

Tender
FOR
RENOVATION OF MOROGORO ZONAL IRRIGATION OFFICE
BUILDING

BIDDING DOCUMENTS
VOLUME 2

Technical Specifications

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Building and Site Works

Specifications are provided in the Divisions contained herein.

DIVISION 1: GENERAL REQUIREMENTS

1. Programme

Before commencing the Works the Contractor shall submit to the Project Manager for his approval a programme showing the order in which the Contractor proposes to carry out the Works. The Contractor shall revise this programme as necessary to ensure completion of the Works within the time periods stated in the Contract. The programme shall include the following details:

- (i) A statement giving the numbers and categories of supervisory and technical staff and skilled and unskilled labour to be employed on the Works;
- (ii) A list and type details of major Constructional Plant (including vehicles) which the Contractor proposes to employ on the Works;
- (iii) Details of the Contractor's methods of working for all operations;
- (iv) A statement giving the proposals for location or locations and sizes of base camps, accommodation, offices, workshops and stores;
- (v) Details of the programme for the Works from the Start Date, including a complete resource allocation showing the number of units and allotted times for each unit of Constructional Plant, materials and labour allocated to each part of the Works.

The Contractor shall prepare and submit such method statements for approval by the Project Manager prior to starting any new activity or section of the Works, or at such other time that the Project Manager may reasonably require.

In his programme the Contractor shall take into account the irrigation and vegetation seasons and agricultural operations by the farmers. The Contractor's rates shall be deemed to include interruptions to works by such irrigation and vegetation seasons and agricultural operations.

2. Site

Except where otherwise shown on the Drawings or specified herein, the Site shall mean the extent of such public and private lands as is, in the opinion of the Project Manager, necessary or practicable for the execution of the Works. The boundaries of the site will be indicated at the time the Contractor takes possession of the Site, and subsequently, as may be necessary. The Contractor shall not use the Site for any purpose not required by the Contract.

The Contractor shall where ordered provide photographs of and make a record to the approval of the Project Manager of the condition and levels of the

surfaces of the Site immediately before entering on them for the purpose of executing the Works.

The Contractor shall maintain the Site in a neat, tidy and healthy condition.

3. Site Compound and Working Area

The Contractor shall submit his proposals for the erection of his temporary.

All temporary fencing, offices, temporary services and temporary roads and ramps shall be removed and the Site shall be left clear at the end of the Contract unless otherwise ordered by the Project Manager.

4. Notice of Operations

The Contractor shall give full and complete written notice of all important operations to the Project Manager sufficiently in advance to enable the Project Manager to make such arrangements as the Project Manager may consider necessary for inspection and for any other purpose. The Contractor shall not start any important operation without the written approval of the Project Manager.

5. Working Hours

No restriction will be placed by the Employer on the hours worked by the Contractor, which must comply with local labour laws. It will be the responsibility of the Contractor to ensure that any work carried out during unsocial hours does not cause a nuisance in respect of noise.

The Contractor shall bear all costs in respect of overtime shift and night-work allowances.

6. Water Supply

The Contractor shall make its own arrangements for the supply of water for the purposes of the Contract. The quality of the water shall be to the approval of the Project Manager and suitable for the purpose for which it is intended.

Waste water shall be disposed of clear of the Site to the satisfaction of the Project Manager so as to cause no damage or complaint.

7. Latrines

The Contractor shall provide throughout the period of construction of the Works and shall maintain and cleanse suitable and sufficient latrines for use by its employees. The Contractor shall ensure that its employees do not foul the Site but make proper use of the latrines.

8. Contractor's Power Supply

The Contractor shall make its own arrangements for the supply of electric power for the purposes of the Contract.

9. Disruption of Local Communities and Maintenance of Existing service

The Contractor shall take all measures necessary to avoid nuisance and disruption to local communities. In particular the Contractor shall ensure no damage is done to existing services, pasture or outside the area for which the Project Manager's approval for bush clearance has been given, that all activities to such areas are maintained and that the Contractor shall plan with Zonal Irrigation Engineer on the operations of the ZIO office activity during the rehabilitation works.

Before commencing any work which could cause interruption to the existing operation the Contractor shall submit full details of his proposed methods of maintaining such operation.

10. Suppliers of Materials

Before ordering a material of any description intended for the Permanent Works, the Contractor shall submit for the approval of the Project Manager the name of the maker or supplier proposed and details of the place of origin and specification of the material. If requested by the Project Manager, the Contractor shall supply to the Project Manager for his retention a copy of any such order placed.

11. Natural Materials

The Contractor shall make all arrangements for locating, selecting and processing natural materials to comply with the Specifications and shall submit to the Project Manager for approval full information regarding the proposed location well in advance of commencement of working of the material. Approval of a source does not imply that all material in that source is approved.

Building sand and aggregates shall be sourced from known borrow pits and quarries run or operated by those having mining licenses issued by the Ministry of Energy and Minerals.

12. Materials Generally

All materials used in the works shall be new and of approved quality and kind and in full compliance with these specifications. Materials shall be delivered sufficiently in advance to enable samples to be taken and tested if required. Materials shall not be used until approved and any material which is not approved or which is damaged, contaminated or has deteriorated in any way or does not comply in any way with the requirements of these specification, shall be rejected and shall be immediately removed from the site at the Contractor's expense.

13. Materials for which there is a Tanzania Bureau of Standards specification

All materials used in the works for which a Tanzanian Bureau of Standards Specification has been published shall fully conform to the latest edition. The Project Manager reserves the right to demand that the Contractor shall obtain at his own expense a certificate in respect of any material to state that it is in accordance with the specifications of Tanzanian Bureau of Standards.

14. Materials for which there is no Tanzanian Bureau of Standards Specification

All materials used in the works for which Tanzanian Bureau of Standards Specification has not been published shall conform to the relevant British Standard Specification for such materials. If there are no published standards as specified for any materials, the quality of such material shall be generally of a standard equal to those for which there is a Tanzanian Bureau of Standards or British Standard Specification.

15. Alternatives to proprietary brands

Where materials are specified by their proprietary names or where fittings are specified by catalogue numbers or descriptions, the Contractor may offer materials or fittings of alternative manufacturer which are of equal quality. Such alternatives must be approved before being used in the works and the Contractor shall allow for this, but prior to tendering he may submit to the Project Manager for approval of the names of any suppliers or manufacturers whose products he intends to use, together with catalogue numbers and descriptions and/or samples but the decision of the Project Manager will be final.

16. Samples

The Contractor shall furnish certificates of compliance in respect of all samples of materials and workmanship as instructed by the Project Manager. The Project Manager shall check and verify samples for conformance with the design concept of the works and for compliance with the Contract Documents. The work shall be in accordance with approved samples

- a. All material samples shall be delivered to the Project Manager's Office. All charges in connection with the samples shall be at the Contractor's expense.
- b. Samples for Project Manager's approval shall be provided in duplicate, one to be kept at office and one at the site.
- c. Samples shall be furnished well in advance, to enable the Project Manager sufficient time to check and verify compliance with specifications.
- d. Each sample shall be identified properly by name and quality of the material, manufacturer's name, the date of submission and the specification with which the sample complies.

17. Measuring and Testing Equipment

The Contractor shall provide the following equipment for carrying out measuring and control tests on the site and maintain in full working order:

- a. Straight edges for testing the accuracy of the finished concrete
- b. Calibrated cylinder of glass for testing of sand
- c. Slump test Cone
- d. 150mm steel cube moulds with base plates and tamping rod to BS 1881
- e. Steel tapes
- f. On Quick-setting level, staff and ranging rods
- g. Digital Vernier calliper

DIVISION 2: DEMOLITION AND MODIFICATIONS

PART 2 GENERAL

1. SCOPE OF WORK

- A. Furnish all labor, materials, tools and incidentals required and demolish, modify, remove and dispose of work shown on the Drawings and as specified herein.
- B. Included, but not limited to, are demolition, modifications and removal of existing materials or work necessary to fix new work as shown on the Drawings and as specified herein and to connect with existing work in approved manner.
- C. Demolition, modifications and removals which may be specified under other Sections shall conform to requirements of this Section.
- D. Demolition and modifications include, but are not limited to, and not specifically in the following order:
 - 1. Remove the existing floor screed (cement render floor) and cut away debris dispose off site.
 - 2. Open existing block walls partitions, cut away debris and dispose off site.
 - 3. Scrape all flecked off paint and prepare surface to receive new paint internally.
 - 4. Remove all damaged chip boards.
 - 5. Carefully remove glass paneled windows including frames and set aside as directed, overall size 1800 x 1200 mm.
 - 6. Carefully remove the single timber panel doors including frames and set aside as directed.
 - 7. Carefully remove double timber panel doors including frames and set aside as directed.

2. SUBMITTALS

- A. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted working conditions of the staff using the office.
- C. Before commencing demolition work, all modifications necessary to bypass the affected structure shall be completed. Actual work shall not begin until

the Project Manager has inspected and approved the modifications and authorized commencement of the demolition work in writing.

3. JOB CONDITIONS

A. Protection

1. Execute the demolition and removal work to prevent damage or injury to structures intended to remain.
2. The placement or storage of demolished materials shall not interfere with operations.

B. Scheduling

1. Carry out operations so as to avoid interference with operations and work in the existing facilities.

C. Notification

1. At least 48 hours prior to commencement of a demolition or removal, notify the Project Manager in writing of proposed schedule therefore. Owner shall inspect the existing materials and to identify and mark those items which are to remain the property of the Owner. No removals shall be started without the permission of the Engineer.

D. Conditions of Structures

1. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.
2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within a structure may occur prior to the start of demolition work.

E. Repairs to Damage

1. Promptly repair damage caused to adjacent facilities by demolition operation when directed by Engineer and at no additional cost to the Owner. Repairs shall be made to a condition at least equal to that which existed prior to construction.

4. DISPOSAL OF MATERIAL

- A. Salvageable material shall become the property of the Owner. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area within 10 kilometres of the site.

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- B. The following materials and items of equipment shall remain the property of the Owner and stored within 10 kilometres of the site. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the payment to the Contractor.
1. All components of the roof (corrugated iron sheets.)
 2. Window frames shutters, door frames and shutters.
 3. Chip boards
- C. All other unwanted materials shall become the Contractor's property and must be removed from the site and disposed of at an approved site in accordance with local and national regulatory requirements.
- D. The storage or sale of removed items on the site will not be allowed.
5. CLEAN-UP
- A. Remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and premises shall be left, clean, neat and orderly.

DIVISION 3: WALLING

MATERIALS

1. Cement

The cement shall be normal or rapid hardening Portland cement complying in all respects with the requirements of B.S. 12.

Where Sulphate Resisting Cement specified shall comply with B.S. 4027. The choice of the use of normal or rapid hardening cement shall not be used unless where expressly allowed, but in each and every case the mix shall be designed for the appropriate cement. Cement may be delivered to the site either in sealed bags or loose in approved containers. In both cases the Manufacturer's Certificate of test showing compliance with the requirements of the relevant standard shall accompany each load of cement. These certificates shall be kept permanently on the site for inspection when requested.

Cement delivered in bags shall be stored on an elevated platform in not more than 10 bags high and adequately protected from the weather and in such

manner that the cement shall be stored and used in the same order as delivered on the site. Loose cement shall be stored in approved fixed or portable silos provided with suitable and approved equipment for the accurate weighing of the cement drawn for each concrete mix.

Damp or partially set cement or cement containing lumps, or which has deteriorated in any way shall not be used in the works.

2. Lime

The lime for making mortar shall be obtained from an approved source and shall comply with B.S. 890 Class A for non-hydraulic lime. The lime to be run to putty in an approved lined pit or container. The water to be first run into the pit or container and the lime to be added until it is completely submerged, stirred vigorously until all lumps are disintegrated and shall be kept constantly covered with water and regularly stirred for at least four weeks. The resulting milk-lime then to be run through a fine sieve and run into a pit or other container and kept clean and moist for not less than two weeks before being used in the works.

3 Sand

Sand used for making mortar shall be clean well graded siliceous sand of good sharp hard quality equal to samples which shall be deposited with and approved by the Engineer. It shall be free from lumps of stone, earth, loam, dust, salt, organic matter and other deleterious substances, passed through a fine sieve and washed with clean water if so directed by the Engineer.

4. Water

Water used for mixing the concrete shall be fresh, clean water, suitable for drinking purposes. On no account shall the water contain impurities in any appreciable extent which would impair the quality of the concrete.

5. Concrete blocks

Concrete blocks shall comply with the requirements of B.S.2028, 1364 except where amended or extended by the following clause. Blocks shall have square arrises and corners. For fairfaced work damage to arrises and corners shall not exceed the removal of 6 mm of the blocks depth or thickness.

Concrete blocks shall have a minimum crushing strength of 3.5 N/mm² except when below the damp course level or in contact with soil when they shall have a minimum crushing strength of 7N/mm², unless noted otherwise on drawings. Hollow concrete blocks shall not be used below the damp course level or in contact with soil.

Concrete blocks used for external walls shall be Class 'A' and for internal load bearing walls they shall be at least Class 'B'. Class 'C' blocks shall only be used for non-load bearing partitions.

No precast blocks shall be incorporated into the works unless approved by the Engineer. The delivery of precast blocks from which samples tested do not comply with this specification shall be deemed defective. Any work constructed with blocks from which samples tested do not comply with this specification shall be deemed to be defective.

From every 1,000 precast concrete blocks delivered to site ten blocks as samples shall be provided for testing. The precast block samples shall be selected in accordance with B.S.2028, 1364. Samples of precast concrete blocks for testing shall be tested for the following properties in accordance with the methods given in B.S. 2028, 1364 and the test results shall comply with the requirements of B.S. 2018, 1364 except where amended by this specification:

- a. Drying shrinkage;
- b. Compressive strength or transverse breaking load (as applicable);
- c. Wetting expansion; *
- d. Density;
- e. Dimensional Tolerance;
- f. Cavity size.

**Test only applicable for concrete blocks made with clinker aggregate.*

Blocks shall also be tested to determine the suction rate. The test shall consist of weighing the block, placing in a tray of water such that only 3mm of the block side is immersed for a period of 1 minute +/- 2 secs; quickly wiping off excess water and reweighing. The suction rate shall not exceed $2\text{kg/m}^2/\text{min}$. Blocks which exceed $2\text{kg/m}^2/\text{min}$ may be used if the contractor uses an approved water reactive additive in the mortar or can show that the blocks are wetted such that the blocks will have a suction rate not exceeding $2\text{kg/m}^2/\text{min}$ for a period of 1 day from being laid and provided the blocks comply with all other requirements.

Concrete blocks shall be stacked on prepared dry areas free of clinker, ashes and sulphate bearing strata.

Blocks of different strengths shall be stacked separately and clearly marked to differentiate the strengths.

Blocks shall not be used for a minimum of 7 days after manufacture and shall not be loaded for at least 14 days after laying. For the first 7 days after manufacture, blocks shall be cured by maintaining in a damp condition, e.g. covering with polythene sheeting after wetting blocks.

6. Damp-proof courses

The bituminous felt sheeting for damp-proof courses shall be hessian based bituminous felt complying with B.S.743 type 4A weighing not less than 3.85 Kgs. per square metre. The sheeting is to be lapped 150 mm at running joints and the full width of walls at angles.

WORKMANSHIP**7. Cement mortar**

Mortar described as cement mortar 1:4 shall be composed of 1 cubic metre (1498 Kgs.) of Portland cement and 4 cubic metres of sand. Other mixes such as 1:3, 1:5 etc shall be similarly construed.

8. Mixing of mortar

The constituent materials shall be measured separately when dry in specially prepared gauge boxes to give the proportions specified without consolidation of the contents by ramming and shaking. The mortar shall be mixed in an approved power driven mixer for not less than two minutes per batch and using the minimum quantity of water necessary to obtain a working consistency. The mixer shall be used as close as practicable to the works and mortar shall be used within 30 minutes of mixing. No partially or wholly set mortar will be allowed to be used or re-mixed.

9. General construction**(a) Setting out**

The Contractor shall provide proper setting out rods and set out all work on some for course, openings, heights, etc and shall build the walls, piers, etc to the widths, depths and heights indicated on the Drawings and as directed by the Engineer.

(b) Building in wood frames

Openings for doors, ventilators, etc are to be set out and left unbuilt until the wooden frames have been fixed in position.

(c) Building in metal windows and doors

Openings for metal frames are to be wide enough for the frames to fit without being forced into position. Build the lugs into the joints of the walling and fill in the space between the walling and frame with cement mortar well tamped into the channel of the frames and point all round externally.

All frames must be set plumb and level and free from twist.

(d) Walls to Receive Plaster and Similar Finishes

All faces of walls to be plastered etc, to have all projections dressed off and joints raked out as key.

10. Building walling**(a) Laying and Jointing**

All blocks shall be well wetted before being laid and the top of walling where left off shall be well wetted before commencing building. Walls to be kept wet three days after building.

All walls throughout the works shall be carried up evenly in 200 mm courses except where courses of less depth are required to bring walling up to level of floors, windows and the like and where otherwise described, no part being allowed to be carried up more than one metre higher at one time than any other part and in such cases the joining shall be made in long steps so as to prevent cracks arising and all walls shall be levelled round at each stage. Not more than 3 metre height of wall shall be laid in any one day.

Blocks shall be bedded and jointed in cement mortar as described with beds and joints 10 mm thick, all flushed up and grouted solid as the work proceeds.

(b) Bonding

The blocks shall be properly bonded together and in such manner that no vertical joint in any one course shall be within 115 mm of a similar joint in the courses immediately above or below. All walling of 300 mm thickness or less shall be built in single thickness of blocks. Walling exceeding 300 mm in thickness shall be built with through bonders not more than 1070 mm apart in each course as directed by the Engineer.

Alternate courses of walling at all angles and intersections shall be carried through the full thickness of the adjoining wall. All perpend, reveals and other angles of the walling shall be built strictly true and square.

(c) Tolerances

All courses of walls shall be level with a maximum deviation of +/- 3 mm in any one metre length and a maximum overall deviation of 10 mm for lengths of wall exceeding 3 metres. Walls shall be plumb with a maximum deviation of +/- 3 mm in any metre height of wall with a maximum deviation of +/- 10 mm in the total height of the wall or any storey.

All corners of walls which are shown as being at right angles shall be square with a maximum deviation of 3 in 1000. All walls shall be straight with a maximum deviation of +/- 3 mm in any one metre length and a maximum overall deviation of 10 mm in any length exceeding 3 metres.

All bed and vertical joints shall be an average of 10 mm thick with a maximum deviation of +/- 3 mm of blockwork, and stone rubble walls. Joints for stone masonry walls shall be 6 mm +/- 1 mm thick.

(d) Curing

All walls shall be maintained in a damp condition for at least 24 hours after laying. Walls under construction shall be dampened by applying water with a brush and no hosing directly on to the wall shall be permitted. When work ceases on any section of the wall polythene or hessian shall be draped over the wall, for at least 24 hours. If hessian is used, it shall be maintained continuously wet.

11. Fair face

All concrete and hollow clay block work described as finished with a fair face is to be built to a true and even face with the joints finished as specified hereinafter.

12. Holes, cutting and chasing

- a. All putlog holes shall be not less than one course deep and carefully filled with a block cut to fit size of opening with beds and joints filled with mortar well tamped in after scaffolding is removed, and if in faced walls to match facing.
- b. Where walling is cut, holed or chased for conduits, pipes and the like all such cuttings etc shall be filled in solid with cement mortar (1:4) prior to the application of finishes.

DIVISION 4: ROOFING

1. IT5 Profiled steel roof sheeting (Resin cot pre painted or galvanised finish)

IT5 mild steel profiled steel sheeting shall be as manufactured by Aluminium Africa Tanzania Limited or other equal and approved and of the thickness and finish specified. Sheets shall be free from twist or buckle. Resin cot and galvanising finish must be clean, free from surface defects, and firmly bounded to the steel. Ridges, valleys, flashings and the like, of the same profile and quality as the roofing sheets, shall be provided.

Mild steel ridges and valleys with appropriate matching finish shall be of profile to suit the specified construction, and not less than 250 mm wide.

Fixings must be of a size and pattern to suit the roof members and the sheets being fixed, and must be approved by the sheet manufacturer. Bolts, screws and nails must be supplied complete with plastic washers. All fixing bolts and screws must be fitted with approved plastic washers suitable for the profile of the sheeting in use. Steel hook bolts and nuts shall comply with B.S. 1494, cadmium or zinc plated and steel roofing screws shall comply with B.S. 1494, galvanised and gimlet pointed.

Roofing sheets and accessories shall be fixed in accordance with the manufacturer's recommendations to make the whole sound and watertight.

Sheeting shall be laid with end laps of not less than 150 mm and one and half corrugation side laps. Sheets shall be laid with open joint of side lap to face away from the prevailing wind.

Eaves and end laps shall be fixed with two fixings per sheet width. Fixing at intermediate supports, where no lap occurs, shall be with one fixing per sheet width.

Wall cladding shall conform to the specification for roofing.

2. Protection

The contractor is to take all necessary precautions to protect the finished work and must ensure that no damage occurs to the roofing until completion of the works.

3. Completion of the works

On completion of the works, the contractor shall clear away, ensure that rainwater outlets are clear and generally leave the roof areas in a clean and watertight condition to the satisfaction of the Engineer.

DIVISION 5: CARPENTRY & JOINERY

1. Generally

All woodwork shall be carried out in accordance with the drawings and the principles of first class joinery construction. Unless specifically stated otherwise, sizes shown on drawings are finished sizes and the Contractor must allow for wrot faces.

MATERIALS

2. Qualities of timber

- a. The qualities of timber stated hereinafter are in accordance with the latest Tanzanian Government Grading Rules.
- b. All timber described as Prime Grade is to be First Grade (Grade I).
- c. All timber described as selected Grade is to be Second Grade (Grade II).
- d. All hardwood is to be Prime Grade (Grade I).
- e. All timber for permanent work in the building shall before use be approved by the Engineer for quality in accordance with the foregoing specification for its respective grade. Any timber not so approved by the Engineer shall be removed from the site forthwith.

3. Insect damage

All timber, whether graded or ungraded, and including shuttering, scaffolding and the like shall be free of live borer beetle or other insect attack when brought upon the site. The Contractor shall be responsible up to the end of the maintenance period for executing at his own cost all work necessary to eradicate insect attack of timber which becomes evident including the replacement of timbers attacked, or suspected of being attacked, notwithstanding that the timber concerned may have been inspected and passed as fit for use.

4. Seasoning of timber

All carpentry timbers are to be seasoned to an average moisture content of not more than 20%. All joinery timbers are to be seasoned to an average moisture content of not more than 15%. The Contractor is to make available on site a meter for testing moisture content of all timber delivered.

5. Preparation and protection of timber

- a. All timber necessary for the works is to be purchased immediately the contract is signed and when delivered is to be open stacked for such further seasoning as may be necessary. Preparation of the timber is to

be commenced simultaneously with the commencement of the works generally.

- b. All timber and assembled woodwork is to be protected from the weather and stored in such a way as to prevent attack by decay, fungi, termites or other insects.

6. Species of timber

Only those timbers specified are to be used for the works, unless alternatives are authorised by the Engineer in writing.

7. Pressure impregnated timber

- a. All timber described as "pressure impregnated" shall be impregnated under vacuum and pressure with "Celcure" or "Tanalith" wood preservative with an average absorption of not less than 6.7 Kgs. of dry salt per cubic metre. In case of resistant species where this retention cannot be obtained the timber shall be treated to refusal point. All treated timber shall not be exposed to wet conditions for least 14 days after treatment has been carried out. All cut ends, drilling or fabrications on the site producing new surfaces shall be thoroughly brushed or soaked with "Celcure B" salts applied in accordance with the manufacturer's instructions.
- b. Any other method of timber impregnation will only be allowed at the Engineer's approval.

8. Hardwood

All hardwood will comply with the requirements of B.S.1186 Part 1 and B.S. 4047. It shall show a straight and regular grain throughout.

Hardwood shall be free from woolly texture, soft heart, sap wood, splits, shakes, all evidence of insect or fungi attack and rot and all faults caused by compression failure. There shall be no waney edges. Hardwood shall be free from knots on exposed faces. Any hardwood showing visible imperfections will be rejected.

Preservatives shall not be used without the Engineer's permission. Where indicated on the drawings, internal hardwoods will be treated with clear sealants as specified elsewhere.

9. Softwood

Softwood timber for caucusing work shall be either Podocarpus or Cypress to the approval of the Engineer and shall be to the dimensions specified on the drawings.

Timber shall be classified in accordance with the Groups listed in the Clause.

All softwood shall comply with the requirements of B.S. 1186 Part 1. Timber shall be free from woolly texture, soft heart, sap wood, splits, shakes, pith showing on the surface, sloping grain exceeding one in eight checks, knots exceeding 25 mm diameter, loose knot or knot holes and any evidence of insect or fungi attack. There shall be no waney edges.

Where indicated on the drawings, the softwood will be treated with clear sealer or painted with gloss paint.

All softwood is to be pressure impregnated against insect attack before delivery to site. Any ends cut after treatment shall be given two liberal coats of preservative.

10. Gypsum board

Gypsum board shall be in accordance with ISO 9002 or to comply with BS 1230 Part 1 1985 specifications.

11. Timber doors

Doors are to be designed, manufactured and fixed in accordance with the relevant British Standards summarised below:

B.S. 476 part 8 1972	Fire tests etc.
B.S. 4787 part 1 1972	Door dimensions etc.
B.S. 1186 part 1 1971	Quality of timber and workmanship
B.S. 1227 part 1 A	Hinges
B.S. 3827	Builder's hardware - glossary

12. Hardwood veneers

- a. Veneer facings shall be selected to the approval of the Engineer.
- b. No glass or synthetic fibre stitching will be permitted for jointing veneer leaves together.
- c. Veneers shall be free from splits, dote, glue, stains, insect or fungi attack and rot.
- d. Filling or inlaying of any kind will not be accepted.
- c. All wood veneers shall be bonded to the core material in such a way that no lifting and blistering shall occur.

13. Miscellaneous material

- a. Tapered timber pellets for filling screw holes must be cut across the grain and shall be of the colour and grain being plugged.
- b. Metal fixing devices must be fully rust-proofed. Cramps, brackets, plugs, bolts, etc must be of a type, make and pattern approved by the Engineer.

- c. Adhesives must be suitable for use in the local conditions and be compatible with the materials with which they are in contact.

14. Nails and screws

Nails shall comply with B.S. 1201, screws shall comply with B.S. 1494 and bolts shall comply with B.S. 916.

WORKMANSHIP

15. Softwood

Fixing shall be by means of non-rusting screws with countersunk heads to proprietary plugs or grounds. Nailing will not be permitted.

Sections shall be neatly and accurately cut so as to avoid splitting of the wood.

16. Hardwoods

Hardwoods are as described.

In jointed panels each piece shall be of the same species. Joinery for oiling shall have all surfaces of the same species and same character or grain.

Fixing shall be by means of brass screws with countersunk heads to proprietary plugs or grounds. Where work is face screwed, heads of screws shall finish not less than 6 mm below the surface and be covered with round teak pellets of appropriate thickness. Pellets shall be chosen and fixed so as to match colour and pattern of grain so far as is practical. Nailing will not be permitted. Sections shall be neatly and accurately cut with fine toothed saws.

17. Fixing doors and frames

Doors shall be properly fitted to give a uniform clearance of not more than 3 mm all round and hinges shall be let into doors.

Door frames shall be properly framed at angles. Door stops shall be housed into grooves in frames. Architraves shall be provided to conceal finishes. Frames shall be fixed to grounds or plugs. Fixing shall be by means of non-rusting screws with countersunk heads. For hardwood frames screw heads shall be finished not less than 6 mm below surface of the wood and shall be covered with matching round hardwood pellets of appropriate thickness. Pellets shall be chosen and fixed so as to match colour and pattern of grain so far as is practical. Nailing will not be permitted.

Except where indicated doors shall be kept clean for clear polyurethane varnish.

Door frames shall be treated to match doors.

Glazing shall be wired glass 6 mm thick with edges wrapped in washleather and secured with hardwood glazing beads size 10 mm x 15 mm mitred at angles secured with brass screws and cups.

18. Fittings and fixtures

The fittings, etc are to be accurately constructed in accordance with the detailed drawings. The doors, drawers, etc are all to fit and open and close smoothly and all work next to walls, floors and ceilings is to be soundly fixed and scribed to fit snugly against same.

19. Scribing

Skirtings, architraves, plates and other joinery works shall be accurately scribed to fit the contour of any irregular surface against which they will be required to form a close butt connection.

20. Finish

All joinery which is to be oiled or painted shall be finished smooth and cleaned by rubbing down by hand with fine glass paper.

21. Completion of works

Protection of all joinery and ironmongery must be maintained until completion of the contract as a whole.

All joinery and glass is to be thoroughly cleaned before the building is handed over.

22. Defective work

All work judged to be defective must be removed and replaced as directed by the Engineer.

IRONMONGERY

23. Generally

- a. Ironmongery shall be fixed with suitable screws to match and prices shall include for this.
- b. All locks and ironmongery shall be fixed before the woodwork is painted, handles shall be removed before the painting commences, carefully stored and re-fixed after completion of painting.
- c. All locks, springs and other items of ironmongery with moveable parts shall be properly tested, cleaned and adjusted where necessary to ensure proper working order at the completion of the works and left in perfect working order by the Contractor.

- d. The keys of all locks shall have labels attached with door references marked on before handing to the Engineer.
- e. All locks shall be provided with a master key system and prices shall include for this as required by the Client and as instructed by the Engineer. The client's requirements are to be obtained by the Contractor before ordering.

DIVISION 6: METALWORK

1. Aluminium windows

Aluminium windows are to be designed, manufactured and fixed in accordance with the relevant British Standards summarised below:-

B.S. DD4	:	Grading of Windows
B.S. 1470	:	Wrought aluminium and aluminium alloys
B.S. 1474	:	Wrought aluminium and aluminium alloys
B.S. 4315	:	(part 1) window and structural gasket-glazing systems
B.S. 4842	:	Finishes to aluminium
B.S. 4873	:	Aluminium alloy windows
C.P. 3CH.V	:	Loading
C.P. 153	:	Code for windows and roof lights.

Alternative standards may be adhered to but the Contractor must demonstrate that they are of an equal or better standard than the standards referred to in this specification.

Members for aluminium windows shall be extruded aluminium and shall be fabricated from designated treated alloy HE9 TF, HE9 TE or HE9 TB to B.S. 1474. Ancillary members such as sills and coupling mullions formed from sheet materials shall be fabricated from designated alloys SIC NS3 or NS4 in an appropriate temper. Alternative alloys meeting the required physical properties of this specification shall be acceptable.

The main web of aluminium solid section outer frame shall be not less than 1.2 mm thick at minimum tolerance.

For information on bi-metallic contacts see C.P.153 appendix A.

The overall sizes of an assembled window frame shall be maintained within a permissible deviation of 1.5 mm. Maximum differences in length of frame diagonals shall be 4 mm. Horizontally the 1800 mm grid shall be used to centre the mullions and vertically allowance must be made for a large setting tolerance at the window head.

Fasteners to be designed so they cannot be released from the outside by the insertion of a thin blade or similar tool.

No opening light shall be open able or removable from the outside when it is fastened in the closed position except by use of special tools or break of part of the window.

The exposure factor shall be considered as moderate. Consideration should be given to both the height of the building and locations where exposure to solar radiation may result in high thermal stress.

Prevention of penetration of fine air-borne dust is essential, and of the utmost importance.

Finish to surface of aluminium alloy prior to anodising shall be a '*Mechanical Satin*' finish.

Where windows are described as "Black Anodised" then the final finish shall be black anodic oxidation coating to grade AA25 (or above) of B.S. 1615.

Weather stripping and joint sealing materials shall be compatible with their adjacent materials and shall remain stable and not adversely affect the proper functioning of the window.

Replacement of weather stripping shall be possible from within the building and without requiring removal of the main frame.

WORKMANSHIP

2. Fixing Aluminium windows

Adjacent sashes in horizontal sliding windows shall be separated by a compatible spacer and the sashes shall be supported on bearing devices that facilitate movement.

Joints in frames shall be made either by welding or by mechanical means. Where necessary joints shall be sealed with flexible material. Joints to be flush joints within one of the tolerances given in B.S. 1474.

Hardware including its fixings shall be compatible with aluminium and shall be replaceable without removing the outer frame from its surround.

All screws, nuts, bolts, rivets, washers and other fastenings shall be of stainless steel or aluminium with the exception of those which are protected when the window is closed. Alternatively these may be made of steel which has been finished by one of the following methods:-

- a. Zinc plated and passivated according to B.S. 1706 Classification Nr.Zn3.
- b. Hot - dip galvanized according to the requirements of B.S. 729.
- c. Sherardized according to the requirements of B.S. 729 Part 2 or,
- d. Sprayed with metal coating according to B.S. 2569 Part 1.

Fixing devices not of aluminium may be made of steel finished by either method (a), (b) or (d) above.

The fixings shall be capable of withstanding the design wind load and any operating forces on the window.

Windows manufactured to standards set out in this specification shall each bear the name or trademark of the manufacturer and the number of the appropriate standard..

Fixing, assembling, bedding frames and painting shall be executed as described for 'Fixing of Steel Windows'.

DIVISION 7: PLUMBING INSTALLATION

GENERAL

1. Cisterns

Ceramic cisterns shall be complete with cover, over flow pipe, ball tap or float operated valve. Floats shall comply with the requirements of B.S. 1968 Class 'C' or B.S. 2456.

2. Waste fitment traps

Where standard or deep seal traps are specified they shall be of non-ferrous material in accordance with B.S. 1184 or P.V.C.

WORKMANSHIP

3. Setting valves

Care must be taken to prevent damage to all valves, fire hydrants and the like, and their ancillary equipment. Valves etc., and ancillary apparatus shall be stored in clean conditions and in a manner that excludes all water. Where directed, head-stocks, motors, gearing or indicators shall be removed, adequately labelled for identification, stored carefully in weather-proof premises and be reconnected after erection of the valves. Frost cocks shall be kept clean and free from obstruction. Electrical equipment shall be protected from damp and the damp-proofing seals shall remain intact until the electrician is ready to connect up the equipment.

The gunmetal faces and seats of all valves must be kept clean. No valve shall be closed without first wiping the faces with a clean cloth. The cavity beneath the valve door shall be thoroughly cleaned by hand. In the event of accident, fouling matter shall be either dissolved or carefully removed by methods that do not involve scraping of gunmetal faces.

All valves shall be set so that operating spindles are truly vertical unless otherwise detailed or directed.

Every stuffing box shall be examined when the main is charged with water and leaking boxes shall be adjusted or repacked with square plaited lubricated hemp packing of approved manufacture. The stuffing box shall not be so tightly packed as to materially affect the friction of the packing on the spindle.

No air valve shall be stored before erection in the open in sunlight, or upside down to expose the balls and air cavities. Air valves shall be checked before the main is charged to ensure that the balls and faces are not scored or split and that there is no dirt or other deleterious materials in the cavities of the body. All air nozzles shall be probed to see that they are clean.

Fire hydrants, frost plugs and similar fittings shall be checked before being incorporated in the line and before the main is charged to ensure that all passageways are clean.

The installation of special types of valve and metering equipment must be strictly in accordance with the manufacturer's instructions.

The direction of opening of the valve shall be indicated on the headstock and on the underside of hydrant covers.

DIVISION 8: ELECTRICAL INSTALLATION

GENERAL

1. Approved electrical Proposal and Sub-contracting

The Contractor shall prepare a detailed proposal for the electrical installation from the Engineers drawings and schedules.

2. Authoritative standards and codes of practice

The following authoritative standards are referred to hereinafter:

- a. Government Electrical Specification No. 1 (G.E.S. No. 1)
- b. Government Electrical Specification No. 2 (G.E.S. No. 2)
- c. Electrical Power Act and the Rules made there under;
- d. The current edition of the Regulations for the Electrical Equipment of Buildings issued by the Institution of Electrical Engineers of Great Britain with any Tanzanian amendments.
- e. Tanzanian Electricity Board Byelaws.

3. Record drawings

The Contractor shall mark accurately on one set of drawings the conduit laid during the progress of the work. This information shall be available on site for inspection by the Engineer.

On completion of the contract, the Contractor shall supply the Engineer with one set of drawings print and a flash disk showing the complete installation. The drawings shall include the location of all apparatus, conduits and cable routes and a Schematic diagram of the main switchboard and distribution system indicating the phasing.

4. Working drawings

The Contractor shall prepare working drawings to show his proposals for carrying out the works. The drawings shall be submitted to the Engineer for approval prior to execution of the works.

The working drawings shall be generally as below but not restricted to those listed.

- a. Layout drawing of concealed and surface conduits, ducts, trunking, etc.

A copy of all working drawings shall be submitted to the Engineer for approval. After receiving approval the Contractor shall submit six copies of the approved drawings for distribution to all relevant parties.

Approval of working drawings shall not relieve the Contractor of any of his obligations under the contract or from correcting errors subsequently discovered.

MATERIALS & EQUIPMENT

5. Regulations

All apparatus and materials shall comply with the requirements of the Regulations for Electrical Equipment of Buildings.

All manufactured items shall comply with the relevant British Standard Specification or Code of Practice.

6. Wiring

The wiring shall be carried out in P V C insulated cables in P V C conduit throughout, but galvanized steel trunking may be offered for multiple cable runs.

7. Main switchboard

The wiring is connected to the existing main switchboard comprising circuit breakers and metering cubicles.

8. Non-metallic conduit

All non-metallic conduit shall be class 'A' heavy gauge, high impact; P.V.C. complying to B.S. 4606 part 2, type N1. The minimum size to be used on the contract is 20 mm external diameter. All conduit installation shall be concealed in the walls or on the surface.

Conduit will be joined and terminated utilizing the appropriate rigid P V C compounds as detailed below or standard conduit entry electrical equipment. Jointing will conform to one of the following techniques:

No 1 - Permanent Adhesives - the solvent cement supplied by the conduit manufacturers will be used to produce a rigid sealed connecting.

No 2 - Flexible Adhesive - a non-hardening adhesive supplied by the conduit manufacturers will be used to produce a flexible sealed joint where allowance is necessary for longitudinal movement (e.g. expansion couplers).

Bends and sets in the conduit will be made in accordance with the manufacturers' instruction. The radius of the bend shall not be less than 2.5 times the outside diameter of the conduit, or such greater radius, which will facilitate easy drawing in of cables.

Adequate allowance shall be made for longitudinal expansion and contraction of the conduit under normal temperature variations as follows:

- a. Expansion couplers should be used in straight runs exceeding 6 metres with a loose or flexible type joint (no 2 above) at the long spout of the coupler.
- b. Saddles as supplied by the manufacturers shall include a sliding support tolerance for longitudinal expansion.
- c. Special consideration may need to be given to the fixing of accessories where this may prevent natural conduit movement. Over-size or slotted fixing holes may be necessary or the introduction of expansion couplers.

Conduit shall be supported by saddles at not less than 900 mm intervals, where working temperatures tend to be high this should be reduced to 600 mm.

9. Conduit boxes and fittings

- a. All conduit boxes shall be circular or square pattern of rigid P.V.C. suitable for plain connections, conforming to sheet 62 B.S. 4607 Part 2. Boxes for supporting a fitting or accessory shall be fitted with a P.V.C. lid held in position by means of two 2 BA round headed screws. Boxes shall have metallic screwed inserts.
- b. Circular or square boxes shall be provided at all outlet points, unless otherwise specified and lighting fittings, ceiling switches and other accessories will be screwed to the internal lugs of the boxes. Care must always be taken when considering the use of totally enclosed fitting with P.V.C. circular boxes where the temperature within the box is likely to rise above 60 C (140 F). Special steel insert clips should be used in conjunction with circular boxes where this problem can arise and also in situations where heavy pendants are used.
- c. Looping in boxes of circular P.V.C. pattern to sheet 63 B.S. 4607 part 2 may be used in such work as dictated by the structure of the buildings. Conduit entry shall be made by means of P.V.C socket adaptors and P.V.C. bushes.
- d. Adaptable boxes shall be of moulded or fabricated P.V.C. of square or oblong shape complete with P.V.C. lids secured by 2 B A brass or steel plated round-headed screws. All adaptable boxes and lids of the same

size shall be inter changeable. No adaptable box smaller than 75 mm x 50 mm or larger than 300 mm x 300 mm shall be of adequate depth in relation to the size of conduit entering them.

- e. Conduit shall be terminated at adaptable boxes; fuse board switches sockets or other equipment not possessing push-in or threaded spouts, by means of appropriate size female adaptor and P.V.C. Hexagonal headed Bare Bush. All cemented joints to be made to depth of not less than the diameter of the conduit being used.

Earth continuity shall be provided by a separate insulated conductor drawn into the plastic conduit and rated in accordance with circuit loadings and appropriate regulations, or as mentioned on the drawings.

Where required under the Regulations, an earth continuity conductor shall be provided for lighting fittings in which case the control switches shall be equipped with an appropriate earth terminal.

10. Final sub-circuit wiring

All power and lighting wiring cables shall be 600/1000 volt grade, single core, P V C insulated, with stranded copper conductors, manufactured in accordance with B.S. 6004. The minimum sizes on lighting circuits shall be 1.5 sq mm and sizes on power ring main circuits 2.5 sq mm. The other circuits shall be as required by the Engineer/Engineer.

Cables forming sub-circuits connected to different sub-distribution boards shall not be drawn into the same conduit or draw-in box.

The cables shall be coloured in accordance with Table B4 of the IEE Regulations. Cables used on extra low voltage circuits shall be distinctive colours other than these colours.

No reduction of the strands forming the conductors shall be allowed at switch or other terminals, but all strands shall be effectively secured by screws, nuts and washers or other approved means.

Cables shall be joined together at the terminals of ceiling boxes and other accessories. Under no circumstances will joints be permitted in the run of the cable.

11. Skirting trunking

Skirting trunking shall have two compartments, one for power wiring and one for telephones, and shall be of approved plastic material similar to that manufactured by Key Terrain Limited or Egatube or of 16 S.W.G. galvanized iron.

A sample shall be submitted to the Engineer for his approval before installation commences.

12. P.V.C. Insulated armoured cable

P.V.C. insulated armoured cable shall be 500/1000 V grade to B.S.6346 or B.S.6004 having copper conductors of plain copper wire P.V.C. insulated, P.V.C. sheathed single wire armoured and P.V.C. sheathed overall.

The cores of four core cables shall be distinctively coloured red, yellow, blue and black.

The Contractor shall provide suitable glands and accessories for all armoured cable terminations and where cables are suspended shall provide the necessary cable rack, cleat or hanger supports and fixings.

Cable supports and racks shall be arranged as far as is practicable for the easy removal of any single cable in a multi-cable-run, without threading cables through supports and racks.

The number of types of supports and racks shall be kept to a minimum commensurate with meeting the requirements of the Works.

Where cables enter buildings pipes or ducts the mouths of the pipes or ducts shall be effectively sealed by means of close fitting solognum impregnated wooded plugs and a mixture of compound and transformer oil, or other approved manner.

All cables passing through interior walls or floors shall be effectively sealed to the approval of the Engineer by means of asbestos cement after the cables have been pulled through, in order to prevent the accumulation of moisture and the ingress of debris, sand or vermin.

The cost of sealing the cables shall be included in the rates for erection and laying.

All cables located in such positions where they are vulnerable to damage by mechanical or other means shall be protected by suitable lengths of steel pipes bushed to prevent damage to the cable.

Each cable when completely erected shall have rating plates permanently attached to it at each end, and in such intermediate positions as may be considered necessary by the Engineers.

Metal plates upon which is engraved, or stamped, the identification number of the cable together with the voltage, size and make-up, and the service, which it supplies.

This information shall be recorded by the Sub-Contractor so that it may appear on drawings of the completed installation.

The Contractor shall be wholly responsible for sealing and jointing of all cables supplied and erected under the contract.

The cable boxes, loop-boxes and glands for power and L V cables on all items of equipment shall be provided under the contract.

Sealing and jointing shall be in accordance with the best current practices and of first class workmanship. Where cable armouring is used, as earth continuity conductors the glands shall have the necessary contact surfaces or straps to provide a low resistance path under fault conditions.

The Contractor shall include for all cable jointing where appropriate and also all labour, jointing material and compound, together with the use of all jointers tools and making off the cable tails to the apparatus terminals.

Generally, cable terminations on switchgear transformers, joint boxes, outgoing and incoming circuits on the switchboards, shall be glanded in an approved manner.

13. Socket outlets

In all areas, general power outlets shall be of the 13 amp 3 pin fused plug type complying with B.S.1363. They shall be flush pattern, with white or ivory cover plates unless otherwise specified on the drawings. The earthing terminal of every socket outlet shall be connected to the earth continuity conductor of the final sub-circuit by an appropriately sized insulated copper conductor.

One plug shall be supplied for each socket outlet installed. Fuses shall be 13 amp unless otherwise specified.

14. Fused connection units

All fused connection units shall be 13 amp with fuse and neon indicator lamp. Boxes shall be flush type with white or ivory cover plates and shall be switched type unless specified on the drawings.

All fused connection units shall be fitted with 13 amp fuses, unless otherwise specified.

The front plate of each fused connection unit shall, unless otherwise specified, be engraved with the name of the appliance connected to it.

15. Lighting switches

Lighting switches shall be of the all-insulated rocker-operated plate switch type to B.S. 3676 of 5/15 amp rating as necessary. Switch inserts shall be white, set in white or ivory cover plates.

Switches controlling points for bathrooms shall be placed outside the bathroom or consist of a ceiling switch operated by a non-conducting cord, as specified. Switches mounted outdoors shall be of a weather-tight pattern.

Switches shall be one way, two ways or intermediate as specified and where a number of switches are mounted together they shall be fitted in a common box.

Ceiling switches shall be white or ivory semi-recessed pattern, and shall only be used where specified. Pull cords shall be fitted with shock absorbing springs.

16. Ceiling roses

Ceiling roses ivory or white shall be of the 3-plate pattern and fitted at all pendant points. An earthing terminal shall be provided and connected to the earth continuity conductor of the final sub-circuit where applicable.

Ceiling roses of the white porcelain semi-recessed pattern shall be used for surface installation and shall be of the all-insulated type of a flush installation.

17. Lamp holders

Lamp holders shall generally be of plastic construction with porcelain interiors, and bayonet fitting.

Lamp holders for lamps rated 200 watts and above shall be of the E S type.

Batten type lamp holders shall be of the all insulated bayonet type.

18. Lighting fittings

The Contractor shall supply and fit all lighting fittings of the type indicated on the drawings. All fittings shall be suitable for operation on a 240 V 50 cycles supply. Lighting fittings rated other than 240 Volts will not be accepted. All lighting fittings shall be supplied with lamps.

Fluorescent fittings shall generally be of the batten type with control gear contained within the supporting channel.

Fittings shall comply with B.S. 3821, Class 1, indoor normal atmospheres. All fluorescent fittings shall be fitted with radio interference suppression capacitors and shall be earthed.

A sample of each type of lighting shall be submitted to the Engineer for approval before installation.

All lighting fittings shall be supplied complete with lamps of the type and rating specified. Fluorescent tubes shall be of the "white" type, except where otherwise stated. Pearly type tungsten lamps shall be fitted in open fittings.

19. Commissioning

All installations shall be tested to the statutory requirements of the UEB and commissioned in the presence of and to the satisfaction of the Engineer.

Four copies of test reports shall be provided within seven days of carrying out the tests and the reports shall include full details of how each test was carried out and a copy of all readings taken.

20. Mounting heights of accessories

Unless otherwise stated accessories shall be mounted at the following heights above finished floor level:

Switch plates	1.3 m
Socket-outlets generally (except in skirting trunking)	0.3 m
Socket-outlets in kitchens	1.3 m

WORKMANSHIP

21. Regulations

All work carried out shall comply with the requirements of the Regulations for Electrical Equipment of Buildings.

22. Cleaning and painting

If necessary all switchgear distribution boards and other equipment shall be cleaned of all dust, oil, grease, dirt, scale and rust by power tool operated metal brush.

Unless otherwise approved, they shall then immediately have applied to them two coats of approved primer paint. After inspection any rough surfaces shall be filled in and smoothed over and further painting shall be as follows:

- a. All interior surfaces of cubicles, kiosks, boxes, etc, containing wiring or other apparatus and internal components of the plant, which are despatched to site in an assembled condition, shall be finish painted with at least two coats of white enamel. The final coat shall be of white anti-condensation finish, where so specified.
- b. The external surface of the panels shall be finished in grey stove enamel to B.S. 381 C shade 631 or other shade as approved by the Engineer.
- c. All interior surface of tanks and other oil filled chambers and external surfaces of piping therein shall be painted finally with an oil resisting coating to the approval of the Engineer.
- d. All wall and floor mounted junction boxes loose starters etc, throughout the works shall be finished in grey stove enamel or painted

to B.S. 381 C shade 631 or other shade as may be approved by the Engineer.

After all erection has been completed at site the Contractor shall make good all defects in painting and galvanizing which have arisen during transport, storage and erection on site and shall apply one undercoat and one finished coat of gloss paint to B.S. 381 C shade 631 or other shade as may be approved by the Engineer to the external surface of all equipment.

Where galvanized metalwork has been damaged it shall either be repaired by cold galvanizing at site or alternatively, at the discretion of the Engineer, be returned to the manufacturer for re-galvanizing by the hot process.

23. Arrangement of conduit layout

The conduit system shall be carefully planned and erected to avoid all unnecessary bends or changes in direction. Conduits shall be laid straight, horizontal or vertical lines with easy sets. Where several conduits follow similar routes, they shall be neatly grouped in multiple runs. Where multiple runs change direction, the radii of the sets shall be laid out from a common centre. Where draw-in boxes for right-angled change of direction are required in multiple runs, adaptable boxes shall be used for such size as to allow all conduits to enter the box without seats.

Where conduits are concealed or laid on constructional floors, they shall be secured by fixing and approved by the Engineer. Where it is essential that conduits cross one another in floors, the chases shall be deepened and the conduits set to create the minimum desirable diversion.

Care shall be taken to ensure that there is no obstruction to cables with the conduits caused by the ingress of plaster, concrete, or other matter. Conduit ends must be cut square and cleaned of burrs.

24. Erection

Conduits for each circuit shall be completely erected before any cable is drawn in. Adequate draw-in points shall be provided.

Straight runs shall have draw-in facilities at distances not exceeding 12 metres. Runs incorporating sets or bends shall have draw-in facilities at a distance not exceeding 9 metres. These distances may need to be reduced in difficult situations or with particular cable complexes.

Not more than four easy sets, or two right angle bends or sets may be installed between drawn-in points. Solid elbows or tees shall not be accepted.

25. Mains electrical supply

On completion of the work, the Contractor shall provide Tanzanian Electricity Board, with the necessary commencement/completion certificates and shall rectify at his expense any defects, which may be notified by them.

26. Method of measurement

The Lump sum measurement shall apply to the measurement of the electrical installation following execution based on the electrical drawing prepared by the Contractor and approved.

DIVISION 9: FINISHES

GENERAL

1. Other specifications

All other specifications of this contract where applicable are deemed to apply equally to the finishings specifications.

2. Samples

The Contractor shall prepare at his own cost sample areas of the paving, plastering and rendering as directed until the quality, texture and finish required is obtained and approved by the Engineer after which all work executed shall conform with the respective approved samples.

3. Finished thicknesses

The thicknesses of floor finishes quoted in this section of the specification shall be the minimum requirements.

Slabs bearing on the ground may be cast to varying levels, and be of constant thickness with varying formation levels, or have varying thicknesses at the option of the Contractor. This stipulation in no way relieves the Contractor of the requirements of the specification for structural work.

4. Materials generally

All materials shall be of high quality, obtained from manufacturer's to be approved by the Engineer.

Cement, sand and water shall be as described under Concrete Work and Block work.

5. Bonding

Bonding compounds, etc., for use in applying plaster and similar finishes direct to surfaces without the use of backings or screeds are only to be used if approved by the Engineer and are to be used strictly in accordance with the manufacturer's printed instructions.

6. Chases, openings and holes

All chases, holes and the like which were not formed in the concrete or walling shall be cut, and all service pipes shall be fixed and all holes and chases filled with mortar before paving and plaster work is commenced. In no circumstances will the Contractor be permitted to cut chases, holes and the like in finished pavings or plasterwork.

INSITU FINISHINGS

7. Generally

The term plastering refers to the operation internally and rendering to the same operation externally but for ease of reference the term plastering has generally been used in this specification to describe both operations.

8. Mixes

The methods of measuring and mixing plaster shall be as laid down under Concrete Work and the proportions and minimum thickness of finished plaster shall be in accordance with the following:-

Item of Work	Mix	Minimum Thickness and Finish
Internal Plaster	1 part cement 1/4 part lime 4 parts sand	16 mm finish to walls and ceilings. Wood float finish unless otherwise specified.
External Render	1 part cement 4 parts sand	12 mm finish in two coats
Tyrolean finish	Ditto	6 mm finished thickness in two coats on 10mm plastered backing.

To obtain greater plasticity a small quantity of lime may be added to the mixes for external plastering at the Engineer's discretion but in any case this is not to exceed 1/4 part lime to 1 part cement.

With regard to the lime mortars gauged with cement, the addition just before use, of the cement to small quantities of the lime/sand mix shall preferably take place in a mechanical mixer and mixing shall continue for such time as will ensure uniform distribution of materials and uniform colour and consistency.

It is important to note that the quantity of water used shall be carefully controlled. Plaster may be mixed either in a mechanical mixing machine or by hand.

Hand mixed plaster shall first be mixed in the dry state being turned over at least three times. The required amount of water should then be added and the mix again turned over three times or until such time as the mass is uniform in colour and homogeneous.

The plaster shall be completely used within thirty minutes of mixing and hardened plaster shall not be remixed but removed from the site.

9. Preparation of surfaces for plaster etc.

Irregularities in the surfaces to be plastered or rendered shall be filled with mortar, without lime, twenty four hours before plastering is commenced. Joints in block work, etc., are to be well raked out before plastering to form a good key. Smooth concrete surfaces to be plastered shall be treated with an approved proprietary bonding agent or hacked to provide an adequate key for the plaster.

All surfaces to be plastered or rendered shall be clean and free from dust, loose mortar and all traces of salts.

All surfaces shall be thoroughly sprayed with water and all free water allowed to disappear before plaster is applied.

As far as practical, plastering shall not be commenced until all mechanical and electrical services, conduits, pipes and fixtures have been installed.

Before plastering is commenced all junctions between differing materials shall be reinforced. This shall apply where walls join columns and beams, particularly where flush, and similar situations where cracks are likely to develop and as directed by the Engineer. The reinforcement shall consist of a strip of galvanized wire mesh 'Expamet' or equal approved 15 cm wide which shall be plugged, nailed or stapled as required at intervals not exceeding 45 mm at both edges. The surfaces to which such mesh shall be applied shall be painted with one coat bituminous paint prior to fixing the mesh.

10. Application of plaster and render

After preparation of the surfaces a key coat of cement slurry shall be applied to the wetted surface to be plastered. When this coat is dry the plaster coat shall be applied, by means of a trowel, between screeds laid, ruled and plumbed as necessary. This coat which shall be to the required thickness shall be allowed to set hard and then cured as described. Surfaces are to be finished with a wood or steel float to a smooth flat surface free from all marks.

Tyrolean finish shall be applied with an approved machine to give a finish of even texture and thickness. The sprayed finish shall be applied in two separate coats allowing time for drying between coats.

Application in one continuous operation to build up a thick layer will not be permitted. The total finished thickness of the two sprayed coats shall be not less than 6 mm. The sprayed finish shall not be applied until all repairs and making good to the undercoat are completed. Any plaster which adheres to pipes, doors, windows and the like shall be carefully removed before it has set.

Curing shall take place after the application of the second coat. The finished surface shall be either 'rough textured' or 'pressed' finish as directed by the Engineer. Where coloured Tyrolean is required this shall be obtained by the addition to the mix of an approved colour pigment.

All plastering and rendering shall be executed in a neat workmanlike manner. All faces except circular work shall be true and flat and angles shall be straight

and level or plumb. Plastering shall be neatly made good around pipes or fittings. Angles shall be rounded to 6 mm radius.

All tools, implements, vessels and surfaces shall be at all times kept scrupulously clean and strict precautions shall be taken to prevent the plaster or other materials from being contaminated by pieces of partially set material which would tend to retard or accelerate the setting time.

11. Curing of plaster

Each coat of plaster is to be maintained in a moist condition for at least three days after it has developed enough strength not to be damaged by water.

12. Angle beads

External angles of plastered walls shall be protected with galvanized mild steel angle beads complying with B.S. 1246 Fig. 7 Profile C3.

They shall be securely plugged, nailed or stapled as required at intervals not exceeding 450 mm at both edges.

13. Plaster stops

Where shown on details, Internal plasterwork shall be stopped against 'Expamet' galvanized steel plaster stop, reference 565 which shall be securely nailed to walls in the positions indicated on the drawings.

Stops shall be neatly and closely fitted together at corners and it is important that they are secured to walls through all holes provided.

TILE, SLAB AND BLOCK FINISHINGS

14. Ceramic tiles

Ceramic floor tiles shall comply with B.S. 3260 of an approved manufacturer to patterns as directed by the Engineer. Adhesives are to be as recommended by the manufacturer in writing and approved by the Engineer.

The tiles are to be laid and bedded direct in adhesive on to a cement and sand bed to make up the total paving thickness.

The cement and sand screed is to be finished with a steel trowel to a perfectly smooth surface before the application of the mastic and tiling.

On completion the ceramic tiles are to be sealed and cleaned in accordance with the manufacturer's printed instructions.

15. Rates

The rates for tile finishing shall include for rounded edge tiles and angles, cutting and fitting up to boundaries and around pipes, brackets, etc.

DIVISION 10: GLAZING

MATERIALS

1. General

Glass used in glazing and for mirrors shall be best quality clear glass free from visible defects so as to afford uninterrupted vision or reflection as appropriate, and without obvious distortion.

2. Standards

Glass for glazing and mirrors shall be of approved manufacture and is to comply with B.S. 952 in all respects free from flaws, bubbles, specks and other imperfections.

3. Clear sheet glass etc

The clear sheet glass shall be ordinary glazing (OG) quality.

4. Plate glass

Polished plate and Georgian wired polished plate glass to be selected glazing (SG) quality.

5. Obscured glass

To be of type described and as approved by the Engineer.

6. Solar treated glass

Where indicated glass to be covered with an approved adhesive solar films.

7. Glazing gaskets

Glazing to metal frames shall be secured with clip-in gaskets of butyl rubber. The gaskets shall be of size and section to suit the frame and glazing so as to provide a weather and air tight seal. The mechanical properties of the gasket shall be such as to resist the climatic conditions experienced in Tanzania.

WORKMANSHIP

8. General

Glazing of all types and in all locations shall be carefully executed by artisans skilled in this type of work and in conformance with the recommendations of

C.P.152. Glazing shall be carefully fitted so that it is not subject to pressure and stresses imposed by being an over tight fit within the framing.

9. Measurements

Each element (door, window, etc) to receive glass shall be accurately measured to ensure a perfect fit subsequently.

10. Single glazing

Single glazing shall be executed with glass of the various types described herein. Ordinary (non-safety) glass may be pre-cut or cut on site.

11. Wired glass

Wired glass shall be cut so that the wires embedded are truly vertical and horizontal (i.e. at right angles to the cut edges).

12. Safety glass

Safety glass shall be factory cut before delivery to site. Site cutting will not be permitted.

13. Storage and handling

Glass shall be delivered to site in stout containers and clearly marked. The containers shall incorporate sling attachment points for lifting bridles. Glass shall be stored under cover so that the panes are truly vertical.

14. Protection

After fixing glass shall be boldly marked with paper or whitewash so that it is clearly visible. In positions where damage due to construction traffic or activity is likely to occur stout screens composed of hardboard or fibreboard on battens shall be arranged to protect the glass.

15. Damage

Should any glass delivered to site be found to be damaged it shall not be incorporated into the works without the express permission of the Engineer. Should glazing installed be damaged for any reason it shall be removed and replaced free of charge to the satisfaction of the Engineer. Should any adjacent works be damaged this shall equally be reinstated free of charge to the satisfaction of the Engineer.

16. Defective work

All glass shall be checked before installation to ensure that defective glass is not installed. Notwithstanding this, if in the opinion of the Engineer, any installed glazing is defective it shall be removed and replaced free of charge to the satisfaction of the Engineer.

17. Glazing to wood

Glazing shall be secured to wood framing with hardwood beads. Edges shall be wrapped in washleather so that the washleather finishes just below the surface of the bead. No adhesives shall be used.

18. Glazing to metal

Glazing shall be secured to metal framing with clip in butyl rubber gaskets.

19. Glass thickness

Glass thickness shall conform to the recommendations of C.P. 152 and the manufacturer's recommendations for sizes of panes relative to the position in the building and the effects of wind pressure (both negative and positive). Glazing to louvred windows shall be 6mm.

20. Cleaning

All windows glazed panels and mirrors shall be cleaned both inside and outside immediately prior to the handing over of the building to the satisfaction of the Engineer.

DIVISION 11: PAINTING & DECORATING

MATERIALS

1. Manufacturers

Except where stated all materials shall be obtained from approved manufacturers. The Contractor shall state the name and address of the manufacturer whose materials he proposes to use. Once approval has been given the Contractor shall not obtain materials from other sources without the prior written agreement of the Engineer.

2. General

Each succeeding coat of priming, undercoating and finishing (pigment) or clear coating shall be sufficiently different in colour as to be readily distinguishable.

All primers and paints in one system upon a particular surface shall be obtained from the same manufacturer.

The mixing of paints, etc of different brands before or during application will not be permitted.

3. Emulsion paints

Emulsion paints shall be matt or satin finish vinyl emulsion paint.

The first (mist) coat shall be thinned in accordance with the manufacturer's instructions.

4. Gloss paint

Gloss paint shall be hard gloss finish oil paint.

5. Lead based paints

The use of lead based paints will not be permitted.

6. Clear finishes

Clear finishes internally shall be clear polyurethane varnish (one pack) to a matt finish.

7. Primers and undercoats

Unless otherwise specified, primers and undercoats shall be the type recommended by the manufacturer of the finishing coats specified for a

particular surface. Primer for external bare metalwork surfaces shall comply with B.S. 2523.

8. Knotting

Shellac knotting shall comply with B.S. 1336.

9. White spirit

The white spirit shall comply with B.S. 245.

10. Timber stain

Timber stain shall be oil based pigmented stain. The application of this material shall be strictly in accordance with the manufacturers written instructions. Tint and degree of application shall be to the approval of the Engineer.

11. Stopping

The stopping shall be as follows:

- a. Plasterwork shall be plaster based filler.
- b. Concrete and brickwork shall be similar material to the background and finished in a similar texture.
- c. Internal woodwork and plywood shall be complying with B.S. 544.
- d. External woodwork shall be white lead paste complying with B.S. 2029.
- e. Internal clear wood finishes: the stopping shall be that recommended by the clear lacquer manufacturer.

12. Fillers

The fillers for internal joinery shall be the type recommended by the paint manufacturer for use with his type of paint or lacquer.

Stoppers and fillers shall be tinted to match the undercoat, and shall be compatible with both undercoats and primers.

All materials shall be used strictly in accordance with the manufacturer's instructions.

WORKMANSHIP

13. General

Workmanship generally shall be carried out in accordance with B.S. C.P. 231, unless otherwise specified.

Before painting is commenced floors shall be swept and washed over; surfaces to be painted shall be cleaned before applying paint as specified and all precautions taken to keep down dust whilst work is in progress.

No paint shall be applied to surfaces structurally or superficially damp and all surfaces must be ascertained to be free from condensation, efflorescence, etc before the application of each coat.

No painting shall be carried out externally during humid, rainy, damp, foggy or freezing conditions or conditions where surfaces have attained excessively high temperatures or during dust storms.

No new, primed or undercoated woodwork and metalwork shall be left in an exposed or unsuitable situation for an undue period before completing the process.

No dilution of paint materials shall be allowed except strictly as detailed by the manufacturer's own direction, either on the containers, or their literature, or with the special permission of the Engineer. For external work dilution of paints will not be allowed whatsoever. For internal work, where permitted by the Engineer, undercoats may be thinned by the addition of not more than 5% thinner. Gloss finish is not to be thinned.

Metal fittings such as ironmongery etc, not required to be painted, shall first be fitted and then removed before the preparatory processes are commenced. When all painting is completed the fittings shall be cleaned as necessary and re-fixed in position.

14. Brushwork

Unless otherwise specified, all primers and paints shall be brush applied. Written permission must be obtained from the Engineer if an alternative method of application is to be used.

15. Stopping and filling

Unless otherwise specified by the manufacturer all primers and undercoats shall be stopped flush and rubbed down to a smooth surface with an abrasive paper and all dust removed before each succeeding coat is applied. Care shall be taken to prevent burnishing of the surface.

16. Stirring

Unless otherwise specified by the paint manufacturer all paint materials shall be thoroughly mixed and/or stirred before and during use, and suitably strained as and when necessary.

17. Inspection

No priming coats shall be applied until the surfaces have been inspected and the preparatory work has been approved by the Engineer. No undercoats or finishing coats shall be applied until the previous coat has been similarly inspected and approved.

18. Paint application

Each coat of paint shall be so applied as to produce a film of uniform thickness. All paint shall be applied in accordance with the manufacturer's instructions. Special attention shall be given to ensure that all surfaces including edges, corners, crevices, welds and rivets receive a film thickness equivalent to that of adjacent painted surfaces.

19. Drying

All coats shall be thoroughly dried before succeeding coats are applied. Allow a minimum of 24 hours between applications on any one surface, unless otherwise specified by the manufacturer.

20. Unprimed woodwork

Unprimed woodwork scheduled to be painted shall be rubbed down with abrasive paper and dusted off. Care shall be taken to prevent 'burnishing' of the surface. All knots and resinous areas shall be coated with two coats of knotting. Pitch on large, open unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, shall be removed with white spirit before applying the knotting. Apply one coat of priming to all surfaces, two coats to all end grains, to be subsequently painted. Backs of all wood frames in contact with concrete, brickwork, blockwork and metalwork or similar materials shall be primed before fixing. After priming all joints, holes, cracks shall be stopped and filled, rubbed down and dusted off.

21. Primed woodwork

Woodwork delivered primed shall be lightly rubbed down with abrasive paper, and dusted off. Touch up bare areas with similar priming including open grained ends.

After touch priming all joints, holes, cracks and open grained ends shall be stopped and filled, rubbed down and dusted off.

22. Plywood and blockboard

Edges of exterior plywood and blockboard shall be sealed with two coats of aluminium primer and the backs treated with a lead primer.

23. Clear finished woodwork

All woodwork scheduled to receive a clear finish shall be well sanded with the grain removing all dirt etc, to give as smooth a surface as possible. Resinous

timber shall be swabbed down with white spirit and dried thoroughly. Split or end grain shall be filled with suitable filler recommended by the clear lacquer manufacturer, in accordance with their instructions, and of the appropriate shade.

24. Block work

All block work, rendered and plaster surfaces scheduled to be painted shall be brushed down, all holes and cracks filled, all projections such as plaster, or mortar splashes etc, removed to leave a suitable dust free surface.

All these surfaces shall be thoroughly dry before any primer or paints are applied. Apply a coat of alkali resisting primer where surfaces are to be finished with oil paints or alkyd resin type emulsion.

25. Colours

The colours will be selected by the Engineer from the paint manufacturer's standard colour range.

26. Toxic wash

Blockwork, plaster and timber surfaces which are to be painted shall be washed down prior to painting with a toxic wash applied by brush or spray. A second wash shall be applied two days after the first wash. The surfaces shall then be allowed to dry out completely before application of paint.

27. Protection

Proper care must be taken to protect surfaces while still wet by use of screens and 'wet paint' signs where necessary.

28. Damage

Care must be taken when preparing surfaces, or painting etc, not to stain or damage other work. Dust sheets and covers to the satisfaction of the Engineer shall be used to protect adjacent work. Any such stains or damage shall be removed and made good at the Contractor's expense.

29. Cleanliness

All brushes, tools, pails, kettles and equipment shall be clean and free from foreign matter. They shall be thoroughly cleaned after use and before being used for different colours, types or classes of material. Painting shall not be carried out in the vicinity of other operations that may cause dust. Waste liquids, oil soaked rag, etc, shall be removed from the building each day. Waste liquids shall not be thrown down in any sanitary fittings or drains.

30. Performance

If, while the work is in progress, the paint appears to be faulty, such as consistency of colour, drying time, or quality of finish, the work shall be stopped at once and the manufacturer consulted.

The manufacturers of the materials shall be given every facility for inspecting the work during progress in order to ascertain that the materials are being used in accordance with their directions, and to take samples of their products from the site if they so desire for tests.

The finishing coats of the various paints or surface finishing shall be free from sags, brush marks, runs, wrinkling, dust, bare or 'starved' patches, variations in colour and texture, and other blemishes.

When the work has been completed, the finished surfaces shall not be inferior in quality, colour and finish to the samples approved by the Engineer, and imperfections in manufacture shall not be apparent through these finished surfaces.

In the event that the Engineer is not satisfied that the quality of finish does not comply with the required standards and/or the sample panel the Contractor will be required to repaint at his own expense, such work to the satisfaction of the Engineer. If in the opinion of the Engineer it is necessary to remove completely the unsatisfactory paintwork this shall be done under the direction of the Engineer at the expense of the Contractor.

31. Packaging, delivery and storage

All paints and surface coatings shall be delivered in sound sealed containers, labelled clearly by the manufacturers, the label or decorated container must state the following:

- a. The type of product
- b. The brand name and colour
- c. The use for which it is intended
- d. The manufacturer's batch number
- e. The B.S. number if applicable
- f. All labels shall be printed - containers bearing type written labels will not be acceptable.

Materials shall be stored under cover in accordance with the manufacturer's instructions, and with local fire and safety regulations. The store itself must be maintained at a temperature of not less than 50 degrees F (10 degrees C) and must not be subjected to extreme changes of temperature.

The batch deliveries are to be dated and used strictly in order of delivery.

32. Vinyl emulsion paint

Surfaces to be painted shall receive one mist coat followed by two full coats of vinyl emulsion paint. Application may be by means of rollers or brushes.

33. Gloss finish paint

Surfaces to be painted shall be primed then painted with two undercoats followed by one coat gloss finish paint.

34. Clear polyurethane varnish

Surfaces to be clear varnished shall be treated with two coats polyurethane varnish.

35. Textured coating

The manufacturer's instructions concerning application of the coating are to be strictly followed under the direction of the Engineer.

All surfaces to receive textured coatings are to be clean and dry with surfaces scraped and brushed before application of the coating.

Application of the coating is to be with textured roller or fibre brush as directed by the Engineer with a minimum spreading capacity of 1 kilogramme per square metre. Under no circumstances is the coating to be thinned.

12. SAFETY

The Contractor shall observe high standards of safety for personnel and machines at all times and with regard to safety, and shall comply with local laws and ensure strict adherence to the following:

- (a) The Contractor shall take appropriate precautions where personnel are required to work in **confined spaces and other hazardous areas**, and to only permit employees to work in confined spaces or other hazardous areas when there are adequate and continuous communication links with colleagues equipped to provide emergency assistance.
- (b) The Contractor shall protect personnel working in trenches from cave-ins by the **proper shoring or sloping of trenches**, and shall take special care of persons working in the trenches, and prohibit individual employees from working alone in trenches.
- (c) The Contractor shall protect personnel from the moving parts of the machines by **installing and maintaining proper guards**.
- (d) The Contractor shall not permit **casual observers close to excavating operations**.
- (e) **Temporary fencing** will be erected, maintained and removed to enclose such areas of land (such as Engineer's/Contractor's offices and yards, construction works being carried out beside buildings, public roads, or footpaths and any other place where the Contractor's operations will endanger lives or public property) occupied by the Contractor within the Site.
- (f) **Sufficient lighting** will be provided to ensure that, in all places where work is in progress safe working conditions are provided for the Contractor's personnel.
- (g) **Safety fencing around electrical and mechanical apparatus** will be installed by the time that the said apparatus is connected to any electricity supply.
- (h) **Safety instructions** will be supplied and issued to the Contractor's employees.
- (i) **Safety signs** for the works will be provided, such as standard road signs, warning/danger signs, control signs, safety signs, direction signs, etc.
- (j) **Protective clothing and equipment** will be provided to workers that are appropriate to the workers' tasks. This may include wellington boots; site boots, steel-toe boots, or similar; work gloves; protective helmets; protective eye goggles; ear protectors; and face masks to prevent inhalation of dust.