masonry work of any completed structure in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.7 Provide stones and build dry stone masonry walls****DESCRIPTION:**

- This Item consists of providing good quality stones and building dry stone masonry walls as specified in the Drawings and directed by the Engineer.
- The workmanship for head and wing walls and aprons shall be in accordance with **Volume 4, Manual B, Section E 4.4.2**
- The workmanship for retaining walls shall be in accordance with the Drawings and as directed by the Engineer.
- The Bonding shall allow a minimum overlap of 1/4 stone length. The biggest stones shall be in the bottom layers of the wall.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - collect stones of minimum 20kg weight and of good quality as required by the Drawings or as directed by the Engineer,
  - build masonry as per the Drawings and/or as directed by the Engineer,
  - backfill in layers whenever one course of stones has been placed,
  - if instructed provide the wall with a cement mortar crown,
  - protect cement crown from direct sunshine for 14 days and keep crown wet for 7 days.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ / - 50 mm
Levels	Line level, Straight edge and spirit level	all	+ / - 20 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.7	Provide stones and build dry stone masonry walls	Cubic Metre (m <sup>3</sup> ) → of masonry work	MAP/AWD

**Payment:** The Engineer will effect payment of completed masonry work of any completed structure in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.8 Provide, erect and remove formwork for concrete****DESCRIPTION:**

- Formwork will be required for any concrete work of structures as specified in the Drawings. Falsework shall be part of the formwork in cases where this is required; e.g. box culvert slabs or decks for small bridges.
- This Item consists of providing all materials for formwork and falsework, erecting the falsework and formwork, and after curing of the concrete, removing it.
- Falsework shall be constructed as specified in the drawings and as directed by the Engineer
- Formwork shall be sufficiently rigid to maintain the forms in their correct position, shape and profile and shall be of such tight construction that the concrete can be placed and compacted without undue leakage of the mortar component of the concrete.
- The formwork construction shall permit accurate erection and easy stripping without shock or damage to the cast concrete.
- All external corners shall be chamfered by fillet strips being fixed into the corners of the formwork.
- Formwork for walls, vertical sides of slabs and pillars can be removed after 24 hours.
- Falsework and formwork for soffits of beams and slabs shall not be removed until after 28 days of curing.
- The formwork shall be provided with a thin film of oil to allow easy stripping and to provide a smooth concrete surface.
- **No concrete shall be cast unless the formwork including the reinforcement has been checked and approved by the Engineer!**

**WORK METHOD:****Refer Volume 4, Manual A**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - supply all material for falsework and formwork,
  - for falsework, establish well compacted foundation strips, if necessary provide lean concrete strips,
  - erect falsework and formwork in accordance with the Drawings and directions of the Engineer,
  - apply a thin oil film on the surface of the formwork,
  - *fix reinforcement (included in **Item 4.9**),*
  - *cast concrete (included in **Item 4.11**),*
  - clean formwork from spilled concrete and cement mortar immediately after casting,
  - remove falsework and formwork after the specified duration, clean and cart away (false and formwork material may be re-used for other structures where approved by the Engineer).

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ / - 10 mm
Levels	Line level, Straight edge and spirit level or Levelling instrument	all	+ / - 10 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.8	Provide, erect and remove formwork for concrete	<b>Square Metre (m<sup>2</sup>)</b> → of form work measured by the total concrete surface area covered with formwork	<b>MAP/AWD</b>

**Payment:** The Engineer will effect payment of completed masonry work of any completed structure in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.9 Provide and fix steel reinforcement****ITEM 4.9.1 Steel bars****ITEM 4.9.2 Weld mesh****DESCRIPTION:**

- Reinforcement required for any concrete work shall be as specified in the Drawings and as directed by the Engineer.
- The Item includes supplying reinforcement of specified strength and quality, bending the bars, and fixing the reinforcement.
- Reinforcement shall be cut and/or bent to the dimensions shown on the bending schedules and in accordance with the Drawings or as directed by the Engineer.
- Reinforcement shall be positioned as shown on the Drawings and shall be firmly secured in position by tying with annealed wire.
- Any cover and spacer blocks required to support the reinforcement should be as small as may be consistent with their use. The concrete cover over the ends of ties shall be as specified in the Drawing but not less than 30 mm.
- Reinforcement shall be clean from dirt and oil.
- **No concrete shall be cast unless the reinforcement including formwork has been checked and approved by the Engineer.**

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - supply reinforcement of the specified quality and quantity,
  - cut and bend reinforcement as specified in the bending schedule,
  - ensure all reinforcement is clean from dirt and oil before fixing it ,
  - fix the reinforcement as specified in the Drawing and tie with wire, including cover and distance blocks; refer **Volume 4, Manual B, Section C 5** and **Manual A**

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Class and type	Compare with drawing	all	0
Spacing and tying	Visual and tape	all	+ / - 10 mm
Cover	Visual and tape	all	+ / - 5mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.9.1	Provide, and fix steel reinforcement Steel bar	<b>Kilograms</b> (kg) → of steel bars	<b>MAP/AWD</b>
4.9.2	Provide, and fix steel reinforcement Weld mesh	<b>Square Metre</b> (m <sup>2</sup> ) → of weld mesh	<b>MAP/AWD</b>

**Payment:** The Engineer will effect payment of completed fixed reinforcement in the following Payment Certificate upon approval of the works.



**BILL 4: DRAINAGE WORKS****ITEM 4.10 Provide, place and compact hardcore foundation layer for structures****DESCRIPTION:**

- Hardcore beds required for structure work shall be as specified in the Drawings and as directed by the Engineer.
- The Item includes supplying approved hardcore material, placing and compacting.
- The longer dimension of the hardcore stones shall not be less than 20 cm and the smaller dimension not less than 10 cm
- The stones shall be placed upright and packed as close as possible. Voids shall be filled with smaller stones
- The hardcore layer shall be compacted using a hand operated vibrating roller.
- **No concrete shall be cast unless the hardcore bed has been checked and approved by the Engineer.**

**WORK METHOD:****Refer Volume 4, Manual A**

- The Contractor shall apply **Labour** method of work for this Item. However, compaction shall be carried out using a vibrating pedestrian roller.
- The Work for this Item may be carried out consisting of the following activities:
  - supply hard core stones,
  - place the stones upright and wedge them with smaller stones,
  - compact with pedestrian vibrating roller → fill additional voids with more smaller stones,
  - ensure a uniform and level surface is achieved.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions and level	Tape, line level and straight edge	all	+ / - 20 mm
Compaction	Visual	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.10	Provide, place and compact hardcore foundation layer for structures	Cubic Metre (m <sup>3</sup> ) → of hardcore compacted	MAP/AWD

**Payment:** The Engineer will effect payment of compacted hard core layer(s) in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.11 Provide, cast and cure concrete in class:****ITEM 4.11.1 Class Lean (1:4:8)****ITEM 4.11.2 Class 15 (1:3:6)****ITEM 4.11.3 Class 20 (1:2:4)****DESCRIPTION:**

- This Item consist of providing concrete materials, mixing, placing, compacting and curing concrete for structural work as specified in the Drawings and as directed by the Engineer.
- Class lean (1:4:8) is concrete used for blinding.
- Class 15 (1:3:6) is mass concrete usually without reinforcement.
- Class 20 (1:2:4) is structural concrete with reinforcement.
- Sand for concrete mixing shall be clean river sand, free from dust, lumps, soft or flaky particles, organic matter.
- Aggregates shall be well graded and free from organic material.
- Water shall be clean and free from oil and shall not contain any impurities that may affect concrete durability.
- The water / cement ratio shall not be more than 0.5.
- Concrete works for small structures shall be carried out in accordance with **Volume 4, Manual B, Section C 2** and **Volume 4, Manual A**
- Concrete works for larger structures shall be carried out as specified in the drawings and as directed by the Engineer.
- Cast concrete elements shall be protected from direct sunshine for 14 days.
- Concrete slabs and wall crowns shall be kept wet for 7 days.
- **No concrete shall be cast unless the formwork, reinforcement and hardcore bed have been checked and approved by the Engineer.**

**WORK METHOD:****Refer Volume 4, Manual B, Section C 2 and Manual A**

- The Contractor shall apply **Labour** method of work for this Item. Mixing shall be done using a mechanical mixer and compacting using a vibrating poker.
- The Work for this Item may be carried out consisting of the following activities:
  - supply approved cement, sand and aggregates,
  - mix concrete using labour or mechanical mixer,
  - cast concrete in equal layers not exceeding 30 cm,
  - compact or vibrate concrete,
  - protect concrete form direct sunshine for 14 days and
  - keep slabs and wall crowns wet for 7 days.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Workability and mix of concrete	Slump test	As directed by Engineer	+ / - 25 mm of the required slump
Quality of cast concrete	Visual	all	No honey comb
Dimensions (completed concrete work)	Tape	all	+ 20mm / - 10mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.11.1	Provide, cast and cure concrete in class: Class lean (1:4:8)	<b>Cubic Metre</b> (m <sup>3</sup> ) → of cast concrete	<b>MAP/AWD</b>
4.11.2	Class 15 (1:3:6)		
4.11.3	Class 20 (1:2:4)		

**Payment:** The Engineer will effect payment of cast concrete for any completed structure following removal of all formwork in the following Payment Certificate and upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.12 Provide gabion baskets and stones, place and fill baskets****DESCRIPTION:**

- Gabions are weld/wire mesh boxes filled with stones and may be used as components of structures, as retaining walls and for erosion protection.
- This Item includes supplying the gabion baskets, placing and filling the baskets with stones as specified in **Volume 4, Manual B, Sections C 6 and E 4.4.1**, the Drawings and as directed by the Engineer.
- Gabion baskets are supplied in different sizes. The correct size to be used shall be specified in the Drawings and/or as directed by the Engineer.
- Gabion baskets shall be tied together with 3 mm galvanised wire securing all edges at 15 cm intervals.
- Filling shall be done with stones of similar size and shape as used for dry stone masonry. The stones have to be packed as if constructing a dry stone masonry wall ensuring adequate bonding.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - supply gabion baskets of the specified size,
  - collect stones of size and shape which allows dry stone masonry,
  - place the gabion baskets in the excavated foundation trench (**Item 4.2**),
  - assemble the gabion baskets; **Volume 4, Manual B, Section E 4.4.1**
  - fill gabion baskets with dry stone masonry,
  - close gabion and secure lid → continue with next gabion course,
  - back fill gabions after each course (**Item 4.14**).

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions and level	Tape	all	+ 100mm / - 50mm
Workmanship; placing, tying, filling	Visual	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.12	Provide gabion baskets and stones, place and fill baskets	Cubic Metre (m <sup>3</sup> ) → of placed and filled gabion	AWD

**Payment:** The Engineer will effect payment of completed gabion work in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.13 Provide material and build grouted stone pitching, 150 mm thickness****DESCRIPTION:**

- Stone pitching is required to protect soil surfaces from erosion. This may be in drains, on slopes or riverbanks.
- The Item consists of levelling the area to be covered with stone pitching, collecting stones, laying stones, mortaring the joints and constructing weep holes.
- The area to be covered with stone pitching shall be trimmed to level and/slope indicated on the Drawings and as directed by the Engineer. The prepared surface shall be firm and well compacted.
- Stones shall be placed in full contact with the surface and bedded into mortar (grout) of mixture 1:4 and at a minimum thickness of 150 mm.
- The mortar shall be troweld off flush with the surface of the stones.
- Weep holes shall be provided to stone pitching on slopes at an average frequency of one per square meter unless otherwise directed by the Engineer.
- The surface of the stone pitching shall be protected from direct sunshine and kept moist for 7 days

**WORK METHOD:****Refer Volume 4, Manual B, Section E 4.6 and Manual A**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - supply cement and sand for grouting and mix mortar (water / cement ratio = 1.4),
  - collect stones, not smaller than 15cm thickness,
  - trim and level area to be covered and compact where necessary,
  - place stones in mortar and towel surface flush with stones,
  - construct weep holes (use stacks or banana stems of min. 10 cm diameter),
  - cover stone pitching area to protect from direct sunshine and keep moist for 7 days.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ / - 50 mm
Workmanship; placing, grouting	Visual	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.13	Provide material and build grouted stone pitching, 150 mm thickness	Square Metre (m <sup>2</sup> ) → of stone pitching	MAP/AWD

**Payment:** The Engineer will effect payment of completed stone pitching work in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS**

**ITEM 4.14 Provide selected material and backfill structures**

**DESCRIPTION:**

- Backfilling is required for structures including their approaches, retaining walls and wing walls on structures, gabions, etc. Note; backfilling of culvert lines is included in the **Items for culvert installation, 4.3 and 4.4** respectively).
- The Item consist of excavation, loading and hauling of approved selected material, backfilling, watering and compacting.
- Material for backfilling has to be approved by the Engineer. Where material from the excavation (Item 4.2) meets the Specifications, this may be used as backfill material provided it has been approved by the Engineer.
- The backfill material shall be filled in layers not exceeding 15 cm loose.
- Each layer shall be compacted with hand rammers for backfill of retaining walls and wing walls, gabions, etc., and equipment for approaches to structures. The material to be compacted shall be watered where necessary.
- Backfilling shall not be done until after 14 days from the date when the cement bound masonry of concrete walls were constructed/cast.
- Stone filters behind walls shall be placed as specified in the Drawings and as directed by the Engineer.

**WORK METHOD:**

**Refer Volume 4, Manual A**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work.
- This Item consists of:
  - excavate approved materials and stockpile,
  - load and haul,
  - off load and spread in layers not exceeding 15 cm loose,
  - water if material is too dry until approximate optimum moisture content is reached,
  - compact with hand rammers all fill behind retaining walls,
  - compact with pedestrian vibrating roller all fills on approaches to structures,
  - care to be taken during compaction so as to not damage the structure.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	-
Compaction	Visual	random	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.14	Provide selected material and backfill structures	Cubic Metre (m <sup>3</sup> ) → of fill	MAP/AWD

**Payment:** The Engineer will effect payment of completed backfilling work in the following Payment Certificate upon approval of the works.

**BILL 4: DRAINAGE WORKS****ITEM 4.15 Excavate water diversions and/or construct barriers****DESCRIPTION:**

- This Item consists of excavating water diversions for structure works and/or building water barriers using soil or sandbags to keep the water away from the area where the structure will be constructed. The Item also includes all maintenance work that might be necessary during the use of diversions and barriers, and removal of, to the satisfaction of the Engineer, all diversions and barriers on completion of structural construction works.
- The length, depth and width of water diversions shall be excavated as specified in the Drawings and as directed by the Engineer.
- Water barriers consisting of dams reinforced with wooden stacks or made of sandbags shall be erected as specified in the Drawings and as directed by the Engineer.
- The excavated material shall be deposited well outside the excavated canal in order to ensure that it shall not fall back into the canal.
- The Contractor shall take the necessary precautions to safeguard the stability and safety of the excavations and barriers and maintain them at all times.

**WORK METHOD:****Refer Volume 4, Manual B, Section H 1.5**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work.
- The Work for this Item may be carried out consisting of the following activities:
  - set out diversion / barrier widths, lengths and levels,
  - excavate, using labour or equipment and deposit material well outside the canal,
  - fill sandbags with sand / soil and erect barriers. Sand bags shall be well stacked to ensure overlapping from course to course,
  - the sides of canal diversions and barriers may require reinforcement using large sticks rammed well into the ground,
  - maintain the canal diversions and barriers throughout their period of use, e.g. inspect daily, remove debris and silt, protect sides from erosion, replace defective sandbags, etc.
  - removal of all diversions and barriers on completion of structural construction works to the satisfaction of the Engineer.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ / - 100 mm
Canal bottom; level(s), uniformity	Line level, boning rods	all	+ / - 50 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.15	Excavate water diversions and/or construct barriers	Lump Sum	AWD

**Payment:** The Engineer shall effect payment for this Item in proportion to the total value of the Works performed at the time of preparation of the next Payment Certificate.

**BILL 4: DRAINAGE WORKS**

**ITEM 4.16 Clear swamps for structures, 50m upstream from inlet and 100m downstream from outlet of structure over full width of structure including head and wing walls**

**DESCRIPTION:**

- This Item consists of clearing the area adjacent to structures up- and downstream from vegetation and debris to allow for the free flow of water.
- The area to be cleared shall be:
  - 50 m upstream and as wide as the structure including its wing walls, and
  - 100 m downstream and as wide as the structure including its wing walls, and
  - as specified in the Drawings and directed by the Engineer.
- The cut vegetation and debris shall be deposited well outside the cleared area at an approved location. Burning may be allowed upon approval by the Engineer.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item.
- The Work for this Item may be carried out consisting of the following activities:
  - clear specified area from all vegetation and debris,
  - haul and deposit cut vegetation and debris well outside the cleared area at approved locations,
  - burn deposited material only on approval by the Engineer.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions	Tape	all	+ 500 / - 500 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.16	Clear swamps for structures, 50m upstream from inlet and 100m downstream from outlet of structure over full width of structure including head and wing walls	Lump Sum	AWD

**Payment:** The Engineer will effect payment of completed swamp clearing work in the following Payment Certificate upon approval of the works.



**BILL 4: DRAINAGE WORKS**

**ITEM 4.17 Other drainage erosion protection works as directed by the Engineer  
(Provisional Item)**

**DESCRIPTION:**

- This Item may consist of any other drainage protection works not covered in the previous drainage Items.
- Such work will be specified in the Drawings and directed by the Engineer

**WORK METHOD:**

- The Contractor shall apply the appropriate work method to this Item
- The Work for this Item may be carried out consisting of the following activities:
  - .....
  - .....
  - .....

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
4.17	Other drainage erosion protection works as directed by the Engineer		

**Payment:** The Engineer will effect payment of .....



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**Bill 5**  
**Gravelling and Completion Works**

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## **Bill 5**

### **Gravelling and Completion Works**

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**BILL 5: GRAVELLING AND COMPLETION WORKS****ITEM 5.1 Preparation of quarry site(s) consisting of clearing vegetation and removing topsoil****DESCRIPTION:**

- The Engineer shall approve quarries and their extent of exploitation. The quarries shall be allocated to the Contractor prior to commencement of the Works. The Contractor shall carry out respective negotiations with landowners and communities.
- Before gravel can be excavated, quarry areas and the adjacent areas where topsoil will be stockpiled have to be cleared from all vegetation, fences and structures. Topsoil has to be removed and deposited in order to use it again to reinstate the quarry at the end of construction work.
- The Item consists of removing all vegetation, crops, trees, roots, stumps, boulders, fences and structures from the gravel excavation area and top soil (overburden) deposited in areas as shown in the Drawings and as directed by the Engineer. Waste material shall be dumped at places approved by the Engineer. The Engineer may allow burning of waste material upon approval.
- The Item also consists of excavation of topsoil (overburden) including loading, hauling and stockpiling at the approved locations.
- Final restoration of the quarry site(s) is covered in **Item 5.3**.

**WORK METHOD:****Refer Volume 4, Manual B, Section F 2.2**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works.
- The Work for this Item may be carried out consisting of the following activities:
  - remove fences and structures from quarry and topsoil deposit areas,
  - cut grass and bushes,
  - cut trees and remove stumps,
  - grub roots,
  - remove and stockpile boulders,
  - haul and deposit cut vegetation and debris well outside the cleared area at approved locations,
  - burn deposited material only when approved by the Engineer,
  - excavate topsoil layer,
  - load topsoil and haul to approved stockpile location,
  - stockpile topsoil neatly so that it can be reused for reinstatement of the quarry.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Dimensions (cleared quarry area)	Tape	all	+ / - 200 mm

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
5.1	Preparation of quarry site consisting of clearing from vegetation and removing topsoil	Square Metre (m <sup>2</sup> ) → of clearing quarry	AWD

**Payment:** The Engineer will effect payment of completed quarry clearing work in the following Payment Certificate upon approval of the works.

**BILL 5: GRAVELLING AND COMPLETION WORKS****ITEM 5.2 Excavate gravel, remove boulders, stockpile, load, haul, offload, spread, water and compact****DESCRIPTION:**

- The Item includes all operations required to win gravel and to lay the gravel road surface layer. In particular the Item consists of excavation, stockpiling, loading, hauling, off loading, spreading, watering and compacting.
- The gravel shall be excavated from quarries approved by the Engineer. It is the Contractors obligation to inform the Engineer in the case that the quality / availability of the gravel changes during the course of excavation.
- Excavation and stocking of gravel shall be carried out as specified in **Volume 4, Manual B, Section F 2.5**
- Reshaping of the formation surface may be required before the gravel can be placed. Where required, this activity is covered in **Item 3.1**.
- Where there remains a residual gravel layer from previous graveling operations, this residual layer shall be scarified to a depth of not less than 10cm in order to provide a bond between the old and new gravel materials. Scarification, where required, with be included in the unit rate for this Item.
- Oversize stones and boulders 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 for structural works.
- Off loading shall be done by tipping or throwing the material uniformly into spreading boxes set out with pegs and strings as specified in **Volume 4, Manual B, Sections F 2.6 and F 2.7**. The compacted thickness of the layer will be as specified in the Drawings and as directed by the Engineer.
- Spreading of the gravel shall be carried using labour method to ensure uniform thickness of the layer and camber cross-fall as specified in **Volume 4, Manual B, Section F 2.7**. Spreading also includes either removing or crushing of all oversize material using sledge hammers.
- Compaction shall be carried out with a self propelled or towed roller with approved total weight and dimension. A minimum six (6) passes of compaction shall be applied or until no roller imprint on the surface can be recognised. The gravel layers to be compacted shall not exceed 20cm loose and the gravel shall be watered before compaction takes place in order to achieve the required moisture content.
- The camber of the compacted formation shall have a cross fall of not less than 8%.

**WORK METHOD:**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Works. **Excluded** are: **spreading** of the gravel layer which shall be done using **labour** only, and **compaction** which shall be done using **equipment**.
- The Work for this Item may be carried out consisting of the following activities:
  - excavate gravel and stockpile ready for loading,
  - remove oversize stones and boulders, haul to locations allocated for depositing,
  - load gravel and haul to the Site,
  - reshape earth road formation by filling ruts and potholes, re-establish camber and shoulder line if defective; refer **Item 3.1**,
  - scarify, to a minimum depth of 10cm, where any residual gravel exists,
  - set out spreading boxes in accordance with required thickness of the gravel layer,
  - offload and spread material uniformly in boxes using labour. Crush oversize stones with sledgehammer. Form camber and check with camber board,
  - water gravel to achieve approximate optimum moisture content,
  - compact with towed or self propelled roller or compactor,
  - check uniformity of layer thickness (20cm loose) and achieved 8% cross-fall → correct immediately where necessary.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Gravel Quality / Approved Source	Visual / Inspection	Daily	None
Scarification	Visual	As required	None
Gravel Surface Width	Tape	every 100 m	+ / - 20 mm
Gravel Surface Thickness	Test holes, Tape	spot checks, average 10 per km	+ / - 5 mm
Gravel Surface Profile	Camber Board	every 50 m	+ / - 1%
Compaction	Roller Imprint	randomly	None

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
5.2	Excavate gravel, remove boulders, stockpile, load, haul, offload, spread, water and compact	<b>Cubic Metre</b> (m <sup>3</sup> ) → of <b>compacted</b> gravel layer in place	<b>AWD</b>

**Payment:** The Engineer will effect payment of any completed section of gravelling work in the following Payment Certificate only after detailed checking and confirmation of the actual quantity of gravel compacted in place and after approval of the works.

**BILL 5: GRAVELLING AND COMPLETION WORKS**  
**ITEM 5.3 Restoration of site(s), quarries and borrow pits**

**DESCRIPTION:**

- For environmental reasons quarries and borrow pits shall be restored at the end of the Works; refer **Clause 64** of the Conditions of Contract. The ground shall levelled, topsoil hauled back and uniformly spread over the entire exposed/excavation area.
- Where necessary appropriate protection measures may be taken to avoid erosion of the spread topsoil layer.
- Grass and trees may be replanted as directed by the Engineer.
- Adequate drainage provisions shall be made to protect excavation areas.
- The Work Site(s) shall also be cleared of all debris, remaining materials, stores, equipment, etc. Site camps including all sanitation facilities shall be dismantled and removed and the entire area of the Works restored to its original condition.

**WORK METHOD: Refer Volume 4, Manual B, Sections E 3.1, F 2.8 and H 4**

- The Contractor may choose **Labour, Equipment or a combination of both** to carry out this Item depending on the degree of difficulty of the Work.
- The Work for this Item may be carried out consisting of the following activities:
  - level quarry or borrow pit,
  - loosen deposited top soil,
  - load and haul,
  - spread uniformly,
  - plant grass and trees as directed by the Engineer,
  - carry out erosion control measures as directed by the Engineer,
  - provide adequate provision for drainage of the area,
  - the entire area of the Work Site(s) restored to its/their original condition.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Check	Visual	all	none

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
5.5	Restoration of site(s), quarries and borrow pits	Lump Sum	AWD

**Payment:** The Engineer will effect payment of this lump Sum Item only after all quarries and borrow pits and the Work Site(s) have all been fully restored to the satisfaction of the Engineer and the work has been approved. Following the completion of this Work and its approval, an Environmental Restoration Certificate will be issued to the Contractor.



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**Bill 6**  
**Preliminary and General Items**

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## **Bill 6**

### **Preliminary and General Items**

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**BILL 6: PRELIMINARY AND GENERAL ITEMS****ITEM 6.1 Mobilisation and Demobilisation****DESCRIPTION:**

- This Item covers the establishment, maintenance and removal of site camp facilities.
- The Contractor shall establish construction camp(s) on Site(s) and at locations as approved by the Engineer in collaboration with the Community/Communities in which the Works are to be performed.
- Particular attention in locating the camp(s) shall take into account the requirements of labourers for which the walking distance from the site camp to the actual Work Site should not exceed 4 km.
- Depending on the size of the road length to be worked on it might be necessary to maintain more than one site camp or to shift site camps to new locations at frequent intervals.
- Site camp establishment work includes:
  - Providing and hauling all required material from Contractor's source to site.
  - Erection of suitable accommodation for the Contractor's staff on site.
  - Cooking facilities to prepare food for the labourers.
  - Supply of drinking water and provision of sanitation facilities to the satisfaction of the Local Health Authorities.
  - Erection of site office for the contractor's site agent and supervisory staff.
  - Adequate space and facilities to allow for site meetings:
    - (i) with the Engineer and Employer, and
    - (ii) with the Community and/or Community Representatives.
  - Erection of stores and other facilities that might be required for the operations on site to enable work to commence.
  - Any facilities and security measures required to maintain safety for the staff and labourers, materials and equipment, such as fences, gates, watchmen, etc.
- Site camp demobilisation work includes:
  - Removing of all above described facilities and hauling them away.
  - Reinstatement of site camp areas to original appearance including filling of pit latrines if they are not required by the community.
  - Removal and safe disposal of all debris and waste materials, etc.
  - Handing back of site camp areas to the community/communities,
  - Undertaking all activities included in this Item and in **Item 5.3** to the satisfaction of the Engineer.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Check	Visual	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
6.1	Mobilisation and demobilisation	Lump Sum	LS

**Payment:** Payment of this lumpsum item will be effected as follows: 70% on the first Payment Certificate, and, following issuance of the Environmental Restoration Certificate (Conditions of Contract, Clause 64), 30% on the final Payment Certificate.

**BILL 6: PRELIMINARY AND GENERAL ITEMS**

**ITEM 6.2 Insurances and Bonds**

**DESCRIPTION:**

- The Contractor shall provide certificates from approved Insurance Companies to the effect that the Contractor has taken out all the insurances as required in the Conditions of Contract, **Clause 13**.
- The Contractor may be required to provide a Performance Bond or Security, either in the form of a Bank Guarantee or of a Performance Bond in accordance with the requirements of the Conditions of Contract, **Clause 52**. The Performance Bond or Security, where required, must be provided to the Employer by the Contractor within fourteen (14) days of notification of award of Contract.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
6.2	Insurance Cover	Shall be paid in full in the first Interim Payment Certificate	LS
	Performance Bond / Security	As negotiated with the Client	

**BILL 6: PRELIMINARY AND GENERAL ITEMS****ITEM 6.3 Traffic Accommodation****DESCRIPTION: Refer Volume 4, Manual B, Section B 6**

- This Item covers all costs for traffic signs and traffic safety measures for i.) signs for diversions and traffic regulation during performance of the Works, and ii.) traffic signs for the completed road. The Item includes supply of materials, their cutting, shaping, painting, labour, equipment, transport and installation and their maintenance for the entire duration of the Works.
- Traffic signs and traffic regulation during the Works shall be done in accordance with the relevant traffic regulations of the Ministry of Works, Housing & Communications.
- Traffic signs for completed road or road sections shall be in accordance with the general standards laid down by the Ministry of Works, Housing & Communications and shall be manufactured and set in accordance with the Drawings of this Contract.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
6.3	Traffic Accommodation	Shall be paid in full in the Final Payment Certificate	<b>LS</b>

**BILL 6: PRELIMINARY AND GENERAL**

**ITEM 6.4 Bill Boards**

**DESCRIPTION:**

- Bill Boards as specified in the Drawings and as directed by the Engineer, shall be placed at the beginning and end of the road or road section covered by this Contract.
- Bill Boards shall be placed next to the roadway at locations identified by the Engineer.
- Bill Boards shall be maintained for the entire duration of the Works.

**WORK METHOD:**

- The Work for this Item may be carried out consisting of the following activities:
  - Supply Bill Board with details as specified in the Drawings.
  - Dig holes for posts; minimum depth of 100 cm and diameter of 30 cm.
  - Erect posts of Bill Board and embed in lean concrete.
  - Dispose of excavated soil and other materials.
  - Maintain on a regular basis during performance of the Works.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Check	Visual	all	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
6.4	Bill Boards	Number (No.) → of Bill Boards	MAP

**Payment:** The Engineer will effect payment for erected Bill Boards in full in the Final Payment Certificate and upon approval of the works.

**BILL 6: PRELIMINARY AND GENERAL****ITEM 6.5 Maintenance of the Whole of the Works****DESCRIPTION:**

- The Contractor shall maintain the Whole of the Works covered by this Contract until the end of the Defect Liability Period and until the road, or road section, is officially handed over to the Employer.
- The Contractor shall carry out all maintenance activities required to retain the Works in the condition "as built". Ordinary routine maintenance activities may be sufficient and which consist of: keeping the drainage system including all drains, culverts and structures open at all times; reshaping of the carriageway including filling of ruts and potholes; raking of loose gravel from side drains and shoulders to carriageway; and controlling vegetation.
- Maintenance activities shall be carried out on a continuous basis and must be attended to at least on a weekly basis. The exact input of resources and operations will depend upon the actual maintenance requirements and on the advise and direction of the Engineer.
- Maintenance operations and their organisation shall be used as a demonstration for the respective Community on how to manage and carry out routine maintenance works using labour-based methods. The Contractor shall, therefore, make all necessary arrangements to inform local community representatives regarding all maintenance operations and shall encourage the Community to participate actively in its management and implementation.

**WORK METHOD:**

- The Contractor shall apply **Labour** method of work for this Item, using either a length-person system or gangs of labourers.
- The Work for this Item may be carried out consisting of the following activities:
  - Remove debris and silt from all drainage channels, culverts and structures.
  - Rake loose gravel from shoulders and side drains back onto the carriageway.
  - Fill ruts, potholes, erosion gullies and depressions with gravel and compact.
  - Control vegetation, e.g. grass cutting, grubbing, etc.
  - Repair erosion gullies on shoulders, slopes and in drains, e.g. fill and plant grass, construct additional scour checks, etc.
  - Repair defective scour checks and/or add new ones where required.
  - Repair minor defects on structures.

**QUALITY CONTROL:**

Test	Method	Frequency	Tolerance
Road condition check	Visual	Continuous	-

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Unit of Measurement	Method of Measurement
6.5	Maintenance of the Whole of the Works	Lump Sum	LS

**Payment:** The Engineer shall effect payment for this Item in proportion to the total value of the Works performed at the time of preparation of the next Payment Certificate and following satisfactory performance of maintenance of the Whole of the Works.

**BILL 6: PRELIMINARY AND GENERAL ITEMS**

**ITEM 6.6 Supervision of the Works by the Employer including testing facilities**

**DESCRIPTION:**

- This Item covers the costs related to a) supervision, and b) testing of the Works by the Employer.
- Costs associated with **supervision of the Works by the Employer and his representative, the Engineer**, and which are not covered under other Items in this Contract include:
  - Provision of transport and allowances for the Engineer and his staff to carry out supervisory activities and to attend various meetings related to this Contract.
  - Provision of testing and measuring facilities and tools to the Engineer as specified in **Section B 4.3** (Test Facilities and Equipment) of the Specifications.
- Costs associated with supervision of the Contract by the Contractor shall be included in the Contractor's unit rates as an Indirect Cost / Overhead for each and every Item.
- The Lump Sum provision for this Item shall be under the discretionary control of the Employer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Payment	Method of Measurement
6.6	Supervision of the Project by the Employer inc. testing facilities	The Lump Sum to be provided for this Item shall be 5% of the total value of Bills 1, 2, 3, 4 and 5. These funds will be retained by the Employer with payments made as his / her discretion	<b>LS</b>



**BILL 6: PRELIMINARY AND GENERAL ITEMS**

**ITEM 6.7 Site Meetings with Local Communities including HIV/AIDS awareness**

**DESCRIPTION:**

- A fundamental principle for ensuring community participation is to ensure that development activities are implemented in the most transparent manner.
- One of the ways of doing so is to involve the stakeholders in the various implementation processes. At the sub-county level, the stakeholders comprise the benefiting Communities in which Works take place, members of their respective Works Committees and other interest groups and Contractors and their workers.
- To enable all stakeholders to follow closely what is taking place in their sub-counties, there is need for regular meetings between the stakeholders mentioned above.
- Others that may participate in these meetings include relevant district staff (such as Community Development Offices, Gender Officers, Environment Officers, labour Officers and the District Engineers among others). Meeting would take place at or near the sites of Works on, at least, a monthly basis.
- A further principle for ensuring community participation is promoting the use of local resources, particularly labour. This includes promoting gender issues and women participation. Women will be working side by side with men. This is likely to lead to sexual relationships, which promote sexual transmission of HIV and other Sexually Transmitted Diseases (STD). To address this potential problem, meetings will be held at the sites to sensitise workers on the sexual transmission and prevention of HIV and STDs. Sensitisation meetings will be facilitated by Health Workers (HWs) from the Health Sub-District (HSDs).
- This Item covers the following costs for all the above mentioned meetings:
  - Fuel for transport of one vehicle from the district to the sites of the Works.
  - Lunch allowance for official representatives of the sub-county including selected members of their Works Committee.
  - Daily Subsistence Allowance for officers from the District.
  - Other small items required for undertaking and recording Minutes of Meetings including stationary, etc.
- The Lump Sum provision for this Item shall be under the discretionary control of the Employer.

**MEASUREMENT AND PAYMENT:**

Pay Item No.	Description	Payment	Method of Measurement
6.7	Site Meetings with Local Communities including HIV/AIDS awareness	The Lump Sum to be provided for this Item shall be 1% of the total value of Bills 1, 2, 3, 4 and 5. These funds will be retained by the Employer with payments made as his / her discretion	LS





