



EUROPEAN UNION



REPUBLIC OF UGANDA

CIVIL WORKS FOR THE REHABILITATION OF THE TORORO-GULU RAILWAY

TENDER DOSSIER FOR CIVIL WORKS

EUROPEAID/139549/IH/WKS/UG

Volume 3

August 2018

**The Head of Delegation
European Union Delegation to the
Republic of Uganda
15th Floor Crested Towers
Plot 17/23 Hannington Road
P.O. Box 5244
KAMPALA**

**The Government of the Republic of Uganda,
The National Authorising Officer of the European
Development Fund
Ministry of Finance, Planning and Economic
Development
Plot 2 – 12 Apollo Kaggwa Road
P.O. Box 8147
KAMPALA**

VOLUME 3

TECHNICAL SPECIFICATIONS

Construction Works must include all associated and overlay activities required for the implementation of the proposed rehabilitation. Such activities include works related to: Drainage, earthwork and pavements, structures and track components and works. Construction Works are to be conducted as per the approved detailed design requirements.

The Technical Specifications shall be read in conjunction with the drawings and the East African Railway & Harbours (EARH) Engineering Manual (Technical instructions) (1959) and the General Specifications for Road and Bridge Works by the Ministry of Works and Transport (2010). Any reference in these document to drawings and specifications relates to the aforementioned documents and the detailed engineering design drawings.

Further to the above, the construction requirements shall be in accordance with the Construction Standards and Technical Specifications presented at the following Table.

Table 1: Standard Technical Specification for Construction

<i>Origin</i>	<i>Name</i>
Local	General Specifications for Road and Bridge Works – Ministry of Works and Transport –2010
Local	Road Project Implementation Manual – Road and Bridge Works – Ministry of Works and Transport – January 2010
International	BS EN 1990 : 2002 Basis of Structural Design
International	National Annex to BS EN 1990 : 2002
International	BS EN 1991-1-1:2002 General actions. Densities, self-weight, imposed loads for buildings
International	BS EN 1991-1-2:2002 General actions. Actions on structures exposed to fire
International	BS EN 1991-1-4:2005 General actions. Wind actions
International	BS EN 1991-1-5:2003 General actions. Thermal actions
International	BS EN 1991-1-6:2005 General actions. Actions during execution
International	BS EN 1991-1-7:2006 General actions. Accidental actions
International	BS EN 1992-1-1:2004 General rules and rules for buildings
International	BS EN 1992-1-2:2004 General rules. Structural fire design
International	BS EN 13670:2009 Execution of Concrete Structures
International	BS EN 1997-1:2004 General rules
International	BS EN 1997-2:2004 Ground investigation and testing
International	The relevant execution documents for BS EN 1997
International	CEN/TR 13201.01 Selection of lighting classes
International	EN 13201.02 Performance requirements
International	EN 13201.03 Calculation of performance
International	EN 13201.04 Methods of measuring lighting performance
International	EN 60598.02.03 E3 Lighting fixtures part2.3 special requirements for road lighting

Special Publications	AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO). 1982. Materials: Part 2: Tests. 13th Edition, AASHTO, Washington, DC., 1982
Special Publications	AMERICAN SOCIETY FOR TESTING AND MATERIALS. Annual book of ASTM standards, Part 19: Soil and Rock; Building Stones. ASTM, Philadelphia, 1998
Special Publications	AASHTO GSH-8 Guide Specifications for Highway Construction 8th Edition published by the American Association of State Highway and Transportation Officials 1998
Special Publications	AASHTO LRFD Bridge Construction Specifications 2004, 2nd Edition published by the American Association of State Highway and Transportation Officials
Special Publications	Officials Standard Specifications for Transportation Materials and Methods of Sampling and Testing, 25th Edition and AASHTO Provisional Standards
Special Publications	Other publications of American Association of State Highway and Transportation Officials and ASTM

NOTE

In case of discrepancy between Local Technical Specifications and International Technical Specifications, each particular case should be discussed and justified and presented to the Employer and/or Engineer for approval. AASHTO, BS and ASTM standards for test materials will be applicable if no standard for a specific test is available in the Local Technical Specifications or if the Local Technical Specifications refer to a particular standard.

The delivery of quality rehabilitation is paramount to realising the expected service life. The Contractor is required to demonstrate through his quality management and quality control testing that all construction meets the appropriate and relevant standards.

All new pavement materials shall comply with the requirements of General Specifications for Road and Bridge Works New Series 3000, 6000 and 7000 specifications or as agreed with the Employer. The requirements of General Specifications for Road and Bridge Works New Series 2000 must be met regarding the Drainage or as agreed with the Employer.

The requirements of General Specifications for Road and Bridge Works New Series 6000 must be met regarding structural, steel and concrete works or as agreed with the Employer.

The East African Railway & Harbours (EARH) Engineering Manual (Technical instructions) (1959) must be met regarding any railway track works or as agreed with the Employer.

The Contractor must verify the properties of the materials (e.g. unbound granular, natural cemented, cement stabilised granular and bitumen bound surfacing materials) to be used in the construction works.

Any post construction failure, during Defects and Liability Period or within the duration of the contract, shall be re-constructed at the Contractors' cost. This reconstruction shall be undertaken as soon as practicable, following instruction from the Engineer to do so.

The Specifications per category are presented here after.

GENERAL

1202 GENERAL REQUIREMENTS AND PROVISIONS

(a) Location of Services

The Contractor shall acquaint himself/herself with the position of all existing services, such as drains, underground and overhead telephone and electricity lines, ducts, poles, water mains, fittings, railway lines, etc. before any excavation or other work likely to affect the existing services is commenced.

The Employer will, in the Contract documents, provide information regarding the location of existing utility services, but the Employer does not accept responsibility for the accuracy of this information.

The Contractor shall check and determine on the Site the position of any services. This shall be done by consultation with owners of services, visual inspections, using detecting apparatus and by making excavations as required to expose the position of the service. This shall also be done where no services are nevertheless believed to be present. The positions of all services so detected shall be marked carefully and then drawn in on the Drawings. These services will then be defined as known services.

(b) Damage to Services

The Contractor shall take all reasonable precautions not to damage the services during the search, when the onus shall rest with him/her to prove that, in the event of damage being done to such services during the search, it was not his/her fault that they had been damaged. The Contractor will be held responsible for any damage caused by him/her to known services, unless he/she can prove that he/she has taken all the above precautions to the satisfaction of the Engineer.

The Contractor shall take all reasonable precautions to protect existing services during construction and during the relocation of such services. Where protective measures involve the construction of permanent work, the Contractor shall execute the work in accordance with the Engineer's instructions, and payment shall be made as provided for in the Special Specifications.

All pipes, cables, conduits or other known services of any nature whatsoever damaged as a result of the Contractor's operations shall be repaired and reinstated forthwith by the Contractor or by the Authority concerned, to the satisfaction of the Engineer, all at the expense of the Contractor.

(c) Safety by overhead power lines

Where work is to be carried out in the vicinity of overhead power lines, the Contractor shall ensure that all persons working in such areas are aware of the relatively large distance that high voltage electricity can "short" to earth when cranes, or other large masses of steel, are in the vicinity of power lines. The Contractor shall be required to work outside the clearances stated in BS 7354:1990 which gives safe clearance for the various voltages.

(d) Relocation of services

It shall be clearly understood that, in certain instances, existing services can be relocated only after the Contractor has advanced sufficiently on or has completed certain sections of earthworks or certain structures. Whenever services are encountered which interfere with the execution of the Works and which require to be moved and relocated, the Contractor shall advise the Engineer, who will determine the extent of work, if any, to be undertaken by the Contractor in moving, relocating and reinstating or protecting such services.

The Contractor shall be responsible for arranging the removal or alteration of such services in conjunction with and to specifications of the relevant statutory authority subject to the prior agreement of the Engineer and where necessitated by the Works.

When relevant a Provisional Sum for such relocation work has been included in the Bill of Quantities. Subject to prior agreement of the Engineer, and upon production of receipts, the Contractor will be reimbursed the net cost of such work plus the percentage inserted by the Contractor in the Bill of Quantities for his/her overheads and costs, in making the arrangement, for co-coordinating the work and effecting payment.

(e) Negotiations with owners of services

The Contractor shall work in close co-operation with private Owners or public authorities controlling services, which have to be protected, moved or relocated.

Details regarding the state of negotiations concluded between the Employer and the Owner at the time of bidding in respect of the time when either the Owner is prepared to start moving such services or when the Contractor is required to or will be allowed to start moving the services, and the duration of such operations, will either be stated in the bid documents or be made available within 30 days of the Commencement Date for the Works.

Further such consultations and negotiations with private owners or public authorities shall be carried out as required by the Contractor. Should the Owners of services refuse to co-operate with the Contractor in a reasonable manner in connection with the protection or moving of services belonging to them, the Contractor shall refer the matter to the Engineer.

(f) Programming relocation of services

When the Contractor details his/her program of work as referred to in the relevant clause of the Conditions of Contract, he/she shall, in consultation with the Engineer, clearly indicate as to when he/she proposes to start with and conclude the moving of each service or when he/she will require the Owner to start with and conclude the moving of each service.

Should it thereafter, through delays on the part the Employer or the Owner of the service to be moved, be impossible to adhere to the programme of work, such programme shall be suitably amended by the Contractor in consultation with the Engineer so as to limit, in so far as is possible, the extent of any damages or delays. Should it be impossible to limit entirely the damages or delays resulting from the amendments necessary to the programme of work, the Contractor shall be reimbursed for any additional costs incurred or damages suffered by him/her.

(g) Payment

Any work required to be undertaken by the Contractor in protecting or moving and relocation of public services for which no provision is made in the Contract Documents, will be classified and paid for at Day work Rates, or if no applicable Day work Rates exist, the Contractor shall submit a quotation for the Engineer's approval.

The Contractor will be responsible for maintaining the water and electricity services and pay all charges and fees for the supplies.

1301 CONTRACTOR'S ESTABLISHMENT ON SITE AND GENERAL OBLIGATIONS

(a) Camps, constructional plant and testing facilities

The Contractor shall establish his/her construction camps, offices, stores, workshops and testing facilities on the Site. The exact location of these facilities shall be approved beforehand by the Engineer. Accommodation, ablution and other facilities for site staff shall also be provided as required and the standard of accommodation and the location of all facilities shall comply with the requirements of the authorities concerned and those of the Engineer.

The contractor shall ensure preservation of landscape and trees shall be complied with when selecting sites for construction camps, offices, stores, workshops etc. This implies that it is undesirable to locate such facilities in woodland and forest areas requiring the felling of trees with a diameter of more than 0.25 metre in a height of 1.0 metre above ground level.

Before choosing the sites for work camps it shall be assured that waste and sewage cannot pollute the local water resources for instance by placing the work camps away from human habitation. Preferably work camps should be located more than 500 metres from larger water courses. According to Ugandan law it is not permitted to build anything closer than 200 meters from rivers.

Prior to starting with construction, the Contractor shall also move all constructional plant and personnel to the Site. On completion of the work and after receiving approval in writing from the Engineer, all constructional plant, buildings, fencing and other temporary structures shall be removed, and the camp site shall be restored to its original condition and left neat and tidy.

(b) Building regulations

All buildings erected by the Contractor upon the site and camp site or sites and the layout of the buildings and the sites shall comply with the Laws of Uganda and all Bye-Laws in so far as they are applicable.

(c) Sign boards

The Contractor shall provide and erect a sign board at the main entrances to the Site and at the site camp, where directed by the Engineer. The boards, with suitable inscription, shall include the name of the Project, the name of the Employer, the name of the Financing Institution, the name of the Consultant and the name of the Contractor etc. The boards approx. 3.30 m x 3.20 m size, shall be approved by the Engineer, before erection.

Suitable inscription shall include the logos of the respective entities, and both text and logo shall be in colours to be approved by the Engineer.

(d) Maintenance during construction

During construction the Contractor's camps, staff living quarters and other facilities shall be maintained in a neat and tidy condition.

(e) Legal and contractual requirements and responsibility to the public

The Contractor shall take all the necessary steps to comply with the Conditions of Contract, particularly in respect of the insurance's and sureties required and his/her general obligations to the public and the Employer. He/she shall comply with all the regulations of statutory bodies.

(f) Liaison with Government and Police Officials

The Contractor shall take all the necessary steps to comply with the Conditions of Contract.

The Contractor shall keep in close contact with the Police and other Government officials of the area regarding their requirements in the control of traffic and other matters and shall provide all assistance or facilities which may be required by such officials in the execution of their duties.

CONTRACTOR'S OFFICES, STORES, WORKSHOPS, CAMPS, ETC

(a) General

It is entirely the Contractor's own responsibility to obtain land or make whatever arrangements with Land Owners or Legal Occupiers regarding use of land for the purpose of erecting his/her offices, stores, workshops, garages, stockpiling of materials, camps and quarters for housing of labour and staff, welfare facilities, etc, including land required for the Engineer's accommodation, offices and laboratory as specified in Section 1400. All costs incurred in connection with obtaining, lease or rental of such land shall be at the Contractor's expense.

Offices for the Contractor's supervisory staff and administration, stores, workshop, camps etc. shall be erected by the Contractor at his/her own expense at a location to be agreed upon with the Engineer.

Before giving such approval, the Engineer will give particular attention to the temporary and permanent effects of the proposed activities on the drainage of the area and the Contractor's proposals for reinstatement.

(b) Contractor's offices, stores and workshops

The Contractor shall provide and maintain at an approved location a suitable main office together with such site offices as may be necessary for the efficient control of the Works. He/she shall also provide and maintain on approved sites sufficient suitable stores, tanks and workshops for the proper storage of materials, fuel, plant and equipment and the efficient maintenance of all such plant and equipment.

MEASUREMENT AND PAYMENT

<u>ITEM</u>	<u>UNIT</u>
(a) FIXED OBLIGATIONS	LUMP SUM
(b) VALUE-RELATED OBLIGATIONS	LUMP SUM
(c) TIME-RELATED OBLIGATIONS	MONTH

Payment of the lump sums tendered under Subitems (a), (b) and (c) shall, for the three Subitems together, include full compensation for all the Contractor's charges in respect of the following items, collectively termed the "Contractor's General Obligations".

- (i) Setting up and maintaining his/her organisation, camps, accommodation and construction plant on the site and their removal on completion of the Contract.
- (ii) Complying with the requirements of the General Conditions of Contract and Section 1200, including the effecting of insurance and providing the sureties required.
- (iii) All general site and office overheads, profit, financing costs, risks, legal and contractual responsibilities and other costs and obligations of a preliminary or general nature which are not specifically measured for payment under any other items of payment.

The lump sum tendered under Subitem 13.01(a) above shall represent full compensation for the fixed part of the Contractor's general obligations (i.e. that part which is substantially fixed and is not a function of the time required for the completion of the Contract) or of the value of the work. This lump sum shall not be subject to variation.

Payment of the lump sum tendered under Subitem 13.01(a) will be made in three instalments, as follows:

- (1) The first installment, 50% of the lump sum, will be paid in the first payment certificate after the Contractor has met all his/her obligations under this Section and

has made a substantial start with construction in accordance with the approved programme.

(2) The second installment, 35% of the lump sum, will be paid when the value of the work done reaches one half of the tendered amount, excluding contingencies and price adjustments in terms of the General Conditions of Contract.

(3) The third and final installment, 15% of the lump sum, will be paid when the Works have been completed and the Contractor has fulfilled all the requirements of this Section.

Before any payment is made under this Sub item, the Contractor shall satisfy the Engineer that he/she has provided camps and constructional plant of good quality on the site, the value of which exceeds that of the first installment.

The Contractor may also be required to furnish documentary proof that he/she owns the camps and constructional plant on the site, the value of which shall exceed that of the first installment.

In the event of the Contractor not being able to satisfy the Engineer as to the ownership of the camps and constructional plant, the Engineer shall have the right to withhold parts of any payments to be made under this Subitem, until the Works have been completed.

The lump sum tendered under Subitem 13.01(b) shall represent full compensation for that part of the Contractor's general obligations, which are a function of only the value of the work, but not of the period of completion. Should the final value of the work (excluding any payments in terms of the General Conditions of Contract) increase or decrease by 20% or less in relation to the tendered amount (less any allowances, if any, in the tender for price adjustments in terms of the General Conditions of Contract), the lump sum tendered for Subitem 13.01(b) will be increased or decreased pro rata in full settlement of any difference in value-related general obligations resulting from an increased or decreased value of the work.

However, should the said increase or decrease in the final value of the work exceed 20% of the tendered amount, the above-mentioned pro rata increase or decrease in the lump sum tendered under Subitem 13.01(b) shall apply up to the limit of 20%, and the provisions of the General Conditions of Contract shall apply to that portion of the said increase or decrease which is in excess of the said limit of 20% of the tendered amount.

The lump sum tendered in Subitem 13.01(b) will be payable monthly in installments in relation to the value of work done (excluding the value of any price adjustments in terms of the General Conditions of Contract).

The tendered rate per month for Subitem 13.01(c) represents full compensation for that part of the Contractor's general obligations, which are mainly a function of construction time. The tendered sum will be paid monthly, pro rata for parts of a month, from the date on which the Contractor has received a written instruction, in terms of the General Conditions of Contract, to start the work until the end of the period for completion of the Works, plus any extension thereof as provided for in the General Conditions of Contract, provided that:

(a) should the works be certified as having been completed before the contractual date for completion of the Works, the Contractor will then be entitled to payments in regard to the unexpired period for completion;

(b) should the progress of the Contractor in terms of the value of work done be in arrears in regard to his/her approved original programme, payments in respect of this item may be limited to payments for that period, which, in this original programme (after suitable adjustments in respect of the extension of time granted) agree with the actual value of work done.

The adjustments specified in Subitems (b) and (c) will be made only if the value of the work or the period for completion were to change and it is agreed that such adjustments will be in full settlement of the changed compensation for amended general obligations.

The stores shall be of such size and construction as to provide adequate storage and protection for stocks of materials, fuel, spares and the like in quantities ensuring uninterrupted progress of the work and the workshops shall be suitably equipped for carrying out major repairs, overhaul or modification by the Contractor of all plant and equipment in or on the Works and other work connected with the permanent work.

(c) Contractor's quarters and camps

The Contractor shall provide, erect, maintain and clear away on completion all quarters and camps for staff and labour necessary for the efficient control and execution of the Works. Suitable, sufficient and properly equipped messing, cooking and sanitary accommodation, an adequate supply of clean water, proper disposal of refuse and sewerage and sufficient labour in attendance shall be provided. The Contractor shall be responsible for meeting the requirements of the local authorities, labour officers and other officers regarding the camp accommodation, sanitation and messing of all workforce and provide the staff necessary for proper control and supervision.

All sites selected by the Contractor for the erection of offices, stores, workshops, quarters, camps and the like are subject to the prior approval of the Engineer. The Contractor shall, by notice in writing, indicate his/her requirements for sites well in advance in order that the Engineer and the Regional Administration may consult local interests.

(d) First aid

The Contractor shall provide, equip and maintain adequate first-aid stations throughout the Works, and erect conspicuous notice boards directing where these are situated and provide all requisite transport. The Contractor shall comply with the government medical or labour requirements at all times and provide, equip and maintain base dressing stations where directed and at all times have experienced first-aid personnel and dressers available throughout the Works for attending minor injuries.

(e) Measurement and payment

Compliance with the requirements, performance of all work, furnishing of all equipment, materials, including water, labour, tools and incidentals necessary to complete the work prescribed in this Clause shall not be measured for direct payment but shall be considered as a subsidiary obligation of the Contractor, covered under the prices quoted for other contract items.

1400 ENGINEERS ACCOMODATION AND ATTENDENCE UPON ENGINEER

(a) General

The Contractor shall provide and maintain an office, houses, site cabins, vehicles, survey equipment etc. for the Engineer, his/her staff and for the Employer. Materials and workmanship shall be to generally recognised standards for permanent buildings of this type. Detailed drawings showing the design, the construction details, the type of materials proposed and their characteristics, shall be submitted by the Contractor for the Engineer's approval, which shall be obtained before starting the construction of the office or houses or ordering the relevant materials.

All buildings for accommodation, offices and laboratories shall be constructed from approved materials. Materials containing asbestos shall not be used.

The Contractor shall provide the buildings with potable water, electricity, sanitary installations, sewage disposal arrangements, air-conditioning, furniture and equipment, and shall maintain them, all to the satisfaction of the Engineer 24 hours of the day during the Contract Period.

All facilities shall conform to the best standards for the required types. The facilities described herein shall be understood to represent the minimum requirements. The Contractor shall provide all additional incidentals necessary, so that the facilities will be completely adequate and satisfactory in every respect for the intended use. All equipment and furniture shall be new and unused when initially put in place.

The Contractor shall maintain, replace and/or restore as directed, any facilities or parts thereof that become damaged, worn out, lost or stolen, except through causes due to negligence of the occupying Engineer's staff. The Contractor shall also provide an adequate stock of all expendable items, such as light bulbs, light tubes, kitchenware, soap, towels, toilet paper, paper towels, drinking cups, materials and accessories and at all times ensure proper and continuing functioning of all components and parts of the Engineer's houses and office.

The houses, offices and installations, etc. including all required equipment to be provided under this Contract shall be handed over to the Engineer in finished and fully habitable condition not later than 3 months after the Engineer's order to commence Work (according to the relevant clause of the Conditions of Contract) and such buildings shall be to the entire satisfaction of the Engineer. Suitable temporary office and residential accommodation for the Engineer and his/her staff shall be provided from the date of the order to commence the Works until such time as the permanent office and residential accommodation are available for use.

ENGINEERS ACCOMODATION AND ATTENDANCE UPON ENGINEER

General

(a) Staff

The Contractor shall provide night and day watchmen, gardeners, labourers, cleaners and sanitary staff as well as all necessary cleaning materials as may be required by the Engineer to keep the offices, the laboratory and houses in first class condition.

(b) Stationery

The Contractor shall provide any stationery required for the office and laboratory of the Engineer.

(c) (Assistance to the Engineer)

The Contractor shall provide all assistance such as labourers, all tools and protective clothing, wooden pegs, iron pins and pickets, water, cement and aggregate for concreting, transport for labour and materials, as may be required by the Engineer and his/her staff for checking, setting out, surveying and measuring or testing the work.

(d) Payment

No separate payment will be made for attendance upon the Engineer the relevant cost being included by the Contractor in rates in the Bill of Quantities or elsewhere. If the Contractor fails in his/her obligations under this Specifications, the Engineer is authorised to employ any staff and/or labourer and to buy any material, as mentioned above, and the costs incurred will be recovered from the Contractor.

1402 OFFICES FOR THE ENGINEER

(a) General

Upon completion of the Contract, the Engineer's office buildings, furniture, equipment and services specified herein shall revert to the Contractor.

The Contractor shall provide, furnish and maintain office accommodation for the Engineer as detailed hereunder.

The Site office shall be erected at a location to be agreed with the Engineer. The plot shall be not less than 0.3 hectares in area and if so required shall be fenced with a 2.0 m high chain link fence and gate, with padlock and chain.

A telephone and telefax shall be provided for the use of the Engineer and the offices shall be provided with electric lighting all to the satisfaction of the Engineer. The telefax shall have a separate dedicated telephone line. The Engineer's telephone and telefax shall be completely independent of the Contractor's telephones and telefaxes. The Contractor shall pay all charges associated with the Engineer's electricity supply and telephone/fax including toll calls lawfully demanded by the electricity authority and the telecommunication service throughout the Contract Period.

The Contractor shall provide an access road at least 3.0 m wide to the Engineer's office and parking area for 10 cars. The road and car park shall be surfaced with a minimum of 150 mm compacted thickness of gravel.

The office shall be erected and handed over to the Engineer fully furnished and equipped, within three months from the date of the Engineers order to commence work.

(b) Construction

The office shall be dimensioned as shown in the Drawings with a minimum of 2.8 m headroom internally, complete with ceiling, smooth concrete or wooden floor and a 2.7 m wide covered veranda extending along the full length of the front. The rooms shall be adequately ventilated and lighted.

The roofs shall be constructed from aluminium or corrugated iron roof sheeting and the roof space between the sheeting and the ceilings shall be adequately ventilated and insulated and the openings shall be screened with mesh screening to prevent the entry of vermin, etc. into the roof space.

Internal wall partitions shall be timber framed and lined both sides. All doors shall be of flush timber type, plywood faced and a minimum size of 2.0 m x 0.80 m. All doors shall be provided with locks with three keys outside doors with cylinder locks. All external walls and doors shall be provided with one prime coat, one undercoat and two finishing coats of gloss paint. Internal walls, doors and ceilings shall be painted with one prime coat, one undercoat and two finishing coats of P.V.C. emulsion paint. All paint shall be from an approved manufacturer.

(c) Furniture and equipment

The Site office for the Engineer shall be complete with furnishings and equipment as listed in Table 1402/1.

TABLE 1402/1

NEW FURNITURE AND EQUIPMENT, TO THE APPROVAL OF THE ENGINEER.

OFFICE FOR THE ENGINEER. FURNITURE AND EQUIPMENT.	
QUANTITY	DESCRIPTION
1	Meeting table 3.0 m x 1.2 m with 6 chairs
6	Ceiling fans
4	Air conditioners 12,000 BTU/hr.
1	Water cooler / dispenser
8	Desks 1.5 m x 0.75 m with 2 chests of drawers.
8	Chairs with arms
1	Table 1.5 m x 0.75 m with 2 drawers and 2 chairs
1	Typist's table with 1 chest of drawers and chair.
1	Desk top computer as specified in the Special Specifications
2	Plan tables and stools.
	Personal computers in number and equipped as specified in Special Specifications
	A3 laser printer or equivalent, compatible with the above personal computer with supply of A4 and A3 paper and consumables, as specified and number as in Special Specifications.
	Colour printer inkjet or equivalent compatible with above laptop computer with supply of A4 paper and consumables, in number and as specified in Special Specifications
	UPS (Uninterruptable Power Supply) with surge protector, capable to support and back-up all computer equipment as specified in Special Specifications
	Complete set of the latest editions of software complete with manuals and floppy discs/CD-ROM of a type compatible with the personal computer disc drives, as specified in Special Specifications.
1	Safe for cash and valuables, min. size approx. 0.8 m x 0.5 m x 0.4 m, to be concreted in place (either wall or floor mounted) complete with lock and keys.
2	Drawing tables A1 size with Drawing machines
2	Drawing table stools
1	Set plan drawers (6 drawers)
1	Two drawer steel lockable filing cabinet
1	Set of transparent plastic curve guides, metric.
	Electronic calculators, in number and type as specified in Special Specifications
1	Electronic desk calculators with printer, type as specified in Special Specifications
3	Fire Extinguisher, type as specified in Special Specifications
2	First aid kits
1	Snake bite kit
2	Adjustable planimeters
8	Stapling machines
8	Paper punches
1	Binding machine
1	A3 size photocopy machine with accessories and supplies as specified in Special Specifications
	Communication system (mobile phones) as specified in Special Specifications.
4	Water filters

8	Thermos jug 4.5 litres capacity
12	Cups, glasses and coffee sets
	All other office equipment necessary including stationery.

The Site office shall be connected to water and an electricity supply. The Contractor shall be responsible for cleaning and maintaining the office and toilets and shall provide soap, towels and all necessary fittings and cleaning materials.

The contractor shall provide a site office of the Resident Engineer and his/her assistant at a central place in the project area, at a location to the convenience of the Engineer. The contractor shall provide and maintain the services for the office for the period of the contract. The office shall be constructed as specified in the Bills of Quantities.

1403 WASH HOUSE FOR THE ENGINEER

The Contractor shall provide a Washhouse comprising two rooms of 20 m² each with electricity, water, waste water outlet and water borne sewage disposal and equipped with two automatic washing machines, two stainless steel tubs with hot and cold running water and automatic electric water heater, all to the approval of the Engineer.

The cost of providing the house, furnishing, equipment, water, electrical supply and maintenance during the whole period of the Contract shall be deemed to be included in the price inserted in Item 14.03 in the Bill of Quantities.

Upon completion of the Contract, the Engineer's wash house, furniture, equipment and services specified herein shall revert to the Contractor.

1404 SITE CABIN/OFFICE FOR THE ENGINEER

The Contractor shall, if so instructed by the Engineer, provide and maintain during the duration of the Contract portable site cabins. Each site cabin shall have a floor area of at least 10 m² and shall be equipped with one bedstead including mattress, blankets, pillows, bed sheets, one wardrobe, one desk with drawers, one metal cabinet, shelves, two chairs and a small gas refrigerator. These units shall be positioned always close to the Work and moved from one location to another by the Contractor as may be directed by the Engineer. The Contractor shall supply the units with light, potable water if possible and sanitary facilities.

The cost of providing the Site Cabins furnishing, equipment, water, electrical supply (where available), moving the site cabins to different locations and maintenance during the whole period of the Contract shall be deemed to be included in the price inserted in Item 14.04 of the Bill of Quantities.

The site units shall be connected with covered communal passages. The whole establishment shall be insured, well ventilated, lit, painted and free of mosquitoes and any other bugs.

The office accommodation for the Engineer shall, at the Contractor's expense, be provided with a piped potable water supply to the toilets and kitchens with a waterborne sewerage system discharging to septic tanks, cesspits, soak ways or main drainage. The Contractor will be responsible for maintaining the water and electricity services and pay all charges and fees for the supplies.

Whenever these supplies are not available from the public utility services, the Contractor must continue to provide the facilities from his own resources.

All accommodation shall also be provided with temporary well drained access roads 3 m wide and covered car ports. Access roads and the surfaces of the car ports shall be surfaced with a minimum thickness of 150 mm of well compacted gravel.

The offices shall be detached completely from the Contractor's site offices although they may both be contained within one compound suitably fenced and guarded.

The Contractor shall continue to provide these facilities and services, without any interruptions, until the date specified in the contract. The Contractor shall provide and maintain new approved furniture and equipment. No permanent works shall be started until the Engineer's site offices/cabin are ready for occupation complete with all specified services, facilities, furniture and equipment.

When the stipulated accommodation is not yet available the Contractor shall provide hotel accommodation for a period not exceeding one month.

At the completion of the project, the site offices and contents shall be handed over to, and become the property of the contractor.

VEHICLES FOR THE ENGINEER

1405 FOUR WHEEL DRIVE STATION WAGON FOR THE ENGINEER

The Contractor shall provide a new right-hand drive diesel powered car for the exclusive use of the Engineer and his staff. The vehicle shall have four wheel drive capability, and an engine capacity of not less than 3000 c.c.

The Contractor shall comprehensively insure the vehicle, maintain and service it in accordance with the maker's instructions and conditions of warranty. Only that make of vehicle, having satisfactory permanent repair and maintenance facilities already well-established in Kampala, will be acceptable.

The driver shall be available during all normal Site working hours and, when specifically required by the Engineer, outside those hours. When not used by the Engineer, the Contractor shall provide adequate and secure garaging for the vehicle and will not permit use of the vehicle other than that authorised by the Engineer.

1406 FOUR WHEEL DRIVE PICKUPS AND MOTORCYCLES FOR THE ENGINEER

(a) General

The Contractor shall comprehensively insure, maintain and service the vehicles it in accordance with the maker's instructions and conditions of warranty. Only that make of vehicle, having satisfactory permanent repair and maintenance facilities already well-established in Kampala, will be acceptable.

The drivers shall be available during all normal Site working hours and, when specifically required by the Engineer, outside those hours. When not used by the Engineer, the Contractor shall provide adequate and secure garaging for the vehicles and will not permit use of the vehicle other than that authorised by the Engineer.

Quantities.

(b) Pickups

The Contractor shall provide 2 new right-hand drive diesel powered pickups (1 double cabin and 1 single cabin) for the exclusive use of the Engineer and his staff. The vehicles shall have four wheel drive capability, and an engine capacity of not less than 3000 c.c.

(c) Motorcycle

The Contractor shall provide two (2) manual motorcycles for the exclusive use of the Engineer and his staff. The motorcycles shall have an engine capacity of not less than 150 c.c.

The vehicles and motorcycle shall revert to the contractor upon completion of the contract.

1407 SURVEY EQUIPMENT FOR THE ENGINEER

The Contractor shall provide at all times during the period of the Contract all such workforce and instruments for the exclusive use of the Engineer as he/she may deem to be necessary for carrying out his/her duties in connection with the Contract. The workforce shall be selected for

their intelligence and knowledge of the English language and as far as possible the same men shall be provided throughout the period of the Contract.

Upon completion of the Contract, the Engineer's survey equipment specified herein shall revert to the Contractor.

The instruments to be provided include those given in Table 1407/1 or equivalent as specified in Special Specifications:

TABLE 1407/1

NEW SURVEY EQUIPMENT, TO THE APPROVAL OF THE ENGINEER.

Item	Number
Total Station-Leica	1 No.
RTK Viva GNSS 15, 1 Base, 2 rovers & 2 controllers	1 No.
Digital Level Instrument	2 No.
Tripods	3 No.
Metal levelling staves 5m (foldable)	3 No.
Steel tape 50 m	2 No.
Steel tape 25 m	5 No.
Fibre-glass tapes 50 m	4 No.
Ranging rods 2.5 m (metal, joinable)	8 No.
Spare batteries (for RTK & Total station)	4 No.
Rapid Charger	2 No.
Reflectors with mounts	5 No.
Triple prism mount with reflectors	2 No.
Tripods	4 No.
Steel hammers (4 kg)	2 No.
Spirit levels for staves (optional)	6 No.
Metal pocket rules (5m)	10 No.
Surveying umbrella	2 No.
Reflective road safety vests	12 No.
Clip boards (field book frames A4 size,)	10 No.
Hand held GPS (load and down load)	1 No.
Calculator (programmable)	2 No.

The Contractor shall be solely responsible for the maintenance of all such instruments and shall ensure that they are at all times in good condition and adjustment. Repairs shall only be carried out by persons or organisations approved by the Engineer.

Supply of miscellaneous survey items (e.g. spray paint, beacon materials, spades, axes, rubber boots, assistants, drawing equipment, approved surveying forms A4 size and field-surveying books).

Payment shall be as per the tendered rates per month OR Km for items or Subitems under item 14.02 through 14.09

1408 LABORATORY FOR THE ENGINEER

(a) General

The Contractor shall provide, erect and maintain for the duration of the Contract a laboratory adjacent to the Engineers Representative's office or where directed by the Engineer.

As specified in the Special Specifications the laboratory shall either:

- (i) be for the sole use of the Engineer; or

- (ii) be a combined laboratory used both for the Contractor's own testing and the independent testing of the Engineer.

In case of the latter the laboratory building shall be provided with a two person office of minimum 10 m² for the exclusive use of the Engineer's site personnel and be provided with new furniture as listed in Table 1408/1. A telephone line extension to the Engineer's office building shall be provided.

TABLE 1408/1

NEW FURNITURE, TO THE APPROVAL OF THE ENGINEER.

Item	Number
Desk 1.6 x 0.9 m with lockable single chest of drawers	2 No.
Table lamps	2 No.
Table with smooth flat top, min. area 2 m ²	1 No.
Swivel type desk chairs	2 No.
Visitors chairs	2 No.
Waste paper baskets	2 No.
Wall boards 2.4 x 1.2 m	2 No.
Steel cupboard with shelves	1 No.
Steel filing cabinet	1 No.
Filings trays	2 No.
Air conditioner 12,000 BTU/hr	1 No.

Upon completion of the Contract, the Engineer's laboratory building, laboratory equipment, air conditioners and furniture specified herein shall revert to the Contractor. If a combined laboratory building is provided it shall revert to the Contractor upon completion of the Contract.

In case a laboratory for the sole use of the Engineer shall be provided, the laboratory shall be dimensioned as shown in the Drawings or described in the Special Specifications with a minimum of 2.8 m headroom internally complete with ceiling, smooth concrete floor and a 5m wide covered veranda extending along the length of the front with a concrete floor for drying of material and sufficient covered outdoor space for location of soaking basins for CBR testing where required.

The rooms shall be adequately ventilated and lighted. Walls shall be constructed of prefabricated timber sections or sand cement blocks. All external doors shall be provided with cylinder locks with three keys.

The working area floor shall have a strengthened section incorporated consisting of 3.0 m x 3.0 m x 450 mm mass concrete plinth. A separate sample store of at least 12 m² floor area shall be provided.

The laboratory shall be provided with electric lighting and power points to the satisfaction of the Engineer (to be 220 Volts, 50 cycles).

The permanent fixtures in the laboratory shall include

- 2 no. double draining board stainless sinks, piped drinkable water supply to each and waste water outlets.
- Work benches, comprising a working surface and one full length and width shelf under, of seasoned timber 1.0 m wide and 0.9 m high.
- Soaking tanks for CBR and concrete specimens shall be provided at floor level, in the stores section of the laboratory and on the veranda. The CBR tank shall have drainage pipes built in.

14.09 LABORATORY EQUIPMENT FOR THE ENGINEER

The laboratory equipment shall revert to the contractor upon completion of the contract.

The Contractor shall provide and install in the laboratory 2 stainless steel fan-circulated drying ovens, minimum 70 litre capacity, and all the necessary apparatus and materials for the performance of all tests required for the testing and control of the works and materials.

The Contractor shall supply one new copy of the latest edition of the Specifications for all referred material standards and testing standards used for the Contract.

All the laboratory equipment, including air conditioners, shall be new and of a make approved by the Engineer.

The Contractor shall immediately after the award of the Contract prepare and submit for the approval of then Engineer a list showing all instruments and apparatus to be purchased.

1701 ENVIRONMENTAL PROTECTION AND WASTE DISPOSAL

1701 SCOPE

This Section covers the environmental protection and waste disposal to be exercised by the Contractor in all work on the Contract. The obligations herein do not prejudice any other Clauses in this Specification.

1702 GENERAL

The Contractor shall comply with the Statutory Regulations in force in Uganda regarding environmental protection and waste disposal and shall liaise with the National Environmental Management Authority (NEMA) and the responsible national and local authorities.

The Contractor shall prepare an Environmental Management Plan for the project and his/her operations, relating to the Environmental Impact Assessment (EIA) studies and the approved Environmental Impact Statement. The Environmental Management Plan shall outline the potential environmental hazards and risks and provide an action plan to deal with the hazards, minimise the risks and mitigate adverse environmental impacts, including a general decommissioning plan covering all relevant aspects of the project.

The Environmental Management Plan shall be submitted to the Engineer not later than 4 weeks after the notice to commence the Works.

The Contractor shall for those of his/her activities which have, or are likely to have, an impact on the environment, keep records relating to:

- The amount of waste and by-products generated by the activity
- The economic value of the activity
- The observable effects of the environment
- How far, in the opinion of the Contractor, the provisions of the Statute have been

complied with.

And the Contractor may from time to time be required to submit progress environmental reports to the Engineer.

During the course of the project, the Contractor shall when required prepare detailed, project specific Decommissioning Plan(s) covering all aspects of the project including but not limited to; quarries, borrow-pits, road diversions at level crossings, camp sites, workshop, field laboratory, equipment and its accessories, electricity lines, water supply, unused construction materials, and housing facilities. The Decommissioning Plans should be submitted to the Engineer who will forward them to the Employer and NEMA for approval.

The Contractor shall afford the officials of the relevant authorities free access to inspect the project site, plant, workshops and the like to check whether the provisions in the Statute are being complied with.

The Contractor shall at the end of the project prepare and submit to the Engineer a final environmental management report detailing how the environmental issues have been addressed during the course of the project and how the decommissioning plan has been complied with. The Engineer shall if satisfied with the Contractor's submissions and compliance

with the environmental obligations forward the Environmental Management Report to the employer and NEMA for approval and issuance of Compliance Certificate.

1703 LANDSCAPE PRESERVATION AND RE-VEGETATION

(a) General

The Contractor shall exercise care to preserve the natural landscape and shall conduct his/her construction operations so as to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, approved construction roads, or excavation operations, all trees, native shrubbery, and vegetation shall be preserved and shall be protected from damage by the Contractor's construction operations and equipment. The edges of clearings and cuts through trees, shrubbery, and vegetation shall be irregularly shaped to soften the undesirable visual impact of straight lines. Movement of labour and equipment within the right-of-way and over routes provided for access to the work shall be performed in a manner to prevent damage to grazing land, crops, or property.

Except as otherwise provided in this Specifications special reseeding or replanting will not be required under these specifications; however, on completion of the work, all work areas not seeded shall be scarified and left in a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion. All unnecessary destruction, scarring, damage, or defacing of the landscape resulting from the Contractor's operations shall be repaired, replanted, reseeded or otherwise corrected as directed by the Engineer, and at the Contractor's expense.

The species used for replanting must not be listed as a noxious weed and the seed blends used must not contain seeds from such.

The use of fertiliser can only be carried out with the approval of the Engineer. Especially near open water and at sandy soils near drinking water interests, the use of fertilisers should be avoided. Leaching from manure to open water areas could also cause nutrients pollution to the waters, and the application of such should therefore be avoided, and only carried out if approved by the Engineer. When available well-decomposed compost should be preferred to manure.

(b) Construction roads

The location, alignment, and grade of construction roads shall be subject to approval of the Engineer. When no longer required by the Contractor, construction roads shall, if required by the Engineer, be restored to the original contour and made impassable to vehicular traffic. The surfaces of such construction roads shall be scarified as needed to provide a condition which will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

(c) Construction facilities

The Contractor's workshops, office, and yard area shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. On abandonment, all temporary buildings, including concrete footings and slabs, and all construction materials and debris shall be removed from the site. The area shall be regraded, as required, so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

(d) Blasting precautions

In addition to any requirements of local regulations, the Contractor shall adopt precautions when using explosives which will prevent scattering of rocks, stumps, or other debris outside the work area, and prevent damage to surrounding trees, shrubbery, and vegetation.

(e) Quarries, borrow pits and storage areas etc.

Problems with erosion in the borrow pit must be avoided, if necessary by the construction of temporary banks, but preferably by the choice of pits.

When they are no longer required, all quarry sites, borrow pits and areas used for the disposal or storage of surplus materials and asphalt plants shall be reinstated by landscaping including the replacement and spreading of topsoil as directed by and to the satisfaction of the Engineer. Steep quarry walls shall be fenced to prevent livestock and people falling in the quarry. Permanent water holes shall be left unchanged unless very close to settlements. Under these circumstances the local people should decide on the future of the water holes.

Material not capable of supporting vegetation shall be used as fill and subsequently evenly covered with soft materials. Spoil from road building, excess stockpiled material etc. can only be used for fill in the borrow pit, provided it does not effect the hydrology of the site. If there is not sufficient soft material the remaining portions shall be scarified along the contours to avoid erosion.

Haul roads must be obliterated, scarified and earth banks constructed to prevent erosion and all damaged fences and structures reinstated.

Erosion mitigating measures shall be given priority to ensure proper drainage, being of the great importance around human habitation, where permanent water holes might be a health risk.

It must be noted that the Taking-Over Certificate will not be issued, before a proper reshaping and replanting of borrow pits has been carried out to the satisfaction of the Engineer.

1704 TEMPORARY SOIL EROSION CONTROL

(a) Scope

These Works shall consist of temporary control measures as shown on the Drawings or required by the Engineer during the process of the Works, to control soil erosion and water pollution, by use of berms, dykes, silt fences, brush barriers, dams, sediment basins, filter mats, netting, gravel, mulches, grasses, slope drains, and other erosion control devices or methods. Appropriate control measures will be required to avoid emission of high concentration of sediments into wetlands, swampy areas and other particular sensitive areas.

The temporary erosion control provisions shall be coordinated with permanent erosion control features to assure economical, effective and continuous erosion control throughout the period of the Works.

(b) Construction

A schedule of proposed temporary (and permanent) soil erosion control Works shall be developed by the Contractor at the commencement of the Contract, in consultation with the Engineer and to his/her satisfaction.

The Contractor shall carry out (and maintain) temporary erosion control to prevent soil erosion that will adversely affect construction operations, damage adjacent properties, or cause contamination of adjacent streams or other watercourses, lakes, ponds, swamps or other areas of water impoundment. Such Works may involve construction of temporary berms, dykes, dams, sediment basins, slope drains or use of temporary mulches, mats, seeding or other control devices or methods as necessary to control erosion. Cut and fill slopes shall be seeded

and mulched as the excavation proceeds, to the extent considered desirable and practicable by the Engineer.

Temporary erosion control may include construction outside the right-of-way where such work is necessary, as a result of roadway construction, such as borrow pit and quarry operations, haul roads and equipment storage sites.

The Contractor shall incorporate all permanent erosion control features as shown on the Drawings into the Works at the earliest practicable time as outlined in his/her schedule, to minimize the need for temporary erosion control measures.

Where erosion is a problem, clearing and grubbing operations shall be so scheduled and performed that grading operations and permanent erosion control features can follow immediately thereafter if conditions permit; otherwise, temporary erosion control measures may be required between successive construction stages.

The Engineer will limit the area of clearing and grubbing, excavation, borrow and embankment operations in progress commensurate with the Contractor's capability in keeping the finished grading, mulching, seeding and other permanent erosion control measures current in accordance with the schedule. Should seasonal limitations make such co-ordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified.

The Engineer may increase or decrease the amount of surface area of erodible earth material to be exposed at one time by clearing and grubbing, excavation, borrow and fill operations as determined by his/her analysis of project conditions.

In the event that temporary erosion control measures are required due to the Contractor's negligence, carelessness or failure to install permanent controls as part of the Works, scheduled or ordered by the Engineer, such Works shall be carried out by the Contractor at his/her own expense.

The Works prescribed in this Clause shall not be measured for direct payment, but shall be considered as subsidiary Works, the costs of which will be deemed to be included by the Contractor in his/her rates in the Bill of Quantities for other items of work.

1705 PRESERVATION OF TREES AND SHRUBBERY

(a) Preservation

All trees and shrubbery which are not specifically required to be cleared or removed for construction purposes shall be preserved and shall be protected from any damage that may be caused by the Contractor's construction operations and equipment. Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage, or other operations; and the Contractor shall adequately protect such trees by use of protective barriers or other methods approved by the Engineer. The removal of trees or shrubs will be permitted only after prior approval by the Engineer.

The layout of the Contractor's construction facilities such as workshops, ware houses, storage areas, and parking areas; location of access and haul routes; and operation in borrow and spoil areas shall be planned and conducted in such a manner that all trees and shrubbery not approved for removal by the Engineer shall be preserved and adequately protected from either direct or indirect damage by the Contractor's operations. Except in emergency cases or when otherwise approved by the Engineer, trees shall not be used for anchorage. Where such use is approved, the trunk shall be wrapped with a sufficient thickness of approved protective material before any rope, cable, or wire is placed.

(b) Repair or treatment of damage

The Contractor shall be responsible for injuries to trees and shrubs caused by his/her operations. The term "injury" shall include, without limitation, bruising, scarring, tearing, and breaking of roots, trunk or branches. All injured trees and shrubs shall be repaired or treated without delay, at the Contractor's expense. If damage occurs, the Engineer will determine the method of repair or treatment to be used for injured trees and shrubs as recommended by an experienced horticulturist or a licensed tree surgeon provided by and at the expense of the Contractor. All repairs or treatment of injured trees shall be performed under the direction of an experienced horticulturist or a licensed tree surgeon provided by and at the expense of the Contractor.

(c) Replacement

Trees or shrubs that, in the opinion of the Engineer, are beyond saving shall be removed and replaced early in the next planting season. The replacements shall be the same species, or other approved species, and of the maximum size that is practicable to plant and sustain growth in the particular environment. Replacement trees and shrubs shall be staked, watered, and maintained for a period of 1 year. Any replacement tree or shrub that dies shall be removed and replaced, as directed by the Engineer, with such replacements being maintained for a period of 1 year from the date of replacement.

To obtain the maximum success with the planting, the trees shall be well suited for the environment. This will normally mean native species of trees or cultivated trees from local nurseries.

1706 PREVENTION OF WATER POLLUTION

(a) General

The Contractor's construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris, and other pollutants and wastes into streams, flowing or dry watercourses, lakes, and underground water sources. Such pollutants and wastes include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, radioactive substances, oil and other petroleum products, aggregate processing tailings, mineral salts, and thermal pollution.

Dewatering work for structure foundations or earthwork operations adjacent to, or encroaching on, streams or watercourses shall be conducted in a manner to prevent muddy water and eroded materials from entering the streams or watercourses by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means. Excavated materials or other construction materials shall not be stockpiled or deposited near or on stream banks, lake shorelines, or other watercourse perimeters where they can be washed away by high water or storm runoff or can in any way encroach upon the watercourse itself.

Turbidity increases in a stream or other bodies of water that are caused by construction activities shall be strictly controlled. When necessary to perform required construction work in a stream channel, the turbidity may be increased as approved by the Engineer for the shortest practicable period required to complete such work. This required construction work may include such work as diversion of a stream, construction or removal of cofferdams, specified earthwork in or adjacent to a stream channel, pile driving, and construction of turbidity control structures. Mechanised equipment shall not operate in flowing water except as necessary to construct crossings or to perform the required construction.

Wastewaters from aggregate processing, concrete batching, or other construction operations shall not enter streams, watercourses, or other surface waters without the use of such turbidity control methods as settling ponds, gravel-filter entrapment dikes, approved flocculating processes that are not harmful to fish, recirculation systems for washing of aggregates, or other approved methods. Any such wastewaters discharged into surface waters shall contain the least concentration of settleable material possible. For the purpose of these specifications, settleable material is defined as that material which will settle from the water by gravity during a 1-hour quiescent detention period.

(b) Compliance with laws and regulations

The Contractor shall comply with all applicable Ugandan laws, orders, regulations, and water quality standards concerning the control and abatement of water pollution.

If wells or other water sources, nevertheless, are polluted, it is the responsibility of the Contractor to compensate for this and provide the consumers with clean drinking water transported through pipes from an unpolluted source if required in the opinion of the Engineer.

1707 ABATEMENT OF AIR POLLUTION

The Contractor shall comply with applicable Ugandan laws and regulations concerning the prevention and control of air pollution.

Notwithstanding the above in conduct of construction activities and operation of equipment, the Contractor shall utilise such practicable methods and devices as are reasonably available to control, prevent, and otherwise minimise atmospheric emissions or discharges of air contaminants.

The emission of dust into the atmosphere shall be strictly controlled during the manufacture, handling, and storage of concrete and road aggregates and the Contractor shall use such methods and equipment as are necessary for the collection and disposal, or prevention, of dust during these operations. The Contractor's methods of storing and handling cement and pozzolans shall also include means of eliminating atmospheric discharges of dust.

Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, shall not be operated until corrective repairs or adjustments are made.

Burning of materials resulting from clearing of trees and brush, combustible construction materials, and rubbish will be permitted only when atmospheric conditions for burning are considered favourable and when authorised by the Engineer. In lieu of burning, such combustible materials may be disposed of by other methods as provided in this Specification. Where open burning is permitted, the burn piles shall be properly constructed to minimise smoke, and in no case shall unapproved materials, such as tires, plastics, rubber products, asphalt products, or other materials that create heavy black smoke or nuisance odours, be burned.

1708 DUST ABATEMENT

During the performance of the work required by these specifications or any operations appurtenant thereto, whether on right-of-way provided by the Employer or elsewhere, the Contractor shall furnish all the labour, equipment, materials, and means required, and shall carry out proper and efficient measures wherever and as often as necessary to reduce the dust nuisance, and to prevent dust which has originated from his/her operations from damaging crops, orchards, cultivated fields, and dwellings, or causing a nuisance to persons. The Contractor will be held liable for any damage resulting from dust originating from his/her

operations under these specifications on the right-of-way or elsewhere. The Engineer may direct sprinkling or other measures for dust abatement if necessary to obtain adequate control.

1709 NOISE ABATEMENT

The Contractor shall comply with applicable Ugandan laws, orders, and regulations concerning the prevention, control, and abatement of excessive noise.

Workers shall be sufficiently supplied with ear-protection as required in the opinion of the Engineer and instructed in using them.

Blasting, the use of jackhammers, pile driving, rock crushing, or other operations producing high-intensity impact noise may be performed at night only upon approval of the Engineer.

1710 LIGHT ABATEMENT

The Contractor shall exercise special care to direct all stationary floodlights to shine downward at an angle less than horizontal. These floodlights shall also be shielded so as not to be a nuisance to surrounding areas. No lighting shall include a residence in its direct beam.

The Contractor shall be responsible for correcting lighting problems when they occur as directed by the Engineer.

1711 PRESERVATION OF HISTORICAL AND ARCHAEOLOGICAL DATA

The Contractor agrees that should he/she or any of his/her employees in the performance of this contract discover evidence of possible scientific, historical, prehistoric, or archaeological data he/she will notify the Engineer immediately giving the location and nature of the findings. Written confirmation shall be forwarded within 2 days. The Contractor shall exercise care so as not to damage artefacts or fossils uncovered during excavation operations and shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by the Employer.

Where appropriate by reason of a discovery, the Engineer may order delays in the time of performance, or changes in the work, or both. If such delays, or changes, or both, are ordered, the time of performance and contract price shall be adjusted in accordance with the applicable clauses in the Conditions of this Contract.

The Contractor agrees to insert this Clause in all subcontracts which involve the performance of work on the terrain of the site.

1712 PESTICIDES, TOXIC WASTE AND HAZARDOUS SUBSTANCES

Pesticides include herbicides, insecticides, fungicides, rodenticides, piscicides, surface disinfectants, animal repellents, and insect repellents. Should the Contractor find it necessary to use pesticides in work areas of this contract, he/she shall submit his/her plan for such use to the Engineer for written approval.

The Contractor shall read and comply with all labelling requirements when using pesticides.

Toxic waste must be collected in appropriate containers (depending on the compound) and kept in approved storage. Depending on the compound in question different ways of destruction will be necessary.

It is the responsibility of the Contractor to seek the required permissions to handle substances or compounds that are defined as hazardous, i.e. the Contractor must be up to date on the definitions and regulations pertaining to hazardous substances. These are defined as substances (or compounds thereof) which may endanger health of human, animals or the environment by reason of its toxic, corrosive, irritant, sensitising, inflammable or radioactive nature. Hazardous substances are also such as depletes the ozone layer.

For hazardous substances a permit for the possessing, handling, import etc. is needed. The Contractor must assure that he/she gets the needed permits for hazardous substances from a Licensing Officer appointed by the Minister. The Contractor must allow a certified inspector to control the Contractor's handling of hazardous compounds.

1713 CLEANUP AND DISPOSAL OF WASTE MATERIALS

(a) Cleanup

The Contractor shall, at all times, keep the construction area, including storage areas used, free from accumulations of waste materials or rubbish.

All waste water and sewage from office, residential and mobile camps shall be piped to soak pits or other disposal areas constructed in accordance with local government regulations, and where and when such regulations require it the Contractor shall obtain a permit or other appropriate documentation approving the disposal methods being used.

All used fuels, oils, other plant or vehicle fluids, and old tyres and tubes shall be collected to a central disposal point, on a regular basis and disposed of as specified below.

All household, office, workshop and other solid waste shall be collected to a central disposal area, on a daily basis and disposed of in a manner approved by the Engineer.

Servicing of plant, equipment and vehicles shall, whenever possible, be carried out at a workshop area. This workshop area shall be equipped with secure storage areas for fuels oils and other fluids constructed in such a way as to contain any spillages which may occur, and similar storage where used fluids can be stored securely prior to their disposal.

When servicing of plant, equipment and vehicles is carried out away from the workshop area it shall be done at locations and in such a manner as to avoid spillage and contamination of streams and other drainage courses. Any spillages shall be cleaned up by either burning in place or collecting the contaminated soils and burning them at the central disposal area, all to the satisfaction of the Engineer.

Prior to completion of the work, the Contractor shall remove from the vicinity of the work all plant facilities, buildings, rubbish, unused materials, concrete forms, and other like material, belonging to him/her or used under his/her direction during construction. All work areas shall be graded and left in a neat manner conforming to the natural appearance of the landscape as provided elsewhere in the Specifications.

Any residue deposited on the ground from washing out transit mix trucks or any similar concrete operations shall be buried or cleaned up in a manner acceptable to the Engineer.

In the event of the Contractor's failure to perform the above work, the work may be performed by the Employer, at the expense of the Contractor, and his/her surety or sureties shall be liable therefore.

(b) Disposal of waste material

(i) General

Waste materials including, but not restricted to, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products, shall be disposed of by the Contractor. Disposal of combustible materials shall be by burying, where burial of such materials is approved by the Engineer; by burning, where burning of approved materials is permitted; or by removal from the construction area. Disposal of non-combustible materials shall be by burying, where burial of such materials is approved by the Engineer, or by removal from the construction area. Waste materials removed from the construction area shall be dumped at an approved dump.

(ii) Disposal of material by burying

Only materials approved by the Engineer may be buried. Burial shall be in pits the location, size and depth of which shall be approved by the Engineer. The pits shall be covered by at least 0.6 metre of earth material prior to abandonment.

(iii) Disposal of material by burning

All materials to be burned shall be piled in designated burning areas in such a manner as will cause the least fire hazards. Burning shall be thorough and complete and all charred pieces remaining after burning, except for scattered small pieces, shall be removed from the construction area and disposed of as otherwise provided in this Subclause.

The Contractor shall, at all times, take special precautions to prevent fire from spreading beyond the piles being burned and shall be liable for any damage caused by his/her burning operations. The Contractor shall have available, at all times, suitable equipment and supplies for use in preventing and suppressing fires and shall be subject to all laws and regulations locally applicable for pre-suppression, suppression, and prevention of fires.

(iv) Disposal of material by removal

Material to be disposed of by removal from the construction area shall be removed from the area prior to the completion of the work under these specifications. All materials removed shall become the property of the Contractor.

Materials to be disposed of by dumping shall be hauled to an approved dump. It shall be the responsibility of the Contractor to make any necessary arrangements with private parties and with local officials pertinent to locations and regulations of such dumping. Any fees for charges required to be paid for dumping of materials shall be paid by the Contractor and shall be included in the prices bid in the Bill of Quantities for other items of work.

1714 MEASUREMENT AND PAYMENT

<u>ITEM</u>	<u>UNIT</u>
17.01 ENVIRONMENTAL MANAGEMENT PLAN AND REPORTING	LUMP SUM

Payment for preparation of the Environmental Management Plan, Decommissioning Plan(s) and environmental reporting will be made at the lump sum entered in the Bill of Quantities for Item 17.01 on the following basis:

- (i) 50% of the lump sum will be paid upon approval of the Contractor's Environmental Management Plan; and
- (ii) 50% of the lump sum will be paid upon approval of the Contractor's final environmental management report.

Except as provided in Item 17.01 above and entered into the Bill of Quantities no separate payment will be made for any work included in this Section. The costs of complying with these requirements shall be included in the Contractor's rates for other items of work.

1801 OCCUPATIONAL HEALTH AND SAFETY, HIV/AIDS AND GENDER

1801 SCOPE

The Section covers measures and methods which the Contractor shall put in place to ensure occupational health and safety (OHS), to prevent the spread of HIV/AIDS and STIs and to ensure equal employment opportunities for men and women as well as addressing their specific gender needs.

1802 GENERAL

The Contractor shall comply with among others the following Statutory Regulations, rules and bylaws with respect to OHS, HIV/AIDS and STI prevention and Gender equity:

- 1) **OHS:** The Public Health Act, the Factories Act, the Workers' Compensation Act, the Trade Union Decree, the Employment Decree and other statutory regulations, rules and bylaws that may be enacted from time to time by Government in respect of OHS.

- 2) **HIV/AIDS:** The National multi-sectoral AIDS control approach (MAC) and the National Strategic Framework (NSF) for the HIV/AIDS prevention and care, which obligate line Ministries and the private sector to ensure that people living with HIV/AIDS are not discriminated against at the work places.

- 3) **Gender Equity:** The Local Government Act and National Gender Policy (1997) and the Social Development Sector Strategic Investment Plan (2003) which provide for a legal basis for protecting women and their rights and to ensure affirmative action on the basis of gender.

Together with the above, the Contractor's attention is also drawn to any current international protocols or convention on OHS in which Government of Uganda is a signatory to. In compliance with above mentioned government and international regulations on OHS, HIV/AIDS and Gender equity and on the basis of available social impact assessment studies related to the project, the Contractor shall prepare an OHS, HIV/AIDS and Gender Management Plan which shall include details of measures he/she proposes to adopt in a bid to:

- a) Prevent and reduce accidents and injuries to the staff and workers and minimise health hazards to the adjacent community and general public.

- b) Prevent the spread of HIV/AIDS and STIs between his staff, labourers and the immediate local community.

- c) Care for workers and staff who are infected with HIV/AIDS and STIs including provision of counselling and clinic services.

- d) Encourage the recruitment of men and women as well as addressing their specific gender working and living needs in the road construction environment.

The OHS, HIV/AIDS and Gender Management Plan shall be submitted to the Engineer not later than 4 weeks after the notice to commence the Work.

1803 OCCUPATIONAL HEALTH AND SAFETY

The Contractor shall ensure, so far as is reasonably practicable, the health, safety and welfare at work of his/her employees including those of his/her sub-contractors and of all other persons on the Site. The Contractor shall comply with the Factories Act, the Public Health Act, the Worker's Compensation Act and other Statutory Regulations, rules and byelaws regarding occupational health, safety and gender. In this respect the Contractor shall liaise with the various local authorities.

The Contractor's responsibilities shall among others include the requirements specified in the following Subclauses (a) through (l):

(a) Safe constructional plant, equipment and methods of work

This covers the provision and maintenance of constructional plant, equipment and systems of work that are lighted, safe and without risks to health. This shall include maintaining equipment, engines, and related electrical installations in good working order; maintaining a clean and tidy work space; providing guards and rails, signals and lighting; providing work site rules, safe working procedures and allocating appropriate places to carry out the work.

(b) Safe handling, storage, transport and disposal

This covers the execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances.

The Contractor must ensure that all stores are located such as reduce risks to the workers on site and arrangements for the safe use, handling, storage, transport and disposal of articles and substance are made before work commences to the satisfaction of the Engineer.

(c) Protective clothing, equipment etc.

This covers the provision of protective clothing and equipment, first aid stations with such personnel and equipment as are necessary and such information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on the Works all in accordance with the Laws of Uganda. The Contractor shall provide, at his/her own expense, the protective clothing and safety equipment to all staff and labour engaged on the Works to the satisfaction of the Engineer.

Such clothing and equipment shall include, at a minimum:

- high visibility vest for workers directing traffic;
- protective boots and gloves for the workforce undertaking concrete mixing work;
- protective boots, gloves and masks for the workforce performing bituminous pavement works;
- protective footwear, gloves, goggles, and dust mask for the workforce undertaking screening, crushing or grinding;
- protective footwear and hard hats for the workforce engaged in bridge construction and in all locations subject to rock fall;

- ear protectors and dust mask for the workforce engaged in rock drilling or in using vibrating equipment such as rollers and compactors.

If the Contractor fails to provide such clothing and equipment, the Employer shall be entitled to provide the same and recover the costs from the Contractor.

(d) Safety Officer

The Contractor shall PROVIDE a qualified Safety Officer (Accident Prevention Officer) who has specific knowledge of safety regulations, experience of safety precautions on similar works and who shall advise on all matters affecting the safety of the workforce and on measures to be taken to promote such safety.

The Safety Officer shall work full time directly on the project at the construction site. He/she might have other obligations in relation to similar topics, e.g. environment, social and/or medical aspects including HIV/AIDS prevention is FULLY devoted to Occupational Health and Safety.

The Safety Officer shall have specific training in the Contractor's safety and health management system and procedures, practice, etc. and before commencement of the Works, the Safety Officer shall receive training in (or receive a refresher course in) industrial first aid (or the equivalent).

The Safety Officer shall routinely provide workers with training in safe work practices and general awareness of potential danger situations to avoid injuries. Trained first aid personnel, transport for sick or injured workers, and an industrial first aid kit shall be available at each site at all times. The Contractor shall establish emergency evacuation procedures to enable a rapid response to accidents.

(e) Safety courses

All employees shall be given training on how to ensure their own personal safety and on ways to reduce the accident risk on those sites where large, mobile heavy vehicles and equipment or equipment with moving parts are in use. The Safety Officer shall provide training in safe work practices and general awareness of potential danger situations to avoid injuries. In addition, all employees handling dangerous/toxic materials shall be trained on how to handle dangerous/toxic materials.

All the Contractor's personnel shall, before starting to work, have an induction course on safety and health at the site. The information and training shall be on the site and have duration of at least two hours. It shall be conducted in English and, if necessary, also in relevant local language to ensure that all personnel can understand the information and instruction. The Site Manager shall take part in at least the first part of the training. He/she shall present the Contractor's safety policy and goal, the responsibilities and roles in relation to safety and health of all individuals, and the more specific responsibilities and roles of key staff (Site Manager, Safety Officer, superintendents, foremen, and others).

The topics of the course can be, but is not limited to be:

- Contractor's safety policy and goal.
- Organisation of safety and health work and the responsibilities and roles of the Site Manager, the superintendents/supervisors/foremen, the Safety Officer and of each individual worker.
- Mandatory use of personal protective equipment on the Site.
- Specification of the type of equipment, where and when to use it and how it shall be used, stored, cleaned and maintained correct.
- Placement and content of first aid equipment.
- How to use the equipment and information on who are specially trained in first aid and how to contact them.

- How to transport an injured person to a medical doctor or to the hospital.
- Safety rules for the site, e.g. in relation to the use of different equipment, tools, vehicles, fuel, oil, chemicals, explosives and abrasives.
- Cleaning, housekeeping and maintenance of the site, including vehicles, equipment, tools, workshops, houses etc.
- If work permits are required for specific tasks.
- Manual handling, transport, storage and disposal of equipment, goods, etc. in a safe way preventing accidents and too heavy burdens.
- How to ensure that equipment, goods, etc. will not be an obstacle imposing a risk to other persons due to inadequate placement and protection of it.
- Welfare facilities and access to drinking water and water in case of skin burns on the site when handling asphalt.
- Procedure for specific instruction when working with new work function, machinery, tool, chemicals, etc.
- The use of safety signs and protective barriers.
- Safe use of fuel, oil, chemicals, explosives.
- Prevention of dust generation and exposure.
- Road safety aspects, sign posting and principles and measures for minimising the risk of traffic accidents.
- HIV/AIDS prevention (only an introduction, more information shall be provided within one month of the employment on the Site).
- Consequences of breach of discipline and not complying with rules.

Different induction courses can be held for different types of workers ensuring the correct weight on relevant topics, e.g. vehicle operators, workers in the quarry, workers in the asphalt plant, work shop workers.

A Safety Booklet written in English shall spell out the most important aspects of occupational safety and health. The Safety Booklet may take its starting point in the Contractor's general description of safety and health, but it shall be very specific for contract works. The safety booklet shall be handed to all staff at the introduction course and used as training material. More training material might be relevant to use at the induction course.

(f) Safe access

The Contractor shall provide and maintain access to all places on the Site in a condition that is safe and without risk of injury.

(g) Sanitation

The Contractor shall provide adequate waterborne sanitation; and refuse collection and disposal, complying with the Laws of Uganda, all local Bye-laws, to the satisfaction of the Engineer, for all houses, offices, workshops and laboratories erected on the camp site or sites.

(h) Latrines and other sanitary arrangements

The Contractor shall provide an adequate number of suitable latrines and other sanitary arrangements at sites where work is in progress to the satisfaction of the Engineer and the Medical Officer in the area.

(i) Control of harmful insects

The Contractor shall execute appropriate measures in consultation with the Public Health Authority to control within the Site, including the camp sites, mosquitoes, flies and pests

including the application of suitable chemicals to breeding areas. Insect repellents and mosquito nets, preferably pre-treated, shall be supplied in areas of high malaria risk.

(j) Reporting of accidents

The Contractor shall report details of any accident to the Engineer and the Uganda Police, if appropriate, as soon as possible after its occurrence.

(k) Contagious diseases

The Contractor shall manage the risk of spreading contagious diseases (e.g. cholera, tuberculosis) through awareness raising programmes, especially when workers come from outside the locality. The Contractor shall manage the risk of harassment and sexual assaults, especially for the female workers. The Safety Officer or Health Services shall inform the workers and the community about the danger of communicable diseases included those transmitted by insects, water, faecal / oral and sexual contact. Prophylaxis shall be provided to all workers free of charge if recommended by the Public Health Authority.

The Contractor shall comply with Government regulations in case of epidemic outbreaks.

(l) Occupational health hazards

The Contractor shall reduce occupational health hazards, such as:

- (i) Physical hazards (continuous noise and vibrations, prolonged stay in high temperatures).
- (ii) Chemical hazards (exposure to fumes, chemicals and dust including solvents, paints, exhaust gases and possible carcinogens such as bitumen).
- (iii) Mechanical hazards (unguarded or exposed moving objects and other dangers from the use and operation of machines).
- (iv) Risk of accidents with hand tools (slips, falls, eye injuries) heavy items (the accidental dropping of heavy items) and vehicles.
- (v) Thermal hazards (heat stroke from long hours working in direct sunlight and burns due to contact with hot items (e.g. heated bitumen or the burner).
- (vi) Electrical, fire or explosion hazards.
- (vii) Ergonomic risk factors (personal injuries associated with poor working postures, heavy lifting, repetitive work, repetitive hand arm vibrations, manual transport).
- (viii) Sanitation hazards (including contaminated drinking water, poor food practices, improper waste disposal, unhygienic toilet and washing facilities, contact with solid and/or biological waste).

The means of reducing the occupational health hazards shall include:

- 1) Using vibration-reduced and sound-reduced equipment.
- 2) Providing shade at stationary work places and at welfare facilities.
- 3) Having only trained and experienced persons use dangerous chemicals and operate the machines.
- 4) Providing safety awareness training for all workers.
- 5) Providing easily movable equipment to reduce risk of injury associated with heavy lifting or strenuous work.
- 6) Varying job functions (to avoid excessive repetitive motions).
- 7) Providing on the Site, throughout working hours, adequate and easily accessible supplies of safe drinking water (including water supply to the Engineer's offices and laboratories), access to washing facilities (because of chemical and

biological hazards), proper eating places and waste disposal facilities. The water for drinking and cooking purposes shall be filtered, boiled or treated as necessary for human consumption. All water sources used shall be approved by the Engineer. The Contractor's attention is drawn to the fact that no separate payment will be made for the provision of water and the Contractor shall include in his/her rates and lump sum items for the provision of all water required in and for the Works.

- 8) Provide adequate signing, fencing and guards to ensure that unauthorised persons shall be kept off the Site. This is especially relevant for the dangerous parts of the Site, e.g. the quarry, the asphalt plant, the storage areas for oil, fuel, chemicals, machines, the car park, the work shop, near deep holes, bridges, villages and power lines.
- 9) The Contractor shall keep the site free from all unnecessary obstructions, and shall store or dispose any equipment or surplus of materials. The Contractor shall clear away and remove from the site any wreckage, rubbish and temporary works which are no longer required.
- 10) The Contractor is responsible for providing safe passage around and through the work site for all kinds of traffic, including non-motorised traffic and pedestrians. Traffic signs, traffic control signals and barriers shall be used for direction and control of traffic and to inform drivers of the importance to slow down and drive carefully. The signs shall be reflectorised or adequately illuminated at night in a manner approved by the Engineer. The goal is to minimise road accidents in general, including accidents involving pedestrians and persons living, working and playing next to the construction site.
- 11) Vehicles shall at all times be maintained in accordance with original manufacturer's specifications and service manual. This will ensure low noise generation, low emission of diesel particulate emission and that the vehicle will not result in accidents due to inadequate maintenance. Special inspection and maintenance is required for brakes, steering wheel, light, horn, tyres, oil and water. Seat belts shall be installed and used. All heavy vehicles shall have reverse warning signal. The operators shall be instructed in avoiding spillage, not overturning or overloading and not to drive at too fast speed. Operators shall be protected against the sun and a cabin shall protect against injuries if the vehicle is tipping around.
- 12) All accidents shall be recorded and analysed by the Contractor in order to prevent similar accidents in the future. The Contractor shall notify the Engineer immediately any accident occurs, at the latest within 24 hours. Accident records shall be submitted to the authorities according to regulations, but also send to the Engineer.
- 13) Special precaution shall be taken when working close to the overhead power lines. Special instruction shall be given to operators of vehicles working close to the power lines. Signs and barriers shall also be placed adequately to prevent from accidents.
- 14) The Contractor shall comply with the regulation on explosives. The Contractor shall not use or bring onto the site explosives of any kind without the prior consent in writing of the Engineer. The explosives shall be stored in a manner and quantities acceptable to the Engineer in magazines provided by the Contractor at suitable positions. The Contractor shall be responsible for the prevention of unauthorised issue or improper use of explosives brought on the

site, and shall employ only experienced and responsible men to handle explosives for the purpose of the works. The shots shall be properly loaded, tamped and where necessary, the Contractor shall use heavy blasting nets. Blasting shall be restricted to such periods as the Engineer may agree to. If in the opinion of the Engineer, blasting would be dangerous to persons or property, or to any finished work, or is being carried out in a reckless manner, he/she may prohibit it and require excavation by other means. Use of explosives by the Contractor in large blasts as in seams, drifts, shafts, pits or large holes is prohibited unless authorised in writing by the Engineer.

15) Internal quarry roads shall be kept free of obstacles and spillage shall be removed. The crusher and other very noisy equipment shall be placed in a distance and with noise shield/embankment, so personnel working other places on the site will be exposed to as low noise level as possible. If persons are working at the crusher, they must either be in a separate cabin (noise insulated) or wear noise and breathing protection. Personnel working at noise levels above 90 dB(A) shall wear hearing protection. If dust cannot be controlled, the persons shall wear filter masks.

Experienced operators, who have received special instruction on safe methods of operating the vehicle, shall operate dozers, dumpers and other heavy vehicles.

16) The Contractor shall by daily inspections monitor if:

- the specified personal protective equipment is used,
- the working area is tidy and clean with no unnecessary obstacles
- dust generation and exposure is sufficiently low and if the area is wetted.
- there are any new workers on the site, or planned to be hired in the near future, and therefore a need for induction courses
- signing, barriers and fencing are adequately in place.

The Contractor (Safety Officer) shall at least on a monthly basis monitor and carry out a report on the result of the monitoring. The report shall be submitted to the Engineer and include:

- number and type of accidents, and preventive measures implemented to minimise future similar accidents.
- number of workers who have attended (and not attended) an induction course.
- number of workers who have received special training because they started on a new work function, and the total number of workers who should have received such training.
- number of workers who have participated in the HIV/AIDS awareness training.
- stock of personal protective equipment.
- maintenance of the vehicles: tyres, brakes, light, steering wheel, oil, water.
- is first aid equipment in place with sufficient number of each item?
- the change in number of workers and their work functions.

PAYMENT

The tendered sum will be paid monthly, pro rata for parts of a month, to the Safety Officer from the date of commencement of Works until the completion of the Works or demobilisation of the local workforce, whichever comes first.

1804 HIV/AIDS AND STD PREVENTION

The Contractor's Management Plan for HIV/AIDS and STD shall include details of the measures he/she proposes to adopt to combat the spread of HIV/AIDS and sexually transmitted Infections (STI) between his/her staff, labour and the local community. The plan shall also outline workplace policies and programmes for employees living with HIV/AIDS, information and awareness campaigns and effective screening and counseling policies for STD and HIV/AIDS cases of his/her project staff.

The contractor will work closely with Uganda Aids Commission and MoH to put in place non-discriminatory workplace measures to protect the employees living with HIV/AIDS and to ensure that they are treated and counseled. Prevention measures will also be established to protect others against any risk of illness and injury, which can result in HIV/AIDS infection and transmission.

The Contractor shall advise all site staff and labour of the danger and impacts of STI's in general and HIV/AIDS in particular. To this end, the Contractor shall conduct information, education and consultation (IEC) campaigns at least every other month, targeting the aforementioned site staff, labour, and the immediate local communities. The Safety Officer or another of the Contractor's staff may carry out the awareness training if qualified; otherwise a person from outside (e.g. from Hospital) may be hired to carry out the awareness training.

The Contractor shall throughout the Contract provide, maintain, and operate at least one STD and HIV/AIDS clinic on each site or make alternative arrangements with an existing suitably qualified and equipped local clinic. Each clinic shall be suitably staffed and equipped for the screening, diagnosis and counselling of STI and HIV/AIDS cases of the project staff and labour. The Contractor shall pay the clinic to provide free treatment for general STI cases for his/her workers, whereas the HIV/AIDS cases shall be referred to the national HIV/AIDS programme coordinated by the Ministry of Health (MoH).

The Contractor shall throughout the Contract liaise with MoH and designated local representatives to report progress and coordinate the STI and HIV/AIDS alleviation measures on Site with the MoH national programmes.

The Contractor shall also make available 100 condoms per year for each member of the above mentioned site staff and labour.

All of the above provisions shall be provided free of charge for the workers.

MEASUREMENT AND PAYMENT

<u>ITEM</u>	<u>UNIT</u>
18.02 HIV/AIDS AND STD PREVENTION AND COUNSELLING	
(a) INFORMATION, EDUCATION AND CONSULTATION CAMPAIGNS INCLUDING REGULAR DISTRIBUTION OF CONDOMS TO THE WORKFORCE	MONTH
(b) PROVIDE, MAINTAIN AND OPERATE STD AND HIV/AIDS CLINIC OR MAKE ALTERNATIVE	MONTH

The tendered rates per month for Subitems 18.02(a) and (b) represent full compensation for these parts of the Contractor's obligations, which are mainly a function of time. The tendered sum will be paid monthly, pro rata for parts of a month, from the date of commencement of Works until the completion of the Works or demobilisation of the local workforce, whichever comes first.

1805 GENDER

The Contractor's Management Plan for Gender shall include description of recruitment policy and procedures, awareness raising meetings, gender sensitive working conditions and facilities to be provided at the workplace, and participatory gender sensitive monitoring.

The Contractor shall throughout the contract period liaise with both government and non-government organisations at all levels dealing with gender and social development issues. The local leaders and Community Development Officers shall be contacted to advise and mobilise communities during the recruitment process.

The Contractor shall ensure that recruitment procedures and working conditions/facilities are gender sensitive and in particular that:

- 1) Announcement notices of equal employment opportunities are posted in visible and popular places in the local communities and that such notices also reach women and youth leaders.
- 2) Both men and women are represented in any information and consultative meetings held at the site and that gender and social issues are raised and analysed.
- 3) Equal payment is made to men and women for similar work and that payment of wages is made to the workers and not to representatives.
- 4) Flexible working hours are introduced to the extent possible to take account of multiple roles of women and cultural norms.
- 5) Separate toilet and accommodation facilities are provided for women, including sanitary facilities and shades for children of working mothers.

The Contractor shall submit monthly reports of labour attendance disaggregated by gender, and the Contractor shall use gender compliance monitoring and evaluation forms to assess and report how gender concerns are addressed in recruitment, promotion, payment, provision of gender sensitive facilities, on-the-job training, etc.

MEASUREMENT AND PAYMENT

<u>ITEM</u>	<u>UNIT</u>
18.02 GENDER	
(a) GENDER SENSITISATION AND AWARENESS RAISING MEETINGS/ WORKSHOPS.	NUMBER
(b) GENDER MANAGEMENT PLAN AND GENDER SENSITIVE MONITORING AND REPORTING	MONTH

The tendered rate per number of meetings/workshops for Subitem 18.03(a) represents full compensation for production and distribution of awareness raising material and conduction of the meetings/workshops, including venue and making all arrangements. The tendered sum will be paid upon submission to the Engineer of an acceptable meeting/workshop report.

The tendered rate per month for Subitem 18.02(b) represents full compensation for this part of the Contractor's obligations, which is mainly a function of time. The tendered sum will be paid monthly, pro rata for parts of a month, from the date of commencement of Works until the completion of the Works or demobilisation of the local workforce, whichever comes first.

Except as provided in Items 18.01, 18.02 and 18.03 above and entered into the Bill of Quantities no separate payment will be made for any work included in this Section. The costs of complying with these requirements, in particular all the OHS requirements shall be included in the Contractor's rates for other items of work.

DRAINS

2101 EXCAVATION OF OPEN DRAINS

Open-drain excavation shall involve the excavating of open drains and channels, including channels to direct the course of streams, all as shown on the Drawings or as directed by the Engineer.

Open drains shall be constructed true to line, grade and cross-section and shall be so maintained for the duration of the Contract.

Care shall be taken to avoid excavation below the required grades for the open drains and any excavation carried beyond the required grade shall be backfilled with suitable, approved, material and compacted to at least 90% of BS-Heavy density by the Contractor at his/her own expense.

Material resulting from the excavations for open drains shall be used in the construction of fills, banks and dykes, or for other purposes, or shall be disposed of to spoil, all as directed by the Engineer.

If ordered by the Engineer, all existing open drains, but excluding open drains constructed by the Contractor himself/herself, shall be cleared and, where necessary, shaped by removing the sediment and trimming the floors and sides.

All culverts indicated by the Engineer shall be cleared. The Contractor shall remove all undesirable materials, all silt, sediment, driftwood, debris and rubble that have accumulated in and around the culvert inlet and outlet structures and in the culvert barrels. All materials resulting from the clearing operations shall be disposed of at locations approved by the Engineer. The clearing shall preferably be done by means of hand tools in order to prevent damage to existing drainage and other structures. The Contractor shall repair all structures damaged by him/her at his/her own cost, and to the satisfaction of the Engineer.

They works shall be measured and paid according to Table 2101/1

Table 2101/1 MEASUREMENT AND PAYMENT

Item	Unit
21.01 Excavation for open drains:	
(a) Excavating soft material situated within the following depth ranges below the surface level:	
(i) 0.5 m up to 1.5 m	cubic metre (m ³)

The unit of measurement shall be the cubic metre of material excavated in accordance with the authorized dimensions, measured in place before excavation. Irrespective of the total depth of the excavation, the quantity of material in each depth range shall be measured and paid for separately. The bid rates shall include full compensation for the excavation of the material to the required lines, levels and grades and the disposal of the material as directed, including all haulage.

2102 CLEARING AND SHAPING EXISTING DRAINS

Open-drain excavation shall involve the excavating of open drains and channels, including channels to direct the course of streams, all as shown on the Drawings or as directed by the Engineer. Any excavation required for constructing a channel or open drain within the formation prism, side drains and open drains on excavation-slope benches, shall be classed as Common Excavation.

Open drains shall be constructed true to line, grade and cross-section and shall be so maintained for the duration of the Contract.

Care shall be taken to avoid excavation below the required grades for the open drains and any excavation carried beyond the required grade shall be backfilled with suitable, approved, material and compacted to at least 90% of BS-Heavy density by the Contractor at his/her own expense.

Material resulting from the excavations for open drains shall be used in the construction of fills, banks and dykes, or for other purposes, or shall be disposed of to spoil, all as directed by the Engineer.

If ordered by the Engineer, all existing open drains, but excluding open drains constructed by the Contractor himself/herself, shall be cleared and, where necessary, shaped by removing the sediment and trimming the floors and sides.

All culverts indicated by the Engineer shall be cleared. The Contractor shall remove all undesirable materials, all silt, sediment, driftwood, debris and rubble that have accumulated in and around the culvert inlet and outlet structures and in the culvert barrels. All materials resulting from the clearing operations shall be disposed of at locations approved by the Engineer. The clearing shall preferably be done by means of hand tools in order to prevent damage to existing drainage and other structures. The Contractor shall repair all structures damaged by him/her at his/her own cost, and to the satisfaction of the Engineer.

They works shall be measured and paid according to Table 2102/1

Table 2102/1 MEASUREMENT AND PAYMENT

21.02	CLEARING AND SHAPING EXISTING DRAINS:	Unit
	The unit of measurement shall be the cubic metre of material excavated in accordance with the authorized dimensions, measured in place before excavation. The bid rates shall include full compensation for excavating the material to the required lines, levels and grades, protecting the existing drainage structure, trimming the sides and floors of the open drains and the disposal of the material as directed, including all haulage.	cubic metre (m ³)

PREFABRICATED CULVERTS

2201 EXCAVATION

(a) Depth of excavation

In the case of culverts to be constructed by the trench method, the Contractor shall first construct the fill, subgrade and if necessary, the subbase to such level of the top of the culvert, as described herein after for the various types of culvert. The Contractor may then commence excavating the trench for the culvert.

The amount by which the excavation is to exceed the proposed level of invert of the culvert shall be sufficient to allow the type and thickness of bedding material to be placed as specified or as shown on the Drawings. The base shall be constructed before the culvert and the backfill have been completed.

(i) Concrete pipe culverts

The minimum height of embankment construction over the top of the proposed pipe culvert before excavation may be commenced, shall be the minimum cover specified on the Drawings for the type of pipe and bedding onto which it shall be laid.

The minimum amount by which the excavation is to exceed the proposed level of the bottom side of the pipe shall be 75 mm or such other as may be required for accommodating the type of bedding required for the pipe in each case.

(b) Width of excavation

The width of excavations shall be sufficient to allow the proper laying, bedding and backfilling of culverts. The widths of the excavation for each type and size of culvert shall be as shown on the Drawings or as may be prescribed by the Engineer in writing.

If the width of an excavation is increased by the side of the trench slipping or collapsing, the Contractor shall immediately inform the Engineer and shall not proceed with any further laying of culverts or backfilling until the Engineer has reviewed the circumstances and has given instructions as to the need for altering the class of culvert or type of bedding.

2202 BACK FILLING

(a) Backfilling alongside and over all culverts shall be placed at or near the optimum moisture content of BS-Heavy and compacted in layers not exceeding 150 mm after compaction, or less if required, to a density of at least the density required for the material in adjoining layers of fill, subgrade and subbase. The density of backfilling in excavations made in natural ground shall be at least 90% of BS-Heavy density.

Backfilling shall be carried out simultaneously and equally on both sides of a culvert to prevent unequal lateral forces from occurring.

The width of backfill on each side of the culvert, after completion, shall be at least equal to the diameter (or span) of one of the openings of the culvert.

(b) The unit of measurement shall be the cubic metre of material in place after compaction. The quantity shall be calculated from the leading dimensions of the backfilling as specified or as authorised by the Engineer. If excavations were carried out in excess of the dimensions authorised by the Engineer, the quantity of backfilling will nevertheless be based on the authorised dimensions. The volume occupied by the culvert shall be subtracted when calculating the volume of backfilling.

(c) The bid rates shall include full compensation for backfilling under, alongside and over conduits, for watering, and for compacting the backfill material to the specified density. The bid rate for SUBITEM 22.02(b) shall, in addition, include full compensation for supplying selected material of sub base quality from approved sources, including a free haul determined according to the following Table.

Overhaul shall apply to all overhaul in excess of the distance given for materials where the following material types are prescribed as a minimum quality in the Specifications or on the Drawings:

TABLE 1602/1
FREE HAUL DISTANCES
Material for layer

Material for layer	Free haul distance (km)
Fill and improved subgrade layers (G3, G7, G15, DR)	5
Subbase and base course (G30, G45, G60, G80, C1.5, C1.0, C0.7, CM)	10
Gravel wearing course (GW)	10

(d) Overhaul distance

The overhaul distance shall be the total haul distance, minus the free haul distance measured to the nearest 0.1km.

(e) Quantity of material

The quantity of material overhauled shall in all cases be measured after placing and compaction in its final position calculated in the same manner as the item for the layer to which the overhaul applies.

2203 CONCRETE PIPE CULVERTS

(a) Reinforced concrete pipe culverts on class B bedding

LAYING AND BEDDING OF PREFABRICATED CULVERTS

(a) Concrete pipe culverts Concrete pipe culverts shall be laid on Class A, B, C or D bedding as shown on the Drawings or as directed by the Engineer. The pipe ends shall be laid hard up against each other so as to obtain tight joints. Ogee pipes shall be laid with their spigot ends downstream. The joints shall be sealed on the outside with two layers of bitumen impregnated burlap as specified in SUBCLAUSE 2210(b). The insides of the culvert shall be smooth and without any displaced joints. All pipes shall be laid true to line and level.

General

The construction of culverts shall be commenced at one end of the culvert, the position of which shall be fixed as shown on the Drawings or as prescribed by the Engineer.

Units which have been deformed or cracked, or which are not constructed to the required lines, levels and grades or which become displaced in the process of the work during the defects liability period shall be removed and replaced by the Contractor at his/her own expense. Prefabricated units shall be lifted and handled by means of approved lifting devices only. Lifting eyes shall be caulked with a suitable mortar after the units have been installed. The Contractor shall exercise due care not to damage, overstress or displace any prefabricated culverts with his/her own traffic or compaction equipment. Where loads exceeding those prescribed in the appropriate statutory provisions are likely to pass over completed culverts, the Contractor shall provide additional cover over the culverts to ensure that design stresses on the culverts will not be exceeded. All concrete work shall be carried out in accordance with provisions of SERIES 6000.

When the Contractor is required to supply and install culverts at slope exceeding 1:4, the work shall be carried out under the direct supervision of the Engineer.

Prefabricated concrete pipe culvert units shall comply with the requirements of BS 5911-1:2002 and BS EN 1916:2002 or BS 5911-110:1992 or equivalent. Pipes with ogee joints shall be provided, unless otherwise specified.

The unit of measurement for concrete pipe culverts shall be the metre of culvert laid as shown on the Drawings or ordered by the Engineer. The length shall be measured along the soffit of the culvert.

The bid rates shall include full compensation for providing, testing, loading, transporting and unloading the culverts, for providing and placing the fine-grained material, where required, and for the installation, laying and jointing of the culverts, as specified. The bid rate shall also include for jointing with existing pipes where culverts have to be extended. Any concrete required for the jointing or for bedding, haunching and surround will not be paid for separately.

Should it be inevitable for a section to be cut off from a concrete pipe unit of standard length, the full standard length of the unit shall be measured for payment. No additional compensation for cutting and disposing of such section will be paid.

Upon payment, differentiation shall be made between the various types and sizes of culverts and between the culverts placed on different classes of bedding.

2207 CAST IN-SITU CONCRETE AND FORMWORK

(a) Concrete Class 15 for bedding

The pipe shall be laid on a bedding cradle of compacted selected granular material as specified. The bedding shall extend upwards on both sides of the pipe to a specified portion of its height, as shown on the Drawings. Joint holes shall be formed in the bedding cradle for pipe sockets and couplings, to ensure that each pipe is fully supported throughout the length of its barrel on the bedding cradle.

No separate payment shall be made for the construction of joints in culvert floor slabs or at inlet and outlet structures and the bid rates for concrete shall include full compensation for forming the joints complete in accordance with the details shown on the Drawings.

Concrete work shall be carried out in accordance with the provision of SERIES 6000 GENERAL SPECIFICATIONS FOR ROAD AND BRIDGE WORKS and the Drawings.

(c) Concrete Class 30 in inlet and outlet structures, excluding formwork, but including Class U2 surface finish

The portal portions of portal and rectangular culverts shall be placed accurately and symmetrically on the floor slabs with a thin layer of mortar of one part of cement and six parts of sand between the contact surface to ensure a firm and uniform support.

The units shall be butted end to end with butt joints, which joints shall be covered with two layers of burlap of 340 g/m², pre-impregnated with a bituminous emulsion, or a similar approved material. The strip of burlap shall be at least 150mm wide and placed symmetrically over the joint.

The units shall first be treated with a primer of 60% bitumen emulsion over the width of the strip of burlap. Where two or more culverts are placed side by side to form a multi-barrel culvert, the space between the culvert shall be filled with concrete up to the level of the top of the culvert. Where prescribed, filter fabrics shall be applied to the vertical outer faces in accordance with the details shown on the Drawings.

Concrete work shall be carried out in accordance with the provision of SERIES 6000 GENERAL SPECIFICATIONS FOR ROAD AND BRIDGE WORKS and the Drawings.

(d) Formwork of concrete under subitem 22.07 (c)

The unit of measurement shall be the square metre, and only the actual area of formwork in contact with the finished face of the concrete shall be measured. Only formwork for mandatory construction joints shall be measured for payment.

The bid rates shall include full compensation for procuring and furnishing all materials required, erecting the falsework and formwork, constructing the forms, forming the grooves, fillets, chamfers and stop-ends for construction joints, treating and preparing the forms, all bolts, nuts, ties, struts and stays, stripping and removing the formwork after completion of the work, all labour, equipment and incidentals, and rubbing and surface treatment. Payment of 80% of the amount due for formwork will be made when the formwork has been removed, and payment of the remaining 20% will be made on approval of the concrete surface finish.

2210 STEEL REINFORCEMENT

Steel reinforcing bars shall comply with the requirements of US 155:1995, BS 4449:1997 or equivalent on the approval of the Engineer unless otherwise noted on the Drawings. For each consignment of steel reinforcement delivered on the site, the Contractor shall submit a certificate issued by a recognised testing authority to confirm that the steel complies with the specified requirements.

The unit of measurement for steel bars shall be the tonne of reinforcing steel in place in accordance with the Drawings or as authorised.

The bid rates shall include full compensation for supplying, delivering, cutting, bending, welding, trial weld joints, placing and fixing the steel reinforcement, including all tying wire, spacers and waste.

2212 REMOVING EXISTING CONCRETE AND MASONRY

Reinforced or plain concrete removed in the process of partial demolition shall be measured and paid for under ITEM 22.12 and the installation of dowels and those surfaces treated with an epoxy bonding compound will be paid for separately but no separate payment will be made for any other work described above, the cost of which shall be deemed to be included in the rates bid for the concrete supplied for extensions to the existing structures.

The unit of measurement shall be the cubic metre of existing concrete removed.

The bid rates shall include full compensation for all demolition and for loading, transporting and disposing of the products of demolition, including haul. The bid rates shall also include full compensation for cutting straight grooves of the specified depth at joint positions where shown on the Drawings.

2214 REMOVING AND STACKING EXISTING PREFABRICATED PIPES (ALL SIZES)

Where shown on the Drawings or directed by the Engineer existing inlets and outlets to pipe culverts shall be demolished and debris or rubbish disposed of in an approved waste site as directed by the Engineer. Existing pipes shall be removed where necessary and saved for later use, especially where required in temporary road deviations. All such work shall be carried out to prevent damage being done to former work which is to remain.

Pipes shall be carefully removed from existing culverts and thoroughly checked. Undamaged pipes shall be re-used in the Works where indicated by the Engineer. Pipes which cannot be re-used shall remain the property of the Employer and shall be stacked within the road reserve or where directed by the Engineer.

The Contractor's attention is directed to the provisions of Section 3100 GENERAL SPECIFICATIONS FOR ROAD AND BRIDGE WORKS, which specifies any structures which have to be removed as part of the clearing and grubbing operations, the removal of which will therefore not be measured and paid for under this Section.

The unit of measurement shall be the meter of existing prefabricated culverts removed and stacked. The bid rate shall include full compensation for lifting, loading, transporting to stack, off-loading, and stacking the prefabricated culverts.

2801 BIOENGINEERING MEASURES

28.01n Planting rooted grass slips (Vetiver or equivalent) on slopes 45-60° including preparation of slips on site

The Planting specifications are as follows:

- i. Dig trenches that are about 15-20cm (6-8") deep and wide.
- ii. Place well-rooted plants (with 2-3 tillers apiece) in the centre of each row at 100-120mm (4-5") intervals for erodible soils, and at 150mm (6") for normal soils.

iii. Since soil on slopes, road batters and filled dike/embankment is not fertile, it is recommended that potted or tube stock be used for large scale mass planting and rapid establishment. Adding a bit of good soil-manure mixture (slurry) is even better.

iv. Cover roots with 200-300mm (8-12") of soil and compact firmly.

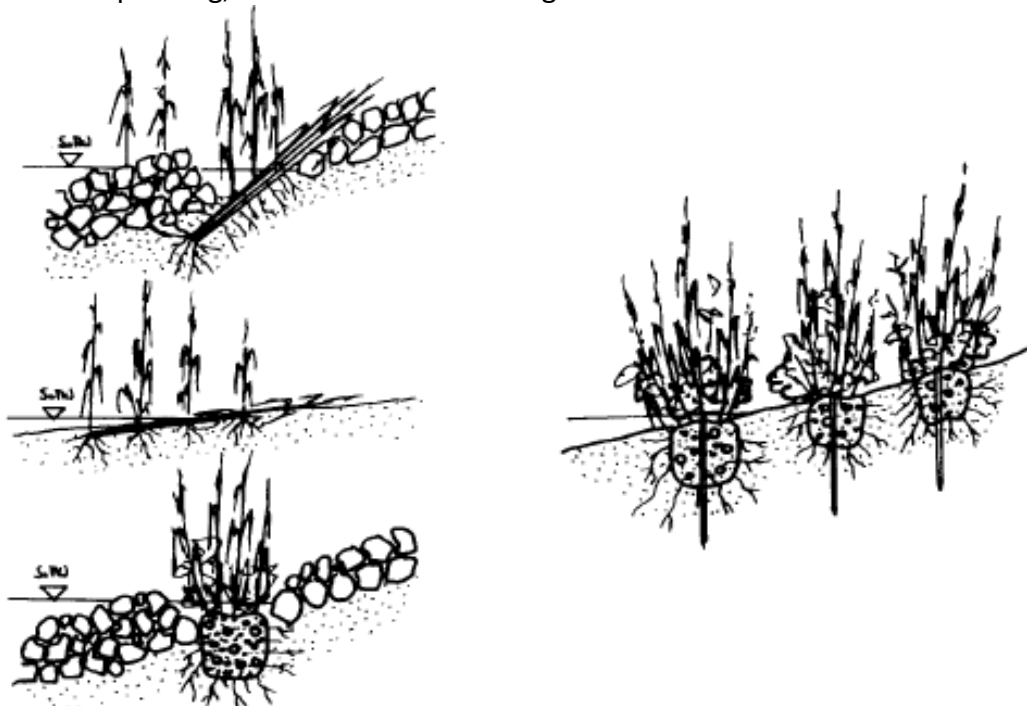
v. Water within the day of planting.

vi. To reduce weed growth during the establishment phase, a pre-emergent herbicide may be used.

The unit of measurement shall be the squire metre of planted area including preparation of slips on site and materials used.

28.02n Reed chump planting, reed rhizome and shoot planting including all preparation and materials

For the protection of the foot of the embankment in swampy areas, where water may remain close to the foot almost year long, the bio-engineering solution of reed chump planting, reed rhizome and shoot planting, as shown in the Drawing.

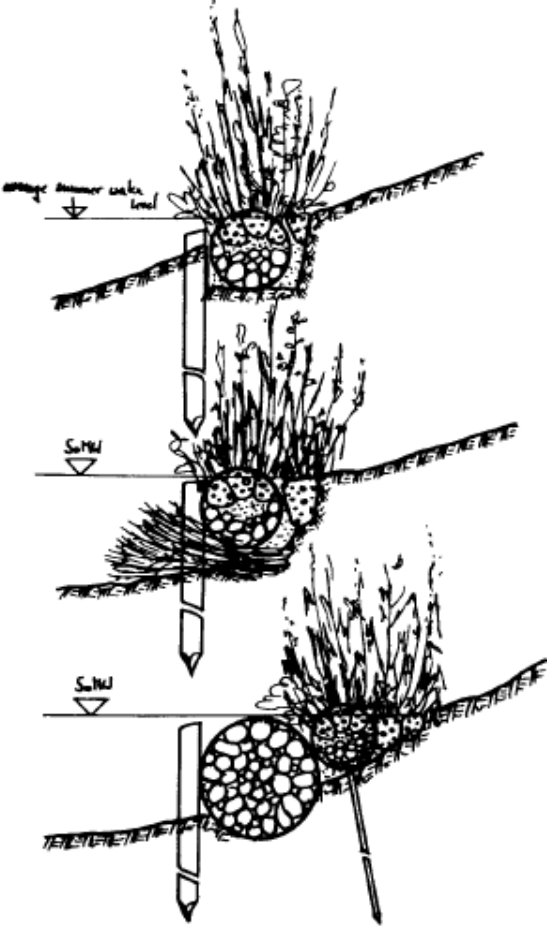


The unit of measurement shall be length in metres measured along the foot of embankment will include preparation and materials used.

28.03n Reed roll constructions (swamp sod rolls) including all preparation and materials (wire mesh and medium gravel and plants)

The methodology of reed roll constructions (swamp sod rolls), should be implemented where 28.02 has failed. In this case stakes (1-1.5m long, 1-1.5m apart) are driven into the ground along the mid-water mark in summer, until only 30 cm reach above the water. Behind this line, a ditch (0.5m deep, 0.5m wide) is dug out and secured with boards, if necessary. In this slot about 1.5m wide mesh wire is placed for the roll. The gap between the roll and the ditch wall is

plugged by the material falling through the mesh during filling. The fill is a mixture of medium and coarse gravel with rests of reed chumps. If the mesh is covered with branches first, the bottom fifth can be filled with material dug out earlier. The top fifth consists of reed chumps. After filling the mesh wire is pulled together to form a roll. The boards on the walls of the ditch are removed, the gaps refilled and the stakes are driven in to match the crest of the roll. The completed roll should stick 5-10 cm out of the water.



The unit of measurement shall be length in metres measured along the foot of embankment will include preparation and materials used.

EARTHWORKS AND PAVEMENT

3101 CLEARING, GRUBBING AND REMOVAL OF TOPSOIL

(a) Clearing and grubbing

Clearing shall consist of the removal of all trees, bush, shrubs and other vegetation, rubbish, fences and all other objectionable material, including the disposal of all material resulting from the clearing and grubbing. The clearance of trees within the extent of the Works shall include Baobab trees. Clearing shall also include the removal of all rocks and boulders of up to 0.15 m³ in size which are exposed or lying on the surface.

Clearing shall include complete removal and disposal of structures that obtrude, encroach upon or otherwise obstruct the work, including existing bridge structures and removal of foundations to a depth of one metre below the bed level shown on the Drawings.

Clearing shall include removal of mounds and nests from termites, ants or other insects or burrowing animals. Such removal shall be carried out by excavation to the required depth as directed by the Engineer, and subsequent poisoning with approved pesticides in the case of ants and termites. No additional payment will be made for removal of such nests, but backfilling and compaction with approved fill materials will be paid as ordinary earthworks fill under the relevant pay item. Poisoning with approved pesticides will be paid for separately.

In the area of interest all stumps and roots exceeding 50 mm in diameter shall be removed at least to the depth which is the larger of the following:

- 600 mm below the finished road level
- 100 mm below the ground level after removal of topsoil
- 300 mm below the top of improved subgrade or formation level.

All stumps and roots, including matted roots, shall be removed to a depth of at least 300 mm below the formation level (top of improved subgrade). The cavities resulting from the grubbing shall be backfilled with approved material and compacted to comply with the Specifications for the relevant layer.

(b) Removal of top soil for re-use, including stockpiling and all haulage

Topsoil shall be removed to a depth as specified in the Drawings or as instructed by the Engineer and conserved as instructed by the Engineer. The entire area shall be stripped of topsoil as directed by the Engineer. The rate paid for clearing, grubbing and removal of topsoil shall include all cost for the removal of topsoil to the depth instructed by the Engineer. No additional payment will be made for conservation measures, stockpiling or re-handling of topsoil.

(c) Conservation of topsoil

If not used immediately, the topsoil shall be transported and deposited in stockpiles or spoil banks provided by the Contractor at his/her own expense and at locations approved by the Engineer. No additional payment will be made for stockpiling or re-handling topsoil. The cost of stripping and disposal of topsoil shall be included in the price bid for clearing, grubbing and removal of topsoil.

3102 REMOVAL AND GRUBBING OF LARGE TREES AND TREE STUMPS

The girth of trees or stumps shall be measured at the narrowest point of the tree or stumps in the first metre of its height above ground level. Trees and stumps with a girth exceeding 1.0 m shall be measured individually and classified according to the size in increments of 1.0 m as indicated above.

The bid rates shall include full compensation for all work necessary for the clearing and grubbing of trees and stumps with girth exceeding 1.0 metre, the backfilling of holes and the removal and disposal of material.

3201 REMOVAL OF EXISTING STRUCTURES

(a) Removal of existing pipe culverts of any size

All existing pipe culverts of any size designated as salvage material shall be removed, without damage, in sections or pieces that may be readily transported, and shall be stored by the Contractor.

Sections of pipe lost from storage or damaged by negligence shall be replaced at the Contractor's expense. Pipes shown on the Drawings or directed by the Engineer to be plugged shall be left in place and the ends plugged.

The unit of measurement for removal of existing pipe culverts shall be the linear metre of pipe acceptably removed, as directed by the Engineer.

(b) Removal of reinforced concrete in bridges, box culverts and slabs including wingwalls and apron

Bridges, culverts, and other drainage structures shall not be removed until satisfactory arrangements have been made to accommodate train traffic and the flow of water.

Unless otherwise indicated, the existing substructures shall be removed down to the natural stream bottom and those parts outside the stream shall be removed 300 mm below natural ground surface. Portions of existing structures within the limits of a new structure shall be removed to accommodate the construction of the proposed structure.

Structures designated as salvage material shall be dismantled without damage and match marked. Structures designated to become the property of the Contractor shall be removed from the Site.

Blasting or other operations necessary to remove existing structures or obstruction, which may damage new construction, shall be completed prior to placing the new work.

3301 BREAKING UP EXISTING PAVEMENT LAYERS

(a) Granular materials

The unit of measurement shall be the cubic metre of material excavated or milled from the existing pavement using approved equipment and methodology.

The bid rate shall include full compensation for excavating or milling the material from the existing pavement irrespective of layer thickness, for loading, transporting, off-loading, and placing the material in approved spoil dumps or stockpiles as directed by the Engineer.

(b) Bituminous material

Existing bituminous material shall be asphalt or other bituminous seal or base course material removed separately from the pavement on the instruction of the Engineer. Where underlying material is broken down or excavated together with bituminous materials, the mixture will not be classified as bituminous material.

Where the asphalt must be reused, the asphalt shall be removed separately. Where the asphalt consists of layers of various mixes or grades, the Engineer may instruct the separate removal of the layers to different stockpiles. Where the milled material is not conveyed directly by conveyor belt and then loaded, and the Engineer so approves, the material shall first be cut to windrow and then loaded. During loading, the floor of the excavation or the underlying material shall not be damaged.

The milled material shall be inspected and classified in accordance with the various types of asphalt and its suitability for recycling. Different stockpiles shall be used for the different types

of material as ordered by the Engineer. Contamination of the asphalt with underlying material will not be permitted, and the Contractor shall adjust the depths of milling in accordance with the thickness of the layer.

3304 SCARIFICATION AND RECOMPACTING OF EXISTING PAVEMENT LAYERS TO 150MM DEPTH

Wherever shown on the Drawings or directed by the Engineer, the existing pavement surfacing and base course material or part of the existing base layer shall be scarified, watered and recompact. The depth of scarification and density of compaction shall be according to the Drawings and the Specifications. Unless specified otherwise existing bituminous surfacing shall, if located within 1.0 m of new pavement surface, be scarified by such method and to such depth that will ensure that any lumps of surfacing is not more than two-thirds of the specified scarification depth and ensuring that a homogeneous mix is obtained.

The unit of measurement shall be the cubic metre of existing pavement materials scarified to the specified depth using approved equipment and methodology.

The bid rate shall include full compensation for scarification of the existing pavement materials to specified depth irrespective of individual pavement layer thicknesses, mixing with imported materials if required, shaping, and compacting the material as specified.

3601 EARTHWORKS

(a) Common excavation for re-use, including stockpiling and all haulage

Common excavation shall be excavation in all material other than rock, whether the material is suitable for use in the Works, or to be spoiled and paid for as Common Excavation to Spoil. The classification includes excavation in earthworks not covered by a separate item in the Bill of Quantities regardless of the nature of the material excavated, other than rock excavation.

The unit of measurement shall be the cubic metre of material removed as specified on the instruction of the Engineer, measured in its original position and computed by the method of average end areas from levelled cross-sections taken prior to excavating the cut, measured along the ground line. Measurements of common excavation shall exclude materials already paid for as removal of topsoil.

(b) Swamps wetlands to spoil

In shallow swamps where tracked earthmoving plants can operate without getting stuck, the soft material shall be removed by tracked earthmoving plant and immediately be replaced with G7 material.

"Excavation in Swamps or Wetlands to Spoil" shall include material excavated according to the special methods when so agreed with the Engineer. Quantities shall be measured in its original position and computed by the method of average end areas from levelled cross-sections taken prior to excavating into the material below the water level as directed by the Engineer. Final levels after excavation/displacement shall be determined either by levelling or the approved profile established by the auger measurements, as directed by the Engineer.

(c) Rock excavation

Rock excavation shall be excavation in material which requires drilling and blasting or the use of hydraulic or pneumatic jackhammers to be loosened. Excavation of rock according to the classification criteria above shall be paid for only as "Rock Excavation" if spoiled, but also under Item 36.02(d) if used for embankment construction.

3602 FILL AND IMPROVED SUB GRADE LAYERS

Requirements for fill and improved Sub grade layers

Material properties	Material class		
	G15	G7	G3
CBR (%) BS1377:Part 4	Minimum 15 after 4 days soaking 1)	7 after 4 days soaking 1)	3 after 4 days soaking, measured at 90% of MDD of BS-Heavy compaction
CBR-swell (%) BS1377:Part 4	Maximum 1.5	Maximum 2	Maximum 2
Plasticity index (%) BS1377:Part 2	Maximum 25	Maximum 30	(no requirement)
Max. particle size BS1377:Part 2	1/2 of compacted layer thickness but not >50mm.		
Maximum layer thickness	250 mm compacted thickness placed in one operation		
CBR values are measured at the specified field density for the respective layer.			

(c) Fill to require minimum G3 quality material

G3 quality is natural gravel/soils with minimum CBR value of 3. The unit of measurement shall be the cubic metre of material measured in the compacted fill according to the Drawings or as directed by the Engineer. The quantity measured shall be computed by the method of average end areas from levelled cross-sections

(d) Fill or improved subgrade layer using rock fill

That part of the fill placed in excess of the cross- sections shown on the Drawings or as directed by the Engineer, will not be paid for irrespective of the tolerances in workmanship allowed under the Contract.

Measurement and payment of fill shall not distinguish between alternative methods of processing and compaction of the materials.

The bid rates shall include full compensation for procuring, excavating, any necessary de-watering, loading, furnishing, placing, preparing, processing, shaping, watering, mixing, and compaction of the materials to the densities according to the Specifications.

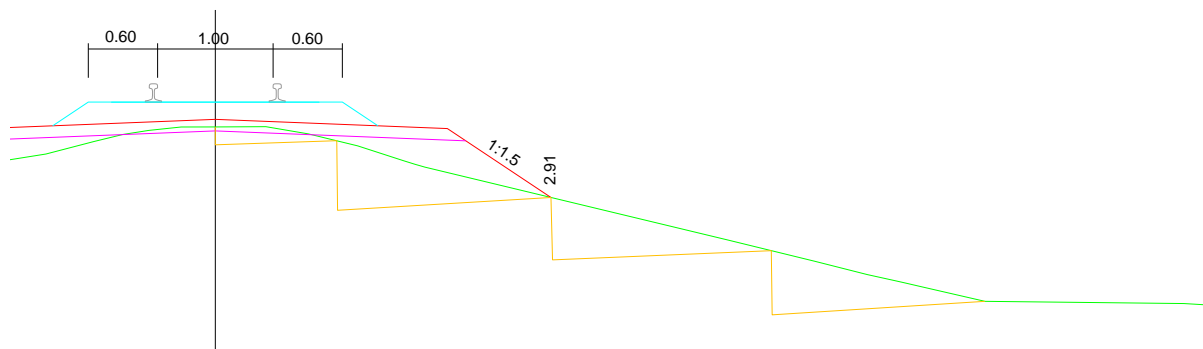
(f) Side fill compacted by dozers or as specified

Earthworks layers, except rock fill, shall be paid for as cross fill where the material on the instruction or approval of the Engineer is taken from cuts in the railway reserve and placed in embankments at a distance of 50 m or less from its original position, measured along the centreline of the railway track. The unit of measurement for crossfill shall be the cubic metre of material measured in the compacted embankment according to the Drawings or as directed by the Engineer. No distinction shall be made for the earthworks layer in which crossfill is used, i.e. whether in improved subgrade layers or common fill.

In the sections of the line in Kapiri and Soroti the existing embankment has failed and is damaged. These damages in the surface of the embankment (cracked, slipped surfaces, etc)

have allowed water, dust and other particles to enter into the embankment core. In some cases, along the Kapiri embankment, plants have grown in the cracks.

In these cases, it is necessary to repair the existing embankment, as shown below. The existing embankment is cut in benches of maximum height 1.0m and the existing material mixed with suitable borrow-pit material is re-placed and compacted by dozers or other suitable method.



3603 ROADBED PREPARATION AND COMPACTION OF MATERIAL

(b) Preparing and compacting the roadbed

(i) Compaction to 95% of BS-Heavy density

Unless otherwise instructed by the Engineer the roadbed shall be scarified, watered and compacted to a density and depth according to the Drawings and the Specifications or as directed by the Engineer. If necessary, roadbed material may have to be temporarily bladed off to windrow in order to achieve the necessary depth of compaction. The Engineer may instruct that expansive soils are given different treatment such as watering to maintain natural moisture content and timely dumping and spreading of following layers. No separate payment will be made for any such operations or alternative techniques to achieve the specified depth and degree of compaction. The Contractor shall carry out field trials as required by the Engineer to show that his/her proposed method and equipment for processing and compaction of the roadbed gives the desired result in accordance with the Specifications and to the satisfaction of the Engineer.

The preparation of the roadbed will take place after dismantling the existing railway line and clearing any vegetation. It will be done for the whole length of the line for the width under the line and sleepers and its purpose is to prepare the existing soil for the laying of the ballast.

The unit of measurement shall be the square metre of roadbed material prepared and compacted as specified in SUBCLAUSE 3603(b)(i). The quantity shall be computed in accordance with the authorized dimensions of the completed layer. The tendered rates shall include full compensation for shaping, scarifying, mixing of in-situ and imported material if required, any necessary de-watering and preparing and compaction of the material as specified. For payment purposes a distinction will be made between compaction to a percentage of BS-Heavy density.

3705 MAINTENANCE OF EXISTING GRAVEL ROADS

(c) Ripping and processing existing gravel roads

Ripping and processing existing gravel roads is paid for per square metre in SUBITEM 37.04(b) and comprises the following operations:

(i) Ripping of the existing road to a depth of minimum 100 mm as required by the Engineer.

- (ii) Bringing loose material back to the road from the slopes and ditches if instructed by the Engineer.
- (iii) Mixing, breaking of lumps, removal of oversize particles and watering as required to make a homogenous material having suitable moisture content at or around the optimum moisture content of BS-Heavy density.
- (iv) Shaping and finishing to the correct grade and crossfall and compaction to the requirements below.

Layer and typical material type specified	Minimum dry density, lower specification limit, BS 1377: Part 4
Base course layers, G80 or G60 material or better	98% of BS-Heavy
Subbase course layers, G45 or G30 material or better	95% of BS-Heavy
Gravel wearing course or unpaved shoulders GW material	

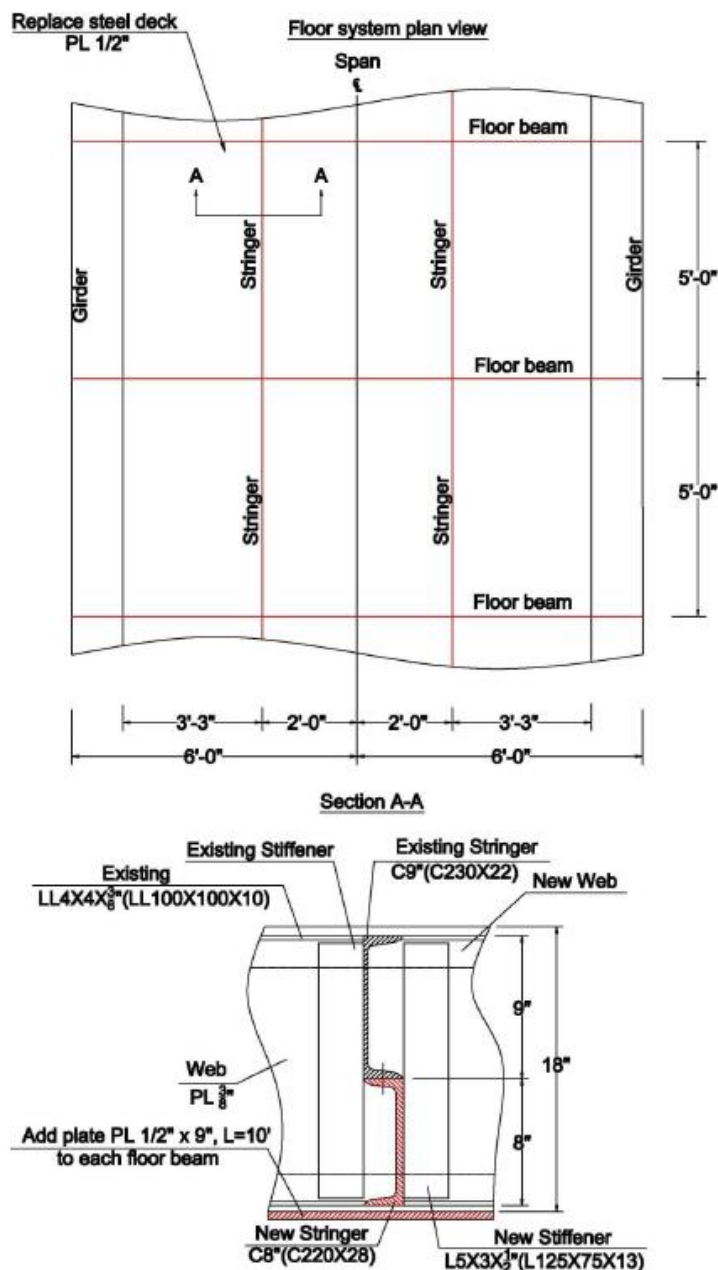
The bid rates shall include full compensation for ripping the existing road by approved equipment, breaking of lumps, removal of oversize particles and watering as required to make a homogenous material having suitable moisture content at or around the optimum moisture content of BS-Heavy compaction and shaping of the layer to the required grade and crossfall as specified including the protection and maintenance of the layer, all as specified.

STRUCTURAL STEELWORK

6701 REHABILITATION OF EXISTING BRIDGES

(a) Kapiri Bridge repair by providing and installing a 5ft stringer

According to the CANARAIL design, the Kapiri bridge stringer has a weak capacity compared to the other components with a rating of only 15.6 tonnes, due to the floor system (Stringer). The stringers and floor beams on the Kapiri bridge will need to be strengthened as proposed in the figure below to sustain safely the required load of at least 15 tonnes per axle.



The unit of measurement shall be Lump Sum.

The bid rates shall include full compensation for preparing shop details, where not provided on the Drawings, the supply of all the required materials, fabrication, process control, loading, transporting to the site, off-loading, and erecting. It shall also include full compensation for all nuts, bolts, washers, rivets, cutting, waste, and any temporary bracing necessary for transporting and erecting.

The bid rate shall also include full compensation for procuring and supplying all the necessary labour, equipment, tools and materials, as well as waste, necessary formwork and finishing to obtain the required surface.

6703 CORROSION PROTECTION

(a) Sprayed on metal

Surface preparation

The surface preparation of existing structures shall be carried out on site in accordance with BS EN ISO 8504-1:2001, BS 7079-D1:2000 or equivalent.

Prime Coat

The prepared surface shall be given two coats of a zincchromate primer in accordance with BS 4652:1995 or equivalent. The first coat shall be applied within 12 hours in the case of wash-primed surfaces and within four hours, but before any oxidation of the surface takes place, in the case of abrasive-blasted surfaces that have not been wash-primed. A fast-drying zinc chromate in accordance with BS 4652:1995 or equivalent, may be used as primer. In all cases the dryfilm thickness shall not be less than 30µm per coat.

Damaged Areas

Damaged areas shall be treated as follows:

Sand down to bright metal and clean. Spot prime with two coats and sand down lightly when hard. Rinse off with water and allow to dry. Apply two finishing coats.

Finishing Coats

Two finishing coats of high-gloss structural paint (BS EN ISO 12944:1998 or equivalent) of the specified colour shall be applied to leave a dry-film thickness of not less than 25 µm per coat. Where the finishing coats are applied on the site, the undercoat shall be lightly sanded and the members washed and cleaned of all contaminants.

Sprayed metal coatings

Where the sprayed metal coating of steel surfaces is called for, it shall be done in accordance with the requirements of BS EN ISO 14713:1999 or equivalent. The type of metal used shall be as specified, and, unless otherwise specified, the metal coating shall comply with the requirements of Type Al 150 or Type Zn 150.

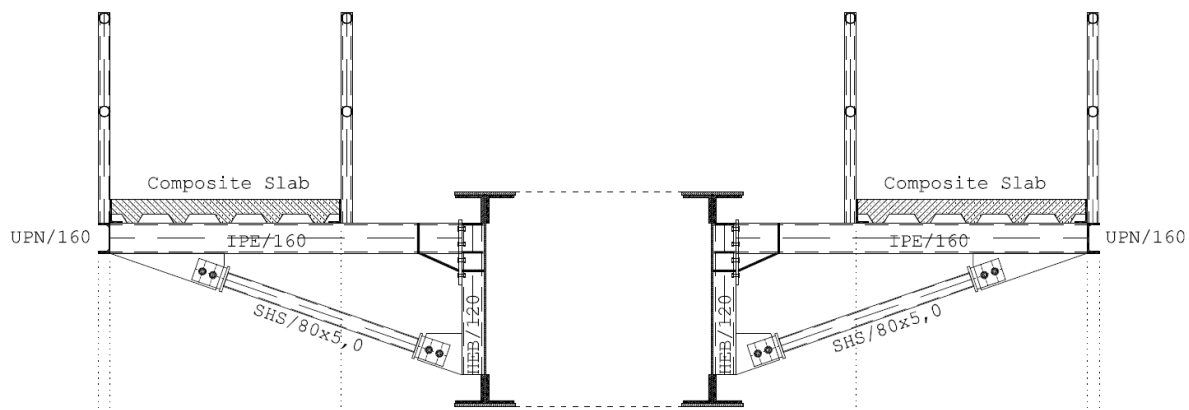
The following conditions shall also apply wherever coating/spraying work is being carried out:

- 1) The work shall be illuminated to the satisfaction of the Engineer.
- 2) Forced draught ventilation to the approval of the Engineer shall be used wherever required for the needs of personnel or for drying out surfaces.
- 3) Operatives shall work in pairs.

The Contractor shall demonstrate all his methods, equipment and materials before any work commences. Sample areas of substrate shall be prepared and coated as required by the Engineer and for his approval. There shall be strict control of surface cleanliness between primer and coating and between coats of the same. Vacuum removal of dust and sand shall be employed and contamination shall be removed as specified in appropriate preparation clauses herein. Where dirt or dust has become trapped in the painted surface it shall be removed with suitable abrasive paper. The surface being treated shall be free of visible moisture throughout these operations.

6704N FABRICATION AND INSTALLATION OF STEEL PEDESTRIAN WALKWAY ON ONE SIDE OF THE FOLLOWING BRIDGES

Detailed specifications for the construction of the pedestrian walkways are provided in Annex 2C of the detailed design.



Prior to the commencement of works the Contractor will perform all the necessary site and laboratory tests and back-calculation analysis to verify the structural capacity of all bridges to undertake the designed loads.

The following parameters were input into the software for the structural analysis:

MATERIALS

- Steel grade for the steel members: S275(Fe430), $f_y=275\text{MPa}$ & $f_u=430\text{MPa}$.
- Metal Plates: S275(Fe430), $f_y=275\text{MPa}$ & $f_u=430\text{MPa}$.
- Welding material ($t=8\text{mm}$): S275(Fe430), $f_y=275\text{MPa}$ & $f_u=430\text{MPa}$.
- Material for Bolts (M16&M20): 8.8 (Galvanized)
- Composite Slap:
 - Profiled sheet ($t=1\text{mm}$): $f_{ypd}=350\text{Mpa}$
 - Concrete class: C25/30
 - Reinforcement ($\# \Phi 10\text{mm}/10\text{cm}$ & $\Phi 14\text{mm}$): S500s
 - Shear Connectors ($d=16\text{mm}$, $d_2=29\text{mm}>1.5d$, $h=100\text{mm}>3d$, $h_b=7\text{mm}>0.4d$): S500s

LOADS

- DEAD LOAD
 - Selfweight of Reinforced Concrete: 25.00kN/m^3
 - Selfweight of Steel: 78.50kN/m^3
 - Composite Slap – Distributed vertically: 1.00kN/m^2
- LIVE LOAD
 - Composite Slap – Distributed vertically: $q=5.00\text{kN/m}^2$ (Critical load)
 - Composite Slap – Distributed horizontally: $10\%q=0.50\text{kN/m}^2$
 - Composite Slap – Concentrated vertically: 10kN
 - Upper Railing - Distributed horizontally: 1.00kN/m^2

SUPPLY OF TRACK COMPONENTS

General

All rails, sleepers and fishplates shall be manufactured from Basic Oxygen Steel continuously cast or conventionally teemed or Electric Quality Steel conventionally teemed at the Supplier's option.

7001 SUPPLY OF NEW RAILS, 60 LBS/YD, 12M LONG

Rails shall be new; flat bottomed; of the BS60R section; of length 40'0' (12.192m); drilled both ends for use with the four-bolt fishplates specified herein; and manufactured in normal quality steel in accordance with *British Standard Specification No 11 (1985)* or other equivalent widely used standard. The brand marking to include the mark "Uganda Railways".

7002 SUPPLY OF NEW PANDROL TYPE STEEL SLEEPERS (60LBS)

Sleepers shall be new; hot rolled steel or cold formed steel profiles to take the elastic rail clips (pandrol); to suit the specified rail section in (7001) above; to suit 1000mm track gauge; and manufactured in accordance with *British Standard Specification BS 500: 2000, UIC 865* or other equivalent widely used standard.

Mechanical properties: Tensile strength: 430 to 510 N/mm².

Chemical properties:

Carbon	Manganese	Silicon	Sulphur	phosphorus
0.15% to 0.22%	0.60% to 1.20%	0.15% to 0.49%	0.030% Max	0.035% Max

Rail seat slope: 1 in 20

Sleepers deviating from this specification BUT of equal performance as shall be demonstrated by the Supplier MAY be accepted.

(a) Clips

Clips shall be new Pandrol clips type PR309A or other equal performance elastic rail clips approved by the Supervisor to suit the rails and sleepers specified herein.

(b) Fishplates

Fishplates shall be new; rolled steel fishplates of class "B" quality steel; four-holed; of shallow section; to suit the rails section specified herein; and manufactured in accordance with *British Standard Specification No. 47: Part 1 (1991)* or other equivalent widely used standard.

(c) Fish bolts

Normal strength grade of steel, square headed Fish bolts with their accompanying hexagonal nuts and spring washers shall be new and manufactured to suit BS 60R rails and fishplates specified herein. Manufactured in accordance with BS 64: 1992.
The bolt heads should bear the mark "UR" embossed

7004 SUPPLY OF "MPEWERE" OR EQUAL APPROVED HARDWOOD TIMBER SLEEPERS SIZE 250mm wide * 125mm thick

1. INTRODUCTION

The definitions and terms used in this specification shall be accordance with *BS 565 - Glossary of Terms Applicable to Timber and Woodwork*.

The illustrated appendices, Drawings Nos PW 452 & PW 453, are included to assist in the interpretation of the various clauses of this specification.

2. TIMBER SPECIES

Only hardwood timber of demonstrated mechanical strength and durability shall be considered. The Supplier shall submit with his tender all strength and durability characteristics and certification thereof. Timbers without such documented data shall be considered non-responsive.

3. TIMBER QUALITY

Sleepers shall be cut from mature standing trees. Deadwood and fire-killed trees shall be rejected.

Only good sound timber free from fungal attack, rot, borer, grub or worm holes and large gum pockets shall be used for making sleepers.

4. SLEEPER MANUFACTURE

The sleepers shall be MACHINE SAWN, shaped correctly and the bark completely removed. The edges shall be at right angles to the top and bottom faces and the ends cut square.

5. KNOTS AND/OR KNOT CLUSTERS

- 5.1 Within the rail seat area, no knot shall be permitted.
 - 5.2 Outside the rail seat area, one or more tight knots not exceeding 50mm in diameter and knot holes not exceeding 40mm in diameter shall be permitted.
 - 5.3 The total number of knots and knot holes on either the top or the bottom face of a sleeper shall not exceed four.
 - 5.4 Knots or knot holes of diameter 12mm or less shall be ignored.
 - 5.5 No knot shall be within 25mm of the edge of a sleeper.
- Splay knots shall not be permitted.

6. IN-BARK

In-bark shall not be permitted in the rail seat area. Elsewhere, it may be accepted if it is not likely to result into the degradation of the sleepers in service.

7. SAPWOOD

Sapwood shall be permitted to a maximum of 25mm in depth in the top face and on the two edges. Sapwood shall not be permitted on the bottom face.

8. GRAIN

The angle at which the growth rings meet the top face shall not exceed 45 degrees.

Spiral grain shall be permitted provided that the deviation in any part of a sleeper does not exceed a slope of 1-in-8 relative to the axis of the sleeper.

9. SPLITS

9.1 One split not more than 75mm long at the end of a sleeper shall be permitted.

9.2 The Engineer may require a split sleeper end to be banded at the Supplier's expense before acceptance.

10. HEART SHAKES

Heart shakes up to four in number shall be permitted provided that their total thickness does not exceed 3mm and that none exceeds 1.5mm in thickness.

11. RING SHAKES

Ring shakes shall not be permitted.

12. CHECKS

An unlimited number of checks shall be permitted provided that none exceeds 300mm in length, 3mm in width and 40mm in depth.

13. WANE

Wane shall be permitted on either or both top edges of a sleeper provided that it does not extend for a distance of more than 25mm from the edge on the top face and 50mm in depth. No wane shall be permitted in the bottom face of the sleeper.

14. HEART CENTRE

The heart centre shall be allowed provided that it lies within the centre 150mm of a sleeper and is within 25mm of the bottom face of the sleeper.

15. SPRING

The spring or curvature along a sleeper edge shall not exceed 1.5mm per 300mm length of sleeper.

16. BOW

The bow or curvature along a sleeper face shall not exceed 1.5mm per 300mm length of sleeper.

17. TWIST

The horizontal plane of the face of a sleeper shall not change through an angle greater than 1-in-20 at any point along the length of the sleeper.

18. SEASONING

All sleepers shall be stacked after cutting for a period of not less than three months in such a manner as to ensure their efficient seasoning to a moisture content of 25%. The method of stacking adopted shall be subject to the approval of the Engineer.

19. PROTECTION OF SLEEPERS

The Supplier shall ensure that sleepers at all stages and particularly during seasoning shall be protected from damage by infestation and fire.

20. FIRST INSPECTION

All sleepers shall be inspected by the Engineer before stacking. This first inspection in no way prejudices the right of the Engineer to reject any sleeper during the final inspection.

21. FINAL INSPECTION

The final inspection shall be made after seasoning. All sleepers which are accepted by the Engineer shall be stamped with an acceptance mark "CCE-URC".

All those which are rejected by the Engineer shall be stamped with a rejection mark "XX". Such marking shall be on both ends of the sleeper.

22. PROVISION OF LABOUR

The Supplier shall provide all labour and supervision necessary to handle the sleepers as required by the Engineer to facilitate inspection.

23. TREATMENT

If so required by the Particular Specifications, the method of treatment and preservative to be used shall be as follows:

23.1 Incising

If incision and treatment is specified in the Particular Specifications, the sleepers shall be incised before seasoning. The incision pattern shall conform generally with BS 913: 1954 except that the blades may be angled up to 30 degrees to the longitudinal axis of the sleeper being incised.

23.2 Seasoning

Following incision, the sleepers shall be dipped in a 1% Gammexane emulsion and stacked for seasoning. The sleepers shall be cross-piled or stick-stacked to any convenient height but the width of the stack must not exceed one sleeper length. Stacks may not be formed closer than 900mm apart and sleepers shall under no circumstances be close-stacked.

23.3 Moisture content on impregnation

The moisture content of the sleepers shall be not greater than 25% at the core on impregnation.

23.4 Impregnating material

The preservative to be used shall comprise:

EITHER

Creosote (BS 144)	70%
Fuel Oil	30%
Penta-Chlor-Phenol	3% W.V. (dissolved in the Creosote before the addition of fuel oil)

AND

FOA 2 or similar anti-sludging agent at 1.5 litres per 1000 litres.

OR	Heavy Diesel Oil	93%
	Dutrec 3 or similar bridging agent	7%
	Penta-Chlor-Phenol	5% W.V.

23.5 Treatment schedule

The treatment schedule shall be as follows:-

- Draw initial vacuum of 560mm Hg and hold for 30 minutes.
- Admit preservative at 82°C plus or minus 6°C.
- Raise pressure to 14 bar and maintain the pressure and temperature for three hours.
- Drain tank and draw final vacuum of 560mm Hg without holding.

23.6 Minimum retention of preservative

The following minimum retention of preservative shall be obtained:-

- In sapwood, 160 kg/m³.
- In heartwood, 48 kg/m³.

23.7 Treatment certificate

Every batch of treated sleepers shall be accompanied by a treatment certificate, a model of which is attached to the Particular Specifications.

24. DIMENSIONS OF SLEEPERS

The sleepers shall be sawn to the following dimensions:

24.1 Turnout sleepers

<i>Type</i>	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
1	1800mm	250mm	125mm
2	2100mm	250mm	125mm
3	2400mm	250mm	125mm
4	2700mm	250mm	125mm
5	3000mm	250mm	125mm
6	3300mm	250mm	125mm
7	3600mm	250mm	125mm
8	3900mm	250mm	125mm

The permitted tolerances are:

- In length +50mm and -25mm.
- In width +12mm and -6mm.

- In thickness +12mm and -0mm.

24.2 Bridge and viaduct sleepers

<i>Type</i>	<i>Length</i>	<i>Width</i>	<i>Thickness</i>
A	2400mm	300mm	125mm
B	2400mm	300mm	150mm

The permitted tolerances are:

- In length +50mm and -25mm.
- In width +12mm and -6mm.
- In thickness +12mm and -0mm.

7005 SUPPLY OF NEW TURNOUTS (1-8 1/2 TYPE)

The turnout & crossing assembly shall be fabricated from normal quality steel rails of the specified rail section. The crossing shall be of angle 1-in-8¹/₂ or 1-in-12 as specified. The switch type shall be “flexible”. The switch mechanism shall be “Williams” or other equal. The whole assembly and all accessories thereof shall be in accordance with the latest relevant British Standard Specification.

The turnout assembly shall be supplied complete with timbers cut to the required lengths. The timbers shall be of hardwood “Azobe” or other equal approved and of section 250 mm x 125mm and pressure impregnated with “Tanalith” or other equal approved.

The timbers shall be straight, even, true to dimension as in 70.4, and free of defects or damage.

7101 All necessary Supply of Railway Track Components for Checked-in-Concrete level crossing

- Two stock rails 80 lb. /yd, 12.2m long, drilled 12 holes of 26mm diameter. Used rails to be provided by URC, cost includes any necessary refurbishing. For details refer to Drawings.
- Check rails 80 lb/yd, cranked ends 15 degrees, and 12.2m long, drilled 12 holes of 26mm diameter. Cost includes any necessary refurbishing for details refer to Drawings.
- Twenty six (26) Check bocks of cast iron, overall size 102mm long x 116mm wide x 84mm high, 26mm diameter hole through. Refer to Drawings for details
- Twenty six Check bolts of mild steel, size 400mm x 150mm x 12mm thick, two 24 mm diameter holes. Refer to Drawings for details
- Panel baseplates of mild steel, number 26, size 400mm x 150mm x 12mm thick, two 24mm diameter holes. Refer to Drawings for details

- f. Modified "F" type rail clips, total number 104, used clips.
- g. Includes any necessary refurbishing. Refer to Drawings for details
- h. 104 Anchor bolts of mild steel, size M22 x 300mm overall length, 150mm one threaded end, two nuts and two plain washers, 75mm x 75mm x 10mm thick plate welded one end. Refer to drawings for details
- i. 26 aligning plates of mild steel, size 400mm x 75mm x 2mm thick, two 24mm diameter holes. Refer to Drawings for details
- j. Six (06) Tie rods of mild steel, size M24 x 1400mm overall length, threaded 500mm one end and 250mm other end, four nuts and four plain washers. Refer to Drawings for details
- k. 28T10 bars and 03T8 bars for reinforcement as per the typical drawing section
- l. 12 m³ of Grade 30 cast in-situ concrete, refer to drawing for detail.
- m. 4 m³ of well compacted hardcore bed approved crushed granite nominal maximum size 75mm compacted to certification of the Engineer.
- n. 11 m³ of Gravel type G45 layer compacted to 95% BS heavy MDD.

Note: All items above include costs for supply of material, transport, loading and offloading, stacking and handling, hole drilling and any necessary refurbishing

7201 All necessary Supply of Railway Track Components for Gravel level Crossing

All items below include costs for supply of material, transport, loading and offloading, stacking and handling, drilling and any necessary refurbishing

- a. Two stock rails 80 lb. /yd, 12.2m long, drilled 12 holes of 26 mm diameter. Cost includes drilling and any necessary refurbishing. For details refer to Drawings EAR&H Manual
- b. Check rails 80 lb/yd, cranked ends 15 degrees, and 12.2m long, drilled 12 holes of 26mm diameter. Rails to be provided by URC and cost Includes drilling and any necessary refurbishing for details refer to Drawings.
- c. Twenty-six (26) Check blocks of cast iron, overall size 102mm long x 116mm wide x 84mm high, 26mm diameter hole through. Refer to Drawings for details
- d. Twenty-six (26) Check bolts of mild steel, size 400mm x 150mm x 12mm thick, two 24 mm diameter holes. Refer to Drawings for details
- e. Modified "F" type rail clips, total number 104, used clips

- f. Includes any necessary refurbishing. Refer to Drawings for details
- g. Converted 80lb/yd steel sleepers, seventeen (17) in number. Refer to Drawings for details.

TRACK WORKS

8101 Refurbishment of existing damaged 43, 45 and 50lbs rails

General

Recover rails in section and those stacked at stations. Examine all of them visually and by straight edge and rail profiling instruments for rail defects. Select rails that are within acceptable tolerances for refurbishment with prior approval of the Engineer.

The contractor shall be at liberty to apply any methodology that shall refurbish the defective rails to meet the standards. Such methods may include straightening, cutting, bending, grinding, boring, welding etc. However, the functions of a rail in the track must not be impaired as a result of the process of refurbishment.

Side wears of rails on curves

The limit of side wear in the high rail of a curve in a through running line is shown for each rail section in ANNEXURE 27 of the EAR&H Engineering Manual. Such wear shall be developed in one face only and, when the limit of wear is reached the rails shall be removed from the running line for use in wayside station yards and sidings.

The gauge for measuring side wear in rails on the main lines only is in Annexure 28 of the EAR&H Engineering Manual.

Table wear in rails

In a through running line the limit of wear on the table of the head of a rail in straight track and in the low rail of a curve, shall be that stated below, provided that side wear is not also present in the rail.

Rail type	Table Wear depth in mm
60R BS	76.2
60N BS	76.2
50 OBS	76.2
All lesser rail weights	57.17

The limits stated represent a loss in the head, amounting to approximately 10 per cent of the nominal weight.

Table wear shall be measured with a calliper on the vertical centre line of the rail, the depth of wear being the difference between such measurement and the height of a new rail.

Except in sharp curves in heavily graded line, where the head may squeeze or wear down fairly rapidly, the limits given are not likely to be found in track due to attrition alone. The density and speeds of trains are not usually enough to cause so great wear before the rails become unfit for other reasons.

Laying Side Worn Rails- When second hand rails, having side wear, are again laid in the track, the worn side shall be on the outside of the track and the unworn side shall be on the gauge line.

8102 Refurbishment of existing dented or otherwise damaged sleepers to restore their shape and principal dimensions

General

All dented or damaged sleepers shall be collected and stacked close to the contractor's established workshop for refurbishing sleepers. The sleepers shall be sorted according to the extent of damage. The Engineer shall approve sleepers that can reasonably attain the required tolerances when refurbished.

The methodology for refurbishing should not adversely affect the strength or durability of a sleeper such as excessive heat. The refurbishing may include welding cracks, welding split lugs, sleeper press to remove dents, provision of base plates etc.

The sleepers are expected to maintain their core functions in the track such as; holding the rails in their correct gauge and alignment, giving a firm and even support to the rails and transferring the load evenly from the rails to a wider area of the ballast after refurbishment.

Refer to drawing for typical steel sleeper annexure 13 of the EAR&H Engineering Manual

8103 Recover and refurbish disused turnout skeletons (including any necessary loading, offloading, metal replacement and transportation) refer to Annexures 33-36 of the EAR&H Engineering Manual Vol. 1 Technical Instructions (1962)

General

A complete set of points and crossings, along with lead rails, is called a *turnout*. Existing turnout design is given in Annexure 34 of the EAR&H Engineering Manual

Uganda Railways Corporation shall identify all such disused turnout skeletons and communicate the location to the Engineer. The Engineer shall assess the materials identified and handover to the contractor the materials recommended for refurbishment.

Recovered materials from broken down turnouts that have been recommended for re-use by the Engineer, shall be brought to the attention of URC and treated as provided by URC to the contractor. Such items shall not be paid for under items 71.01 and 71.02.

The contractor shall establish and equip a workshop from where the refurbishment will take place. The contractor shall be at liberty to apply any methodology that shall refurbish the turnout to meet the standards. Such methods may include straightening, cutting, bending, grinding, boring, welding etc. of various components.

On site gas welding

Normally gas welding is adopted to recondition crossings at the site itself. The sequence of operation is as follows.

1. An advance party carries out the preliminary work in which complete and detailed attention is paid to the turnout including through packing, replacement of worn out fittings, tightening of fittings, squaring, spacing of sleepers, etc.
2. Both the vertical and side wear are measured with the help of an 1.8-m straight edge.
3. The surfaces to be welded are also cleaned, and burns, etc. are removed using chisels.
4. Welding is done with the help of an oxyacetylene flame using suitable welding rods after pre-heating the surface for about 5 minutes. When the section is built up to the thickness required, the deposit metal is hammered to make a uniform level surface. The prepared surface is then checked with the help of a straight edge.
5. A caution order is sent out while the work is in progress and no speed restriction is necessary.
6. One welding party consisting of one permanent way craftsman, two welders, and six labourers including lookout men can weld one crossing or two pairs of switches every working day. The consumable items required for reconditioning work are; oxygen, acetylene and suitable welding rods.

Leading Dimensions of Turnouts- In the manufacture and in the laying of turnouts only the theoretically correct dimensions shown in Annex Vol. 2A df4 shall be used.

Handling of Points and Crossings- When loading, off-loading or handling any point; and crossings, throwing of the assembly shall not be allowed. They must be handled carefully as they are damaged much more easily than rails and sleepers.

Scrapping Limits for a turnout - The safe condition of the rails in a turnout must remain within the judgment of the Engineer, who should take into account the character of the design traffic and other conditions.

The following will serve as a guide in the assessment of a unit:

Stock Rail.

Excessive thinning down of the rail table due to wear or flattening, causing the head of the matching tongue rail to break down over its thinned portion.

Side wear on the gauge face causing excessive side wear to the matching tongue rail which may result in it splitting at the toe.

Tongue Rail.

Side wear or chipping at the thin end to an extent which may cause a wheel flange to force itself between the stock and tongue rails.

Vertical Wear on the Wing Rail.

The grooving of the wing rail and not the squeezing of the nose rail will normally determine when the crossing should be replaced. The rate of wear in a wing rail may be noticeably rapid within the first year of the crossing being laid, thereafter slowing down appreciably.

The entire crossing unit (wings and vee) should be replaced when the vertical depth in one or both of the wing rails, measured at the rubbing edge and opposite the **blunt** nose of the crossing reaches 6.7 mm.

Side wear in the Check Rail and Wing Rail.

Wear on the rubbing face to an extent causing the flangeway clearance to exceed 44.45 mm.

It is important to note that, except for the curvature, studs and distance blocks, the lengths of the stock rails and tongue rails and their machining are identical for all crossing numbers in each group of rail sections. **Thus, the stock and tongue rails are interchangeable**, and consequently manufacture and the holding of spares are simplified. The curving or straightening of them for replacements can readily be done on the works site.

Check and ensure that the following defects are avoided that cause the Nose being struck by Wheel Flanges:

- (a) tight track gauge;
- (b) excessive check rail clearances;
- (c) loose bolts and chair fastenings, particularly in the throat of the crossing causing the wing rail to spread under wheel thrust. It is a serious defect which must be avoided.

Setting the Curves of Turnouts by Offsets- The turnout curve must not be set by "eye" but in the manner illustrated in ANNEXURE 34 using the perpendicular offsets from the main track given for each design of turnout.

No turnout may be installed, until its 'exact' location has been approved by the Engineer.

Standard Dimensions and Clearances- No infringements of Standard Dimensions are permissible.

The prescribed limits particular to points and crossings are given in Items 29 to 35 of the book of Standard Dimensions.

Gauge- See ANNEXURE 33 of the EARH Manual. The track gauge in turnouts shall be as follows:

Switches, Main Track in "lead", crossing (both tracks) is one metre gauge.

Special fittings with turnouts

Some of the special fittings required for use with turnouts are enumerated below.

Distance blocks

Special types of distance blocks with fishing fit surfaces are provided at the nose of the crossing to prevent any vertical movement between the wing rail and the nose of the crossing.

Flat bearing plates

As turnouts do not have any cant, flat bearing plates are provided under the sleepers.

Spherical washers

These are special types of washers and consist of two pieces with a spherical point of contact between them. This permits the two surfaces to lie at any angle to each other. These washers are used for connecting two surfaces that are not parallel to one another. Normally, tapered washers are necessary for connecting such surfaces. Spherical washers can adjust to the uneven bearings of the head or nut of a bolt and so are used on all bolts in the heel and the distance blocks behind the heel on the left-hand side of the track.

8201 Supply only of stone ballast according to specifications

1. SCOPE

This specification covers the production and delivery of railway stone ballast.

2. MATERIAL

2.1 General

The ballast shall in general conform to BS 812. The ballast shall be good hard stone, angular in shape with all dimensions nearly equal, clean and free from dust. It shall be obtained by the mechanical crushing of suitable rock. The rock shall be granite or other equal approved.

2.2 Grading

On a square mesh grid, the ballast grading shall conform to the following:-

- a) 100% passing 63mm (2 ½") sieve
- b) 20% passing 38mm (1 ½") sieve
- c) 0% passing 19mm (¾") sieve

The 80% retained on the 38mm sieve consist of a general gradation in sizes up to 63mm.

2.3 Crushing Strength

The Crushing Strength of the parent rock at the quarry determined on samples of 70mm side using a standard procedure and equipment shall not be less than 80 N/mm².

2.4 Crushing Value

The Crushing Value of the ballast shall not exceed 30%. The Crushing Value is the weight of material passing a 2.35mm sieve expressed as a percentage of the original weight of a single-sized sample after having been subjected to increasing load reaching 400kN after ten minutes and then released using a standard procedure and equipment.

2.5 Impact Value

The Impact Value of the ballast shall not exceed 25%. The Impact Value is the weight of fines expressed as a percentage of the original single-sized sample after having been subjected to a series of fifteen (15) blows from a 14kg hammer falling from a 380mm height under standard conditions and using standard equipment.

2.6 Flakiness Index

The Flakiness Index of the ballast shall not exceed 50%. This index shall be determined during the sieve analysis using special standard flakiness sieves.

2.7 Elongation Index

The Elongation Index shall not exceed 50%. The index shall be determined during sieve analysis using special standard elongation gauges.

2.8 Attrition Value

The Attrition Value shall not exceed 50%. The Attrition Value shall be determined by a standard abrasion test using the Deval Attrition Machine comprising one or two steel cylinders fitted with water tight covers on a rotating shaft, inclined at 30%, rotated 10,000 times at a speed of 30-33 rpm. The Attrition Value is the loss of weight determined by sieving the sample on a 2.36mm sieve expressed as a percentage of the original weight.

3. TESTING AND QUALITY CONTROL

- 3.1 All testing necessary to determine compliance of the ballast with this Specification shall be carried out in accordance with the relevant British Standard.
- 3.2 The onus rests on the Supplier to produce ballast that conforms in quality to the Specifications. The Supplier shall at his own expense institute a quality control system and provide experienced technical staff together with all transport, instruments and equipment to ensure adequate supervision and adequate control. The Supplier shall provide all necessary assistance including labour for the Engineer to carry out any necessary checks.
- 3.3 The tests specified above shall be carried out at a minimum frequency of 750m³. The Supplier shall at his discretion increase this frequency to ensure adequate quality control. For each ballast batch (750m³), the Supplier shall furnish the Engineer with a test certificate(s).
- 3.4 The costs of all supervision and quality control shall be deemed to be included in the tendered rates.
- 3.5 The Supplier shall submit to the Engineer the results of all tests indicating compliance with the Specifications.

4. MEASUREMENT AND PAYMENT

- 4.1 The unit of measurement shall be the cubic metre (m³) of ballast delivered to the destination (railway station). The ballast shall be deemed delivered if it is offloaded from trucks and stockpiled as directed by the Engineer.
- 4.2 The ballast shall be measured both on the delivery trucks, and while on the ground after offloading and stockpiling. Stockpiling of ballast during delivery shall be done in a manner that enables the Engineer to measure it. The ballast trucks shall be loaded "struck" as any heaped ballast shall not be paid for.
- 4.3 The tendered rate shall include full compensation for the production of the ballast, loading onto trucks, transportation to destination, offloading from trucks at destination, and stockpiling at destination.
- 4.4 The tendered rate shall include full compensation for the transportation of ballast from stockpiles at the railway station or halt established for the sole purpose of holding stone ballast stockpiles shall be paid for separately. The tendered rate shall include full compensation for loading of ballast into hopper wagons and transporting by rail to site in cubic metre kilometre.

8203 Installation of turnouts

In the laying of turnouts only the theoretically correct dimensions shown in Annexure 34 of the EAR&H Engineering Manual Vol. 1 (1962) shall be used.

8204 Ballasting, laying, lining and Levelling of railway track including Packing, boxing and dressing (tamping) ready for traffic. (Measured over level track - URC to provide tamping machine)

A layer of ballast will be placed on top the sub-ballast layer with a minimum depth of 150mm. The sleepers and rails will then be put back into place, after refurbishment of the damaged sleepers and re-profiling of the rails. The hopper wagons loaded with ballast will then move slowly over the laid line while discharging enough ballast to surface to the specified depth and tamped for the entire length of the railway.

The tamping machine shall lift, align and level the track to the correct vertical and horizontal position to the satisfaction of the Engineer. The tamping machine shall be capable of tamping multi sleepers continuously. Pushing vibrating tines into the ballast on both sides of a sleeper until squeezing depth is achieved and ensuring that the sleeper and rail hold position when released and the machine moves to the next sleepers and begins a new cycle.

The portions to be firmly packed in a sleeper are 300mm on each side of the centre of the rail. The sleeper ends and centre should only be loosely filled.

A lift must not exceed 75mm at any one operation and should be done against a gradient if such is present in the line to enable the level to run out quickly.

When lifting on the approaches to a bridge, work should proceed from the bridge and not to the bridge and ensuring that the rail level at the bridge remains the same.

Stone ballast shall be neatly boxed and dressed in accordance with Annexure 14 of the EAR&H Engineering Manual Vol. 1 (1962). A steel template to profile the finished section shall be fabricated, made available by the contractor and approved by the Engineer before use.

Ballast surplus to the standard cross section shall be trimmed off, placed on the cess and then moved forward to track which is not up to full section.

The unit of measurement shall be kilometres of railway tracks, measured over level track.

8301 Laying and assembling checked in concrete level crossing track. Refer to Drawings. Includes and levelling track ready for concreting.

- a. The existing track will be removed and re-assembled using new material as per the drawings.
- b. Rail joints in level crossings should be avoided where possible by using cut rails on either side
- c. The tops of the running and guard rails shall be maintained at the same level using railway tools like combined gauge for measuring gauge and cant, steel gauge, jack for lifting track
- d. The flangeway between running and guard rails shall be kept clear down to the flanges of the rails
- e. Road surface at the crossings, refer to table 7.03A of EAR&H Engineering Manual Vol 1, shows the limits on either side of the track for which the railway shall be responsible. The centre line of the carriageway shall, as far as possible, be horizontal for a distance of 2.1336 m (7 feet) on each side of the railway track or tracks where more than one track exists, measured from the centre line of the track or of each track. Beyond 2.1336 m (7 feet) point the grade shall be that of the approach road but not steeper than 1 in 20 for a distance of 6.096 m (20 feet) from the centre line of the track.
- f. The surface at all level crossings shall be maintained up to the tops of the rails over the width of the railway track. The surface of the carriageway on each side shall be graded to conform to the level of the track both in regard to its gradient and cant.

g. Excavations

Examine the site

The Contractor is recommended to examine the site carefully and to ascertain for himself the nature and the kinds of materials to be excavated.

Excavations

Excavations shall be to the width of 2000mm and depth of 1075mm from top of rail as indicated on the Drawings. If, however, the Contractor excavates to any greater depths or widths than are shown on the Drawings, then the Contractor shall, at his own expense, satisfactorily fill in such extra depth and width with concrete/specified material similar to that described for use.

Bottoms to excavations

The Contractor shall report to the Engineer as and when a secure bottom to the excavations has been obtained and the same is ready to receive concrete.

Any concrete or other work put in before excavations have been inspected and approved, shall, if so directed, be removed and new work substituted after excavations have been approved, all at the Contractors expenses.

If so directed the Contractor shall water and well ram the bottoms of excavations to the satisfaction of the Engineer.

Starting level

Unless otherwise described, the starting level of all excavations has been measured from the level remaining after completion of reduced level excavation.

Borrow Pits

No borrow pits will be allowed to be opened on the Site.

Removal of surplus material

All surplus excavated material, where so directed, and all rubbish, is to be carried away from the site and the contractor shall find his own dump and pay all charges.

Hardcore filling

Hardcore for filling to a depth of 150mm must be well compacted hardcore bed of approved crashed granite (or equivalent) nominal max size 75mm, compacted to certification of the Engineer, Compaction shall be by hand or mechanical tampers. The top surface of the hardcore shall be leveled or graded to falls as required and blinded with similar material broken to 25mm gauge and surfaced with 50mm layer of stone dust/sand, well-watered and rolled to receive concrete.

Protection from water

The Contractor must take every precaution to protect the excavation and foundations at all stages of construction from damage from water caused by sudden rains or other means, both by phasing the work to minimize damage and also by means of pumping, shoring, temporary drains and the like.

h. Specifications for Road/Railway Earthworks

(Extract from Ministry of Works, Housing and Communications General Specifications)

Fill Material

Min CBR at specified in-situ density 3% for 0-9m below formation level, and 5% for 9-12m below formation level. Compaction not less than 93% mod AASTO density

Selected Subgrade from Cut/Borrow

Compaction 93% mod AASHTO density

Gravel Sub-base (Railway sub-Ballast)

Grading modulus (GM) 1.50 min

Plasticity index (PI) 10% max

CBR (soaked) 30% min

Compaction 95% mod AASHTO density

Gravel Base

Grading modulus (GM) 2.00 min

Plasticity index (PI) 6% max

CBR (soaked) 80% min

Compaction 98% mod AASHTO density

NB Testing frequency 1 test every 2,500m with minimum of 2-4 tests per lot.

Usual free-haul 10km

Gravel road wearing course specifications similar to gravel base above.

Raft Concrete Grade 30, Admixtures

The use of admixtures to the concrete to accelerate or retard the setting or to improve the workability shall be subject to the approval in writing of the Engineer in every case. Permission to use plasticizers shall be granted subject to certain safeguards to ensure the correct dosage used in every batch. The use of accelerators shall be permitted only in exceptional circumstances. In every case, the Contractor shall apply in writing to the Engineer, if he intends to use admixtures of any kind in the concrete.

Traffic Management during Construction

For all level crossings with asphalt roads the Contractor shall provide a temporary traffic deviation of the asphalt road, so that the level crossing equipment can be installed. These are all shown in the layout drawings included as Annex in Vol. 2A.

8401 Laying and assembling conventional gravel road level crossing track.

- a. The existing track will be removed and re-assembled using new material as per the drawings.
- b. Rail joints in level crossings should be avoided where possible by using cut rails on either side.
- c. The tops of the running and guard rails shall be maintained at the same level using railway tools like combined gauge for measuring gauge and cant, steel gauge, jack for lifting track
- d. The flangeway between running and guard rails shall be kept clear down to the flanges of the rails
- e. Road surface at the crossings, Consider table 7.03A of EAR&H Engineering Manual Vol 1, shows the limits on either side of the track for which the railway shall be responsible.

The centre line of the carriageway shall, as far as possible, be horizontal for a distance of 2.1336 m (7 feet) on each side of the railway track, measured from the centre line of the track. Beyond 2.1336 m (7 feet) point the grade shall be that of the approach road but not steeper than 1 in 20 for a distance of 6.096 m (20 feet) from the centre line of the track.

- f. The surface at all level crossings shall be maintained up to the tops of the rails over the width of the railway track. The surface of the carriageway on each side shall be graded to conform with the level of the track both in regard to its gradient and cant.
- g. Earth only, shall not be used for the surfacing of level crossings. The minimum standard, even if the approach carriageways are of earth, shall be water bound macadam; where the standard carriageways is higher than this, the standard of the carriageways shall be adopted.

NB: Gravel road wearing course specifications similar to gravel base specifications in 83.01 above.

Traffic Management during Construction

For earth roads, the layout in Annex in Vol. 2A shall be followed to allow construction of the level crossing in one half of the road, while traffic is deviated and managed in the other half of the road. This way there is no obstruction of traffic and delays should be minimal due to the low traffic volumes.

8501 "Level Crossing Marking Board" signs for PERMANENT level Crossings

- a. Two "Level Crossing Marking Board" signs with Advance warning board for permanent level crossing. Rail posts cast into ground and painted white and black, Red letters on a white background, train symbol painted black colour on a white background. Refer to drawings for details. Cost includes painting. **All items include costs for supply of material, transport, loading and offloading, stacking and handling, drilling, welding, fabrication and any necessary refurbishing**

8502 "Level Crossing Marking Board" signs for TEMPORARY level Crossings

- a. Two "Level Crossing Marking Board" Signs for Temporary road diversion level crossing. Refer to Drawings. The level crossing marking board of steel plate 3mm thick and two posts of 50ld/yard rail. Refer to drawings for details. Cost includes painting. **All items include costs for supply of material, transport, loading and offloading, stacking and handling, drilling, welding, fabrication and any necessary refurbishing**

8503: "Whistle Board" Signs.

Whistle board location.

The sitting of the whistle board shall be a minimum of 201.1m from centerline of the carriageway and 3.048 m from the centerline of the railway track on both approaches to the level crossing. The position depends on speed, gradient and curvature on the railway and road and also any topographical features that may tend to prevent a road user hearing the

whistle of a locomotive. Refer to EAR&H Engineering Manual Annexure 6 for details on location of whistle boards for level crossings near or in a station

The whistle board sign shall be a height of 3m, as shown on the drawing. It's fixed in grade 20 concrete square depth of 700mm into the ground. The pit shall be 450 mm x450 mm x700mm. The board is painted white and black, and the rail post painted black& yellow. Refer to EAR&H Engineering manual, Annexure 6 for paint details. All items include costs for supply of material, transport, loading and offloading, stacking and handling, drilling, welding, fabrication and any necessary refurbishing