General Specifications

For

Construction Works

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PRELIMINARIES

GENERAL MATTERS

A. Sufficiency of Tender

The Contractor shall be deemed to have satisfied themselves before tendering as to the correctness and sufficiency of their Tender for the Works and of the rates and prices stated in the priced Bills of Quantities, which rates and prices shall cover all their obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the Works.

B. Stamp charges

The Contractor shall allow for the payment of all Stamp Charges, if required, in connection with the Surety Bond and Contract Agreement.

C. Definitions and abbreviations

Terms used in the Bills of Quantities shall be interpreted as follows:

Approved	shall mean approved by the IOM Engineer.
‘as directed”	shall mean as directed by the IOM Engineer.
B.S	Shall mean the current British Standard Specification published by the British Standards Institution in the United Kingdom.
“CM.	Shall mean Cubic Meters.
‘SM.”	Shall mean Square Meters.
‘LM’	shall mean Linear Meters.
“mm’	shall mean Millimeters.
‘Kg.”	Shall mean Kilograms.
“No.”	Shall mean Number.
Provisional	shall mean measured after execution
M.S	shall mean measured separately

D. Progress schedule

The Contractor shall, upon receiving instructions to proceed with the Works, draw up a Time and Progress Schedule setting out the order in which the Works are to be carried out with the appropriate dates thereof within 14 days from the order of commencement.

This Time and Progress Schedule is to be agreed with the IOM Engineer and no deviation from the order set out in this Schedule will be permitted without the consent of the IOM Engineer. The Main Contractor will be responsible for arranging the above Program with all Sub-Contractors including the Nominated Sub-Contractors and Nominated Suppliers.

The contractor will be deemed to have considered the effect if seasonal weather variations. When programming his operations, it must be understood that rains of up to 75mm per day will be deemed to be normal and expected. No claims by the contractor for extension of time due to rains or floods less than 75mm per day as measured by meteorological department will be considered.

The contractor, when preparing his Program has to consider the delivery of imported materials and IOM Engineers working hours.

E. Figured dimensions

Figured dimensions are to be followed in preference to dimensions scaled from the Drawings; but whenever possible dimensions are to be taken on the Site or from the Buildings. Before any work is commenced by Sub-Contractors or Specialist Firms, dimensions must be checked on the Site and/or buildings and agreed with the Contractor, irrespective of the comparable dimensions shown on the Drawings. The Contractor shall be responsible for the accuracy of such dimensions.

F. Existing services

Prior to commencement of any work the Contractor is to ascertain from the relevant Authorities the exact position, depth and level of all existing electric cables, water pipes or other services in the area and they shall make whatever provisions may be required by the Authorities concerned for the support and protection of such services. Any damage or disturbance caused to any services shall be reported immediately to the IOM Engineer and the relevant Authority and shall be made good to their satisfaction at the Contractor's expense.

G. Transport to and from the site

The Contractor shall include in their prices for the transport of materials, workmen, etc., to and from the Site of the proposed Works, at such hours and by such routes as are permitted by the Authorities.

H. Overtime

The Contractor shall allow in their tender for any extra costs for overtime working they consider will be necessary in order to complete the works by the contract Date of Completion.

I. Public and private roads, pavements, etc.

The Contractor will be required to make good, at his expense, any damage they may cause to the present road surfaces and pavements within or beyond the boundary of the Site, during the period of the Works.

In particular, all existing trees, shrubs, plants, etc., which may be destroyed or damaged during the progress of the Works are to be made good by the Contractor to the approval of the IOM Engineer.

The contractor shall satisfy the Engineer, the local authority and the police as to the precautions he proposes to take and the signs and lights to be provided and operated. On any road or track at least 4 red lights shall be suitably placed on either side of the trench and diversions shall be clearly marked, signed and maintained.

J. Police regulations

The Contractor is to allow for complying with all laws, ordinances, rules and regulations of the Police (and local) Authorities as long as they do not conflict with the performance of their obligations under the SSI contract.

K. Contractors' Superintendence

The Contractor shall constantly keep on the Works a literate English-speaking Agent or Representative, competent and experienced in the kind of work involved, who shall give all his time to the superintendence of the Works. Such Agent or Representative shall receive on behalf of the Contractor, directions and instructions from the IOM Engineer and such directions and instructions shall be deemed given to the Contractor in accordance with the Conditions of Contract. The Agent shall not be replaced without the specific approval of the SSI.

It is to be a specific condition of this Contract that the successful Tenderer shall provide onsite throughout the period from the site clearing to the Date for Practical Completion a suitably qualified, experienced and competent

person to ensure that the works are carried out to the standard required by the specification and detailed on the Drawings; and shall ensure that upon any termination of employment a suitable replacement is found.

Before the Tenderer's offer is accepted the IOM Engineer may choose to personally interview the Contractor's proposed Representative. Curriculum Vitae of past experience and qualifications must be provided for the IOM Engineer's scrutiny.

The SSI's decision will be final regarding the suitability of the proposed Representative.

L. Site Instructions

All site instructions to the contractor shall be written and from the IOM Engineer or his appointed representative. The Contractor shall be required to follow all instructions from the Engineer or his representative.

The contractor must not under any circumstances accept instruction outside of his contract from any other unauthorized persons.

No work that is not within the scope shall be carried out by the contractor without instruction of the IOM Engineer or his representative.

Such work if carried out without instruction, shall be deemed to be at the Contractor's cost and no claim shall be entertained, the contractor may however be instructed to demolish or remove from the site such works if they conflict or are not in line with the spirit of the construction.

M. Water

All water shall be fresh, clean and pure, free from earthy vegetable or organic matter, acid or alkaline substance in solution or suspension.

Unless otherwise agreed the Contractor shall provide at his own risk and cost all water for use in connection with the Works (including the work of Sub-Contractors). The Contractor shall provide at his own expense all temporary distribution pipes, storage tanks, meters, etc., and they shall clear away same upon completion of the Works.

N. Lighting and power

The Contractor shall provide at their own risk and cost all artificial lighting and power for use on the Works, including all Sub-Contractors' and Specialists' requirements and including all temporary connections, wiring, fittings, etc., and clearing away on completion. The Contractor shall pay all fees and obtain all permits in connection therewith.

O. Safety

The Contractor shall comply at all times with the requirements of the Factory Act (Cap 514), and ensure that the safety of their workpeople and authorized visitors to the Site are protected at all times. In particular, there shall be proper provision of planked footways and guard-rails to scaffolding, etc.; protection against falling materials and tools and the Site shall be kept tidy and clear of dangerous rubbish.

From the time of commencements of the works until the end of the maintenance period, the contractor shall be responsible for protecting the public from anything dangerous to persons or property, and for safe and easy passage of pedestrians and vehicular traffic.

The IOM Engineer shall be empowered to suspend work on the Site should he consider these conditions are not being observed, and no claim arising from such a suspension will be allowed.

P. Protective clothing

The Contractor shall provide all protective or any other special clothing or equipment for their employees that may be necessary and these shall bear the markings or emblem of the company.

These shall include, inter-alia, safety helmets, gloves, goggles, earmuffs, gumboots, steel toed boots, overalls, etc according to the type of work. The Contractor shall ensure that all safety and protective gear are worn by all staff on site at all times

Q. Coordination of the Works

The contractor will be required to carefully co-ordinate his activities and work, both on and off site, with the activities and work of other contractors, Sub-Contractors, statutory, undertaking and all supervisory staff for the works appointed by the Client. He shall allow all works to proceed without undue hindrance and will cooperate to expedite the execution of the works.

MATERIALS AND WORKMANSHIP

A. Generally

All materials shall be new unless otherwise directed or permitted by the IOM Engineer and in all cases where the quality of goods or materials is not described or otherwise specified, is to be the best quality obtainable in the ordinary meaning of the word ‘best and not merely a trade signification of that word.

All materials and workmanship shall, unless otherwise specified or described, conform to the appropriate Kenya Bureau of Standards or British Standards Institution Specification current at the date of tender.

The Contractor shall order all materials to be obtained from overseas immediately after the Contract is signed and shall also order materials to be obtained from local sources as early as necessary to ensure that such materials are on Site when required for use in the Works.

The Contractor shall be responsible for and shall replace or make good at his own expense any materials lost or damaged. The Works throughout shall be executed by skilled workmen well versed in their respective trades.

B. Rejected Workmanship or Materials

Any workmanship or materials not complying with the specific requirements or approved samples or which have been damaged, contaminated or have deteriorated, must immediately be removed from the Site and replaced at the Contractor’s expense, as required.

C. Proprietary materials

Where proprietary materials are specified herein-after the Contractor may propose the use of materials of other manufacture but equal quality for approval by the IOM Engineer.

All materials and goods, where specified to be obtained from a particular manufacturer or supplier are to be used or fixed strictly in accordance with their instructions.

D. Samples

The Contractor shall furnish at the earliest possible opportunity before work commences and at his own cost, any samples of materials or workman-ship that may be called for by the IOM Engineer for his approval or rejection, and any further samples in the case of rejection until such samples are approved by the IOM Engineer and such samples, when approved, shall be the minimum standard for the work to which they apply.

If in this specification the practice is adopted of specifying a particular item as “similar” to that of a particular firm’s product, it is to be clearly understood that this is to indicate the type and quality of the equipment required. No attempt is being made to give preference to the equipment supplied by the firm whose name or products are quoted.

Where particular manufacturers are specified herein, no alternative make will be considered, and the IOM Engineer shall be allowed to reject any other makes.

E. Concrete tests

Concrete test cubes i.e. per set of three as later described, including testing fees, labor and materials, making moulds, transport and handling etc. and ensuing copies of tests are promptly dispatched to the SSI Offices.

F. Defects liability

Contracts of more than $ 3,000 shall carry a defects liability period of a minimum of 6 months or 180 days from date of practical completion and handover and the contractor shall be fully responsible for all defects related to the use of the building, poor materials or workmanship. Normal wear and tear shall not be covered during this period unless otherwise agreed. All contracts less than $ 3,000 shall carry a minimum defects liability period of 3 months or 90 days.

TEMPORARY WORKS

A. Sanitation

The Contractor shall make arrangements for the necessary toilet facilities for their staff and workmen to the requirements and satisfaction of the Health authorities and/or IOM Engineer and maintain the same in a thoroughly clean and sanitary condition and pay all conservancy fees during the period of the Works and remove when no longer required.

B. Plant, tools and scaffolding

The Contractor shall provide all necessary hoists, tackle, plant, vehicles, tools and appliances of every description for the due and satisfactory completion of the Works and shall remove same on completion.

The Contractor shall provide, erect and maintain all temporary scaffolding, sufficiently strong and efficient for the due performance of the Works, including Sub-contract Works, provide special scaffolding as and when required during the Works and remove on completion and make good.

Such scaffolding shall be constructed of tubular steel or timber of sufficient scantlings and be provided with planked footways and guard-rails to approval.

All such plant, tools and scaffolding shall comply with all regulations whether general or local, in force throughout the period of the Contract and shall be altered or adapted during the Contract as may be necessary to comply with any amendments in or additions to such regulations.

The Contractor must allow here or in his rates for scaffolding as described above.

C. Existing and adjacent property

The Contractor must take all steps necessary to safeguard existing and adjacent property, make good at their own expense any damage to persons or property caused thereon, and hold the Employer indemnified against any such claim arising.

The Contractor will be held fully responsible for the safety of the existing and adjacent buildings and for any damage caused in consequence of these Works. They must reinstate all damages at his own expense and indemnify the Employer against any loss.

The Contractor must take such steps and exercise such care and diligence as to minimize nuisance from dust, noise or any other cause to the occupiers of the existing and adjacent property.

D. Hoarding

Where necessary and directed by the IOM Engineer the Contractor shall enclose the site, with a hoarding 2.40 meters high, with openings and gates as required, constructed of substantial timbers to approval and covered with reasonably new corrugated galvanized iron sheeting painted to approval

The Contractors attention is drawn to the fact that some areas of the site are already built up and shall be in use during the duration of this project. As such the contractor must allow for keeping his/her employees from interfering with such other users and preventing and minimizing any nuisance arising from dust, noise or by way of trespass. Rates for hoarding will be requested in the Bill of Quantities when required for the works.

E. Watching and lighting

The Contractor shall provide at their risk and cost all watching and lighting as necessary to safeguard the Works, plant and materials against damage and theft throughout the construction works until handover to the Client.

F. Signboard

The Signboard and lettering on same for the display of the General and Sub-Contractors' names shall be of an approved size with the Employers name painted thereon. The SSI and other Consultants names shall be printed in 50 mm letters all to the SSI's approved design. No other signboard or advertising will be permitted without prior permission from the IOM Engineer. Rates for Signboards will be requested in Bill of Quantities when required for the works.

G. Marking

The limits of the areas to be cleared will be marked by use of stakes, flags, tree markings or other suitable methods.
Trees to be left standing and uninjured will be designated by special markings placed on the trunks at a height of about 1.8 meters above the ground surface

PROTECTION AND CLEANING

A. Protection

The Contractor shall cover up and protect from damage, including damage from inclement weather, all finished work and unfixed materials, including that of Sub-Contractors, etc., to the satisfaction of the IOM Engineer until the completion of the Contract.

B. Cleaning

The Contractor shall, upon completion of the Works, at their own expense, remove and dear away all surplus excavated materials, plant, rubbish and unused materials and shall leave the whole of the Site and Works in a clean and tidy state to the satisfaction of the IOM Engineer, including clearing away and making good all traces of temporary access roads, offices, sheds, camps, etc.

Particular care shall be taken to leave clean all floors and windows and to remove all paint and cement stains. They shall also, at the discretion of the IOM Engineer, remove all rubbish and dirt as it accumulates. The Contractor is to find their own dump or as advised by the Health or local Authorities and shall pay all charges in connection therewith.

MISCELLANEOUS COSTS

A. Nominated Suppliers

The Cost of “Fix Only” materials to be obtained from Nominated Suppliers which are covered by Prime Cost or Provisional Sums shall include for taking delivery where directed, checking with invoices or indents, reporting and claiming damages for shortages and damaged goods, defraying demurrage, signing for as having been received in good order, transporting, unloading, storing, covering and protecting until the time of fixing, unpacking, replacing anything lost or damaged, sorting, assembling, hoisting to required levels and fixing as described.

Before placing any orders with Nominated Sub-Contractors or Nominated Suppliers the Contractor must ascertain that the terms and conditions of the quotations and the dates of delivery of materials or execution of works comply with the terms of Contract and the Progress Schedule.

B. Prime cost rates

Where the description of items includes a P.C. rate per unit this rate is to cover the net supply cost of the unit only. The Contractors price must include the cost of the unit at the rate stated, plus waste, taking delivery, storage, fixing in position, profit and overheads. The actual net cost per unit will be adjusted within the Final Account against the P.C. rate stated.

C. Other statutory obligations, notices, fees and charges

Notwithstanding any other statutory obligations, notices, fees and changes not listed above, the Contractor shall allow in his tender for all such costs incurred in complying with all statutory requirements and payment of all levies currently in force and affecting the construction industry.

SCOPE OF WORKS

The Scope of Works shall be defined for each piece of work undertaken by the SSI Technical Unit before any further activities are undertaken.

The scope of works will form part of the contract documentation.

The Works shall comprise but are not limited to the construction/rehabilitation of the following facilities:

1.

2.

3.

4.

5.

1. GENERAL DESCRIPTION OF MATERIALS AND WORKMANSHIP

1.1. Alterations additions and extensions

In alterations or extensions to existing buildings and/or external works new work is to match up in all respects to the existing work unless otherwise specified shown on the drawings or approved before-hand by the IOM Engineer.

1.2. Quality samples testing and approval

Materials, commodities components and equipment are to be new and unused unless otherwise specified or agreed with the IOM Engineer. Handle, store fix and protect all commodities with care to ensure that they are in perfect condition when incorporated into the work and handed over on completion.

1.3. Manufacturers' recommendations

Handle store and fix every commodity strictly in accordance with the printed or written recommendations of the manufacturer and/or supplier. Supply the IOM Engineer with copies of manufacturers' recommendations. Inform the IOM Engineer if the manufacturers' recommendations conflict with any other specified requirements and obtain his instructions before proceeding.

1.4. Standards

Where commodities or workmanship are specified by reference to British Standards (B.S or Codes of Practice C.P) or International (I.S.O) or other standards, such standards are deemed to be the latest published at the time of tendering.

The contractor will be deemed to have read and understood the standards specified and no claim for want of knowledge shall be entertained. The substitution of commodities or standards of workmanship complying with other standards may be allowed at the discretion of the IOM Engineer but application for permission for such substitution must be made in writing in sufficient time to allow adequate investigation. Obtain certificates of compliance with standards and supply to the IOM Engineer on request.

1.5. Local conditions

All materials, commodities, components and equipment must be suitable for use in tropical climates.

1.6. Samples

Where samples of commodities or specimen of finished work are specified, submit samples or specimens to the IOM Engineer and obtain his approval before confirming orders or carrying out the work.

Retain approved samples and specimens on site for comparison with the finished work. Finished work must conform in all respects to the samples or specimens approved. Remove samples and specimens when no longer required. The cost of supplying samples and specimens must be borne by the Contractor, but specimens may form part of the finished work when approved by the IOM Engineer.

1.7. Demolition and alteration of works on site

The Contractor is required to visit the existing building and ascertain for him/herself the nature of the works and no claim for lack of knowledge in this respect shall be entertained. The dimensions and quantities where stated in the Section are approximate and the contractor is referred to the site to ascertain the exact value and extent of the works.

The items of alterations are to include for both labour and materials and for any shoring, needling and strutting and temporary works in connection therewith. The contractor must allow in his prices for making good all works disturbed all trades and for carting away all rubbish.

During demolition works the Contractor shall keep the debris constantly watered to minimise the dust arising and this shall be included in the rates.

All rubbish shall be removed from the Site as soon as possible and not necessarily until after all the works are complete.

Where work is to be performed within occupied premises the Contractor is to erect dust-proof screens to the approval of the IOM Engineer where deemed necessary and to remove them on completion of the Works, all to the satisfaction of the IOM Engineer.

1.8. Interpretation of terms

'Demolish' shall be deemed to mean cutting away, breaking up, demolishing, pulling down, taking down, removing, etc. as the content requires and shall include in all cases temporarily strutting and supporting and making good the remaining works as necessary, and cleaning away and removing from Site all debris spoils, etc.

'Removal' shall mean taking down, hacking up, breaking down, removing etc. and clearing away from Site and all other expenses thereby entailed.

'Making good' shall mean all making good, fitting, facing up, plastering, paving, repairing, and painting to match and jointing to the remaining existing work.

'Adapting' shall mean cutting and fitting or lengthening as required to fit an existing opening or space

'To match' shall mean to be equal to relevant existing work in design workmanship and all other respects.

'Re-fixing' shall apply to existing materials arising from the Works and shall mean to take from stores and fix in new position including checking for satisfactory cleaning making good and adjusting as necessary.

2. EXCAVATIONS AND SITE CLEARANCE

2.1. Examine the Site

The Contractor is assumed to have examined the site carefully and ascertained for himself its nature and kind of materials to be excavated and cleared.

Excavations shall be the widths and depths indicated on the Drawings or to such lesser or greater depths as the IOM Engineer deems necessary and so instructs the Contractor in order to obtain satisfactory foundations.

Any difference in quality of the Works actually executed under such instructions and that provided in the Bills of Quantities shall be measured and valued by the IOM Engineer as a variation under the relevant Conditions of Contract.

If, however the Contractor excavates to any greater depths or widths than are shown on the Drawings or directed, then the Contractor shall, at his own expense, satisfactorily fill in such extra depth and width with concrete similar to that described for the foundation.

2.2. Bottoms of excavations to receive foundations

The Contractor shall report to the IOM Engineer when secure bottoms to the excavations have been obtained. Any concrete or other work executed before the excavations have been inspected and approved shall, if so directed, be removed and new work substituted after the excavations have been approved, all at the Contractors expense.

The surface of the bottoms of excavations to receive foundations shell be levelled or graded to fall as required.

2.3. Sides of excavations

Sides of Excavations shall be maintained vertical by means approved by the IOM Engineer, and the Contractor shall also allow for keeping same free from fallen material in his rates for excavations.

The Contractor shall also allow for keeping excavations free from water and mud by bailing, pumping or otherwise, in his rates for excavations.

2.4. Rock

Excavations in Rock shall exclude all materials which can be removed by hand and does not necessarily require the use of compressors or other mechanical equipment although the Contractor may use such equipment to loosen the materials for ease of its removal. All top soils, black cotton and other clay soil, murram, stone, and other fill and all similar materials will not be classified as rock.

Rock has been measured hereafter as extra over excavations for excavating in soft or hard rock.

Soft rock shall be deemed to mean any material which cannot reasonably be removed without the use of mechanical plant such as rippers, compressors, excavators, but which does not require drilling, wedging or blasting. Local tuffs, magadi, highly consolidated laterite weathered lavas, boulders or out crops of harder rock exceeding one cubic meter in volume, Nairobi building stone and similar material shall be classified as soft rock.

Hard Rock shall be classified as materials which is massive and geologically homogenous and which requires the use of drilling, wedging, or blasting for its removal such as black trap and similar materials.

The U IOM Engineer’s decision shall be final with regard to classification of excavated material.

2.5. Starting level

Unless otherwise described the starting level of all excavations has been measured form the level remaining after completion of reduced level excavations. However, the Contractor’s prices should include for carrying out the excavation work in any alternative sequence that may be required.

2.6. Blasting

No blasting shall be allowed without the prior approval of the Local Authorities and the IOM Engineer

2.7. Cart away

All surplus excavated materials where so directed and all rubbish are to be removed from the Site and the Contractor is to find his own dump site and shall pay all charges required by any Local Authority.

2.8. Borrow pits

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

2.9. Filling obtained from excavations

Filling obtained from surplus excavated material will only be incorporated if suitable material arises and is to be free from all weeds, roots vegetable soil or other unsuitable materials and is to be filled in layers each of not more than 250mm finished thickness. Each layer to be well wetted and consolidated as described hereafter.

2.10. Hardcore filling

Hardcore for filling under floors shall be good hard stone or quarry waste to be approved by the U IOM Engineer broken to pass not greater than a 150 mm ring or to be 75% of the finished thickness of the layers being compacted, whichever is less. Hardcore shall be free from all weeds, roots vegetable soil, clay, black cotton soil or other unsuitable materials.

It shall be well graded with smaller stones and fine materials to give a dense compact mass after consolidation. Sufficient fine material shall be added to each layer to give gradation of materials as necessary to obtain a solid compact mass after rolling. Hardcore filling shall be laid in layers each of a consolidated thickness not exceeding 250 mm. Each layer shall be compacted by at least 8 passes of a 10 ton smooth wheeled roller or a 2 ton vibrating roller until all movement ceases.

Sufficient water must be added to obtain maximum compaction to the IOM Engineer's approval. To each layer a 25 mm thick layer of sand complying with the specifications for fine aggregates for concrete shall be spread over the surface and forced into the hardcore by the use of a vibrating roller weighing not less than 2 tons; this operation should be carried out when the materials are dry and repeated whilst the sand is well watered. Should all the sand be absorbed the IOM Engineer may require a further layer to be applied and the process repeated.

The top surface of hardcore shall be levelled or graded to the falls as required and shall then be blinded with a layer of similar materials broken to 25mm gauge and surfaced with a 10 ton smooth wheeled roller. The surface so obtained shall be to the IOM Engineers approval.

2.11. Materials found in excavations

No sand, aggregate, murram, or other material found in the excavations is to be used in the Works without the permission of the IOM Engineer.

2.12. Rates for excavations

The rates for excavation, including excavation in rock, **MUST INCLUDE**, leveling and preparing bottoms and all faces to receive concrete, etc. and for any extra excavation required for planking and strutting.

Prices shall include for excavating in any material encountered unless specifically otherwise described handling etc of extra bulk after excavating, or before consolidating, any extra excavation required for formwork or planking and strutting, circular work, grubbing up any old drains, roots, etc., that may be encountered for trimming sides and leveling and ramming bottoms, forming stepping and trimming excavation or filling to embankments and batters as required.

In his prices for excavations the Contractor shall allow for keeping the whole of the excavations free from spring, Underground River or stream, drainage, storm or seepage water. The Contractor shall allow and make provision for keeping the whole of the Works thoroughly drained and clear of water below the lowest level of any part of them so long as may be required and if considered necessary by the IOM Engineer, continuously day and night by petrol or hand pumps or other mechanical appliances, pipes, chutes, dams, manholes, sumps, diversions or any other means necessary for that purpose. Water pumped from the trenches shall not be allowed to run down the road channels but shall be conveyed to the nearest surface water sewer, ditch or river through troughs, chutes or pipes.

2.13. Rates for disposal

Rates for disposal of excavated materials are to include for the selection of spoil as it arises and for all double handling and re-excavation from spoil heaps not specifically ordered by the IOM Engineer.

2.14. Diothene sheeting

Diothene sheeting shall be 1,000 gauge as described and as approved. Joints in sheeting shall be treble folded with 150mm fold and taped at 300mm intervals with 50mm wide black plastic adhesive tape as manufactured by Cello tape Limited. The sheeting shall not be stretched but shall be laid loose with sufficient wrinkles to permit shrinkage up to 15%.

2.15. Cutting down trees

The Contractor must consult the U IOM Engineer before cutting down or pruning and trees or shrubs encountered on the Site.

Trees and other woody vegetation designated to remain undisturbed shall be protected from damage throughout the entire construction period. Any damage resulting from the Contractor's operations or neglect shall be repaired by the Contractor.

Earth fill, stockpiling of materials, vehicular parking, and excessive foot or vehicular traffic shall not be allowed within the drip line of vegetation designated to remain in place. Vegetation damaged by any of these or similar actions shall be replaced with viable vegetation of the same species or as specified and approved by the Engineer.

3. CONCRETE WORK

3.1. Code of Practice

All workmanship, materials, tests and performances in connection with reinforced concrete work are to be in conformity with the latest edition of the British Standard Code of Practice (C.P 110 for "the Structural Use of Concrete") where not inconsistent with these Preambles.

3.2. Supervision

A competent person approved by the IOM Engineer shall be employed by the Contractor whose duty it will be supervise all stages in the preparation and placing of the concrete. Unless otherwise agreed all cubes shall be made and Site tests carried out under his direct supervision, in consultation with the IOM Engineer.

3.3. Contractor's plant, Equipment and Construction procedures

Unless otherwise agreed and only for large construction works, not less than 30 days prior to the installation of the Contractor's plant and equipment for processing, handling, transporting, storing and proportioning ingredients, and for mixing, transporting and placing concrete, the Contractor shall submit drawings for approval by the Engineer, showing proposed general plant arrangements together with a general description of the equipment he proposes to use.

After completion of installation, the operation of the plant and equipment shall be subject to the approval of the IOM Engineer.

Where these preambles, the Bills of Quantities or the Drawing require specific procedures to be followed, such requirements are not to be construed as prohibiting use by the Contractor of alternative procedures if it can be demonstrated to the satisfaction of the IOM Engineer that equal results will be obtained by the use of such alternatives.

Approval of plant and equipment or their operation, or of any construction procedure, shall not operate to waive any provision or requirements contained in these preambles governing the quality of the materials or of the finished work.

3.4. Tolerance

On all setting dimensions of 5 meters and over a maximum non-accumulative tolerance of plus or minus 5 millimeters will be allowed. On all setting out dimensions under 5 meters a maximum non-accumulative tolerance of plus or minus 3 millimeters will be allowed. On the cross-sectional dimensions of structural members, unless otherwise required by the Drawing, a minimum tolerance of plus or minus 3 millimeters will be permitted.

The top surface of concrete floor slabs and beams shall be within 6 millimeters of the normal level and line shown on the Drawings. Columns shall be truly plumb and non-accumulative tolerance of 3 millimeters in each storey and not more than 15 millimeters out of plumb in their full height will be permitted. The Contractor shall be responsible for the cost of all corrective measures required by the IOM Engineer to rectify work which is not constructed within the tolerance set out above.

3.5. Materials generally

All materials which have been damaged, contaminated or have deteriorated or do not comply in any way with the requirements of these Preambles shall be rejected and shall be removed immediately from the site at the Contractor's expense. No materials shall be stored or stacked on floors without the IOM Engineer's prior approval.

The source of supply for all materials used for concrete work shall be approved by the IOM Engineer before these materials are delivered on the Site. All materials shall comply with the requirements of the latest appropriate British Standard unless otherwise agreed with the IOM Engineer, whose approval shall be obtained in writing.

The suppliers of materials shall give the IOM Engineer access to their premises when directed for the purpose of obtaining samples of the materials for testing.

3.6. Samples

Samples of materials shall be submitted as soon as possible after the Contract is signed. No deliveries in bulk shall be made until the samples are approved by the IOM Engineer. All condemned material shall be removed from the Site within 24 hours.

Unless otherwise agreed every effort shall be made to enable the IOM Engineer to obtain samples and carry out tests on the materials and construction. If these tests show that any of the materials or construction does not comply with the requirements of this specification, the Contractor will be responsible for the costs of the tests and the replacement of defective materials and/or construction.

Samples of all materials proposed to be used shall be submitted to the Engineer and shall be tested where required, by the materials Branch of the Ministry of Works or other approved testing place, and receive his approval prior to being delivered in bulk upon the Works.

The Contractor's attention is drawn to the fact that the testing of samples of aggregate, sand and cement by the Materials Branch, MOW., takes time and it is of the utmost importance that the samples should be submitted for testing as soon as possible after the letting of the Contract. The Ministry will not accept any responsibility whatsoever for delay in the commencement of the Contract due to delay on the part of the Contractor in submitting samples.

3.7. Cement

Cement, unless otherwise specified, shall be Ordinary Portland Cement of a brand approved by the IOM Engineer and shall comply with the requirements of B.S. 12 with the exceptions that it may contain reactive volcanic ash (or not than 10% of the total weight) and the quality of insoluble residue permitted in B.S. 12 may be exceeded. A manufacturer's Certificate of Testing in accordance with B.S. 12 shall be supplied for each consignment delivered to the Site unless otherwise agreed.

Should the Contractor require using cement of the rapid hardening variety, he shall obtain the approval of the IOM Engineer and also obtain any instructions regarding modifications to these Preambles caused thereby. Any additional cost that may be caused by the use of rapid hardening cement shall be at the Contractor's expense.

Cement may be delivered to the Site either in bags or in bulk.

If delivered in bags, each bag shall be properly sealed and marked with the manufacturer's name and on the Site is to be stored in a weather-proof shed of adequate dimension with a raised floor. Each consignment shall be kept separate and marked so that it may be used in the sequence in which it is received. Any bag found to contain cement which has set or partly set, shall be completely discarded and not used in the Works. Bags shall not be stored higher than 1,500 mm in height.

If delivery in bulk the cement shall be stored in a weather-proof silo either provided by the cement supplier or by the Contractor, but in either case the silo shall be to the approval of the IOM Engineer.

3.8. Aggregates

The aggregates shall conform to the requirements of B.S. 882 and the sources and types of all aggregate are to be approved in all respects by the IOM Engineer before work commences.

The grading of aggregates shall be done within the limits set out in B.S 882 and as later specified and the grading, once approved, shall be adhered to throughout the Works and not varied without the approval of the IOM Engineer.

Fine aggregate shall be clean, course, siliceous sand of good, sharp, hard quality and shall be free from lumps of stone, earth, loam, dust, salt, organic matter and any other deleterious substances. It shall be graded within the appropriate limits set out in B.S. 882.

Coarse aggregate shall be good, hard, clean and durable crushed rock, crushed gravel or natural gravel, approved black trap or similar stone, free from dust, decomposed stone, clay, earthy matter, foreign, substances or friable thin elongated or laminated pieces. It shall be graded within the appropriate limits set out in B.S. 882 for its respective nominal size.

If in the opinion of the IOM Engineer the aggregate meets with the above requirements but is dirty or adulterated in any manner it shall be screened and/or washed with clean water if he so directs at the Contractor's expense.

Aggregates shall be delivered to the Site in their prescribed sizes or grading and shall be stockpiled on paved areas or boarded platforms in separate units to avoid intermixing. On no account shall aggregates be stockpiled on the ground.

3.9. Water

The water used for mixing concrete shall be from an approved source, clean, fresh, and free from harmful matter.

The amount of water to be used in any particular class of concrete shall ensure complete hydration and for thorough mixing and subsequent working of the concrete in place, taking into consideration the purpose for which the concrete is intended for and the method of compacting.

Therefore for given aggregates the cement content shall be sufficient to provide adequate workability with a low water/cement ratio so that the concrete can be completely compacted with the means available.

3.10. Ready mixed concrete

Ready-mixed concrete may only be used with the permission of the IOM Engineer.

3.11. Concrete mixes

Concrete mixes shall have been described either by the volumetric proportions or by the 28-day cube strength.

The maximum cement content shall not exceed 500kg/m^3 or as otherwise described in the contract or directed by the IOM Engineer.

Cement contents in excess of 500kg/m^3 should not be used unless special consideration has been given in design to the increased risk of cracking due to drying shrinkage in the sections or to thermal stresses in thicker sections.

Where the minimum dimension of concrete to be placed at a single time is greater than 600mm and especially where the cement content is likely to exceed 400kg/m^3 or more, measures to reduce temperature, such as selection of the cement type with slower release of heat of hydration may be considered.

3.12. Concrete strengths

Concrete mixes shall have the following minimum strengths as given by Works Cube Tests:-

Minimum Crushing Strengths at 28 Days

N/MM

Class 25 25

Class 20 20

The average strength obtained from cube tests shall be 10% higher than the minimum strengths shown above.

Works Cube Tests will not be required for class 15 blinding concrete which shall comprise 1: 4: 8 by volume

Volumetric mixes shall comprise the following:

Cement/Kg : Fine Aggregate/CM : Coarse Aggregate/CM

1: 2 : 4 50: 0 07 : 0.14

1 : 3: 6 50: 0.10 : 0.20

1: 4 : 8 50: 0.13 : 0.26

3.13. Testing Equipment

The Contractor shall provide the following equipment for carrying out control tests on the Site: -

a. Straight edge 3 meters and 1 meter long for testing the accuracy of the finished concrete

b. A glass graduated cylinder for use in the silt test for organic impurities in the sand;

c. Slump test apparatus;

d. Four 150 mm steel cube moulds with base plates and tamping rods to B.S. 1881

4. MEASURED PROPORTIONS OF CONCRETE

4.1. Cement

The quantity of cement shall be measured by weight. Where delivered in bags, each batch of concrete is to use one or more whole bags of cement.

4.2. Aggregates

Unless otherwise agreed concrete aggregates shall be measured by weight in a weight batching machine. Volume batching may also be accepted with prior approval by the IOM Engineer.

For Class 15 concrete and other volumetric mixes, aggregates may be measured by volume using approved gauge boxes of such sizes as to give the correct proportions.

Weight batching machines shall be of an approved type and shall be properly maintained and checked for accuracy at regular intervals.

4.3. Concrete classes 20 to 25

The weights of fine and coarse aggregate to be used in concrete classes 20 to 25 shall be within accepted limits to be agreed with the IOM Engineer.

The proportions of fine to coarse aggregate and cement which the Contractor proposes to use for each of the mixes specified shall first be approved by the IOM Engineer.

The IOM Engineer may require at any time during the Contract the proportions of fine to coarse aggregate to be altered in order to produce a mix of greater strength or improved workability and providing that the total proportions of aggregate to cement remain unchanged, no claim for additional cost will be considered.

4.4. Mechanical Mixing and Placing of Concrete

The concrete shall be mixed only in approved power-driven mixers of a type and capacity suitable for the work, and in any even not smaller than 0.40/ 0.28 m^3 capacity. Concrete mixers may be of the revolving drum or the revolving blade type and the mixing or blades shall be operated uniformly at the mixing speed recommended by the manufacturer. Mixers shall be fitted with an automatic recorder registering the number of batches discharged.

It is desirable for the mixers to be equipped with an accurate water measuring device. All materials shall be thoroughly dry before the water is added and the mixing of each batch shall continue for a period of not more than two minutes after the water has been added and until there is a uniform distribution of the materials and the mass is uniform in color.

The entire contents of the mixed drum shall be discharged before recharging. The volume of mixed materials shall not exceed the rate capacity of the mixer. Whenever the mixer is started, 100% extra cement shall be added to the first batch and no extra payment will be made on this account.

The slump of the concrete made with specified water content, using dry materials shall be determined and the water to be added under wet conditions shall be so reduced as to give approximately the same slump.

The concrete shall be mixed as near to the place where its required as is practicable, and only as much as is required for a specified section of the work shall be mixed at one time, such section being commenced and finished in one operation without delay. All concrete must be efficiently handled and used in the work within twenty (20) minutes of mixing. The temperature of the materials as charged into the mixer shall be such that the temperature of the mixed concrete at the time it is placed in final position does not exceed 30deg.C.

Mixing shall continue for at least 90 seconds, after all materials including water, which shall be added last of all, have been passed into the drum and before any portion of the batch is discharged.

It shall be discharged from the mixer direct either into receptacles or barrows and shall be distributed by approved means which do not cause separation or otherwise impair the quality of the concrete. Approved mechanical means of handling will be encouraged, but the use of chutes for placing concrete is subject to the prior approval of the IOM Engineer.

Concrete shall be placed from a height not exceeding 1,500 mm directly into its permanent position and shall not work along the shutters to that position. Unless otherwise approved, concrete shall be placed in a single operation to the full thickness of slabs, beams, and similar members, and shall be placed in horizontal layers not exceeding 1,500 mm deep in walls and similar members.

Concrete in columns may be placed to a height of 4 meters with careful placing and vibration with satisfactory results. Where the height of the column exceeds 4 meters suitable openings must be left in the shutters so that this maximum lift is not exceeded.

Concrete shall be placed continuously until completion of the part of the work between construction joints as specified hereinafter or of a part of approved extent. At the completion of a specified or approved part a construction joint of the form and in the positions hereinafter specified shall be made. If stopping of concreting be unavoidable elsewhere, a construction joint shall be made where the work stopped. A record of all such joints must be made by the contractor and a copy supplied to the IOM Engineer.

Any accumulation of set concrete on the reinforcement shall be removed by wire brushing before further concrete is placed.

The Contractor shall provide runways for concreting to the satisfaction of the IOM Engineer. Under no circumstances will the runways be allowed to rest on the reinforcement.

Care shall be taken that the concrete is not disturbed or subjected to vibrations and shocks during the setting period.

Mixing machines, platforms and barrows shall be clean before commencing mixing and be cleaned on every cessation of work.

Where concrete is laid on hardcore or other absorbent materials, the base shall be suitable and sufficiently wetted before the concrete is deposited.

4.5. Mixing of concrete by hand

Where it is not practical to employ machine mixing and approval has been obtained from the Engineer, concrete shall be mixed by hand as near as practicable to the site where it is to be deposited. Hand mixed concrete shall be made in batches of not more than 0.25 m3.

The mixing shall be done on a clean watertight, non-absorbent platform approved by the IOM Engineer. The cement and fine aggregate shall then be added and mixed dry until the mixture is thoroughly blended and uniform in color. The coarse aggregate shall then be added and mixed until the coarse aggregate is uniformly distributed throughout the batch. The correct quantity of water shall be added using a can with a nose nozzle and the mixing continued until the entire batch of concrete is homogenous and has the desired consistency.

Mixing shall be carried out until the whole batch has been turned at least three times dry and three times wet.

For hand mixing the cement content shall be increased by 10% over that required for machine mixing.

The platform shall be emptied before a subsequent batch is mixed and thoroughly cleaned, if not in use for more than 30 minutes, before the next batch is prepared.

4.6. Compaction

At all times during which concrete is being placed, the Contractor shall provide adequate trained and experienced labor to ensure that the concrete is compacted in the forms to the satisfaction of the IOM Engineer.

Concrete shall not be placed at a rate greater than that which permit satisfactory compaction nor to a depth greater than 400 mm before it is compacted.

During and immediately after placing, the concrete shall be thoroughly compacted by means of constant tamping, spading, slicing and vibration. Vibration is required for all concrete of Class 40, 35 and 25.

Care shall be taken to fill every part of the forms to work the concrete under and around the reinforcement without displacing it and to avoid disturbing recently placed concrete which has begun to set.

Any water accumulation on the surface of newly placed concrete shall be removed and no further concrete shall be placed there until such water is removed.

Internal vibrators shall be of a frequency of not less than 7,000 cycles per minute and shall have a rotating eccentric weight of at least 0.50 kg, with an eccentricity of not more than 12 mm. Such vibrators shall visibly affect the concrete within a radius of 250 mm from the vibrator.

Internal vibrators shall not be inserted between layers of reinforcement less than one and one half times the diameter of the vibrators apart. Contact between vibrators and reinforcement and vibrators and formwork shall be avoided.

Internal vibrators shall be inserted vertically into the concrete wherever possible at not more than 500 mm centers and shall constantly be moved from place to place. No internal vibrator shall be permitted to remain in any one position for more than ten seconds and it shall be withdrawn very slowly from the concrete.

In consolidating each layer of concrete the vibrating head shall be allowed to penetrate and re-vibrate the concrete in the upper portion of the underlying layer. In the area where newly placed concrete in each layer joins previously placed concrete more than usual vibration shall be performed, the vibrator penetrating deeply at close intervals along these contacts. Layers of concrete shall not be placed until layers previously placed have been vibrated thoroughly as specified. Vibrators shall not be used to move concrete from place to place in the formwork.

At least one internal vibrator shall be of the high frequency low amplitude type applied with the principle direction of vibration in the horizontal plane. They shall be attached directly to the forms at not more than 1,200 mm centers.

In addition to internal and external vibration the upper surface of suspended floor slabs shall be leveled by tamping or vibrating to receive finishes. Vibrating elements shall be of low frequency high amplitude type operating at a speed of not less than 3,000 r.p.m.

Construction joints shall be permitted only at the positions predetermined on the Drawing or as instructed on the Site by the IOM Engineer. In general they shall be perpendicular to the lines of principle stress and shall be located at points of minimum shear, viz, vertically at, or near, mid-spans of slabs, ribs and beams.

4.7. Formwork for structures

Formwork shall include all temporary forms required for forming the concrete together with all temporary construction required for the support. All formwork shall be so constructed that there shall be no loss of material from the concrete and shall be of sum quality and strength as will ensure rigidity throughout the placing, compaction and setting of the concrete. After hardening, the concrete shall be in the position and of the shape, dimensions and surface as described in the contract.

Falsework or centering shall be founded upon a solid footing safe against undermining and protected from softening. Falsework which cannot be founded on satisfactory footing shall be supported on piling which shall be spaced, driven and removed in a manner approved by the IOM Engineer.

The design of the forms shall also take into account the effect of vibration of concrete as it is paced. They shall be built mortar tight and *of* sufficient rigidity to prevent distortion due to the pressure of concrete and other loads incidental to the construction operations and so as to prevent warping and the opening of joints due to shrinkages of the timber.

The form shall be so constructed that they shall be capable of being removed without shock, vibration or damage to the concrete. All forms for beams and similar members shall be designed and constructed so that the sides may be removed without disturbing the bottom boards or supports thereof. The supporting struts shall be adjusted and securely fixed in position by approved means.

Form clamps, bolts and anchors shall be used to fasten forms. The use of wire ties to hold forms in position during placing of concrete will not be permitted. Bolts or clamps shall be positive in action and shall be of sufficient strength and number to prevent spreading or springing of the forms. They shall be of such type that they can be entirely removed or cut back 25mm or more below the finished surface of the concrete leaving no metal within 25mm of the concrete surface. The cavities shall be filled with grout and the surface left sound, smooth, even and uniform in color.

Where reinforcement passes through the faces of a construction joint the stopping off board shall be drilled so, that the bars can pass through, or the board shall be made In sections with a half round indentation in the joint faces for each bar, so that when placed, the board is a neat and accurate fit and no grout leaks from the concrete through the bar holes or joints.

Where holes are to be provided in formwork for weep holes and the like, they shall be neatly trimmed off to fit the pipe and caulked with an approved material to form a waste-tight joint

Formwork for columns and small concrete sections, or where directed by the IOM Engineer, shall be fitted with trap doors through which saw dust, shaving and other debris can be removed.

All formwork for new lifts of concrete shall be tightly and accurately fitted against the concrete already cast to ensure that the surface of the new work will be quite flush and in line with that of the old one.

All surfaces of the formwork which come into contact with the wet concrete shall be treated with an approved non-staining mould oil or similar oil. Any material which will adhere to or discolor concrete shall not be used. The Contractor shall ensure that the oil will be kept from contact with the reinforcement or embedded fittings.

All forms shall be set and maintained true to the line designated until the concrete is sufficiently hardened. Forms shall remain in place for periods which shall be as specified in the Table below. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the IOM Engineer shall order the work stopped until the defects have been corrected.

Formworks shall be provided for concrete surfaces at slopes of 30 degrees to the horizontal or steeper. Surfaces at slopes less than 20 degrees may be formed by screeding. Surfaces at slopes between 20 degrees and 30 degrees shall generally be formed unless the Contractor can demonstrate to the satisfaction of the Engineer that such slopes can be screeded with the use of special screed boards to hold the concrete in place during vibration.

Horizontal or inclined formwork to the upper surface of concrete shall be adequately secured against uplift due to pressure of fresh concrete. Formwork to voids within the body of concrete shall also be tied down or otherwise secured against floating.

All timber used for forms, false work and centering shall be sound wood, well-seasoned and free from loose knots, shakes, large cracks, warping and other defects. Before use on the work, it shall be properly stacked and protected from injury from any source. Any timber which becomes badly warped cracked, prior to the placing of concrete shall be rejected.

Where steel shuttering is to be used, it shall be of approved manufacture and panels shall fit tightly and accurately to form a true surface and joints, which will not allow the escape of liquid from the concrete. All rivets and bolt heads must be countersunk on the inside face and finished flush, so as to leave no mark on the resulting concrete surface. The provisions for timber shuttering specified above shall also apply to steel shuttering where applicable.

All formwork shall be approved by the IOM Engineer before concrete is placed within it. The Contractor shall, if required by the Engineer, provide the later with copies of his calculations, of the strength and stability of the formwork or false work, but notwithstanding the Engineer's approval of these calculations, nothing will relieve the Contractor of his responsibility for safety or adequacy of the formwork.

The rates for formwork shall include for the cost of submission of details, providing and transporting all materials for formwork and False work, erection including provision of supports, fillets and chamfers 75mm and less in width, bolts, ties, fixings, cutting to waste, drilling or notching the formwork for reinforcement where required.

4.8. Removing of formwork

In the determination of the time for the removal of forms and False work, consideration shall be given to the location and character of the structure, the weather and other conditions influencing the setting of the concrete and the admixture used in the mix.

No formwork shall be removed without the prior approval of the IOM Engineer and in no case shall shuttering of props be removed before the periods mentioned in the Table below have elapsed after placing the concrete.

Compliance with these requirements shall not relieve the Contractor of his obligation to delay the removal of the forms, if the concrete has not set sufficiently hard.

Minimum period for formwork removal

POSITION OF FORMWORK	MINIMUM PERIOD FOR TEMP. OVER 10º C.	STRENGTH TO BE ATTAINED
Vertical or near vertical faces of mass concrete	24 hours	0.2C
Vertical or near vertical faces of reinforced walls, beams and columns	48 hours	0.3C
Underside of arches, beams and slab formwork only	4 days	0.5C
Supports to underside of arches, beams and slabs	14 days	C
Arched linings in tunnels and underground works	24 hours	4N/mm2

Note: C is the nominal strength for the class of concrete used.

When shuttering is removed after 3 days it will be necessary to ensure that the exposed surfaces of the concrete are kept thoroughly wetted for the period of curing specified in this section.

Forms shall be removed in such a manner as will not injure the concrete. The formwork shall be removed by gradual easing without jarring and only under competent supervision. Before removal of the shuttering, the concrete shall be examined and removal shall only be proceeded with, if the concrete has attained sufficient strength to sustain all the loads to which it will be subjected.

The Contractor shall be responsible for any injury or damage to the work caused by or arising out of the removal of formwork and props and any advice, permission or approval given by the IOM Engineer relative to the removal of formwork and props shall not relieve the Contractor of this responsibility. Any work showing sign of damage through premature removal of shuttering or through premature loading shall be entirely reconstructed at the Contractor's expense.

Where props are to be left in position under slabs and beams, the formwork shall have been made in such a fashion, that it can be removed without disturbing the props in any way. Otherwise it must be left in position for the full period that the props are left in position.

False work supporting any span of a continuous or rigid frame structure shall not be released before the period specified for the concrete placed in that span. The same shall apply for the adjacent portions of each adjoining span over a distance of at least half the length of the span where false work is to be released.

The shuttering for any part of a structure supported by concrete placed subsequently to that in, or on the shuttering, shall rot be removed until the supporting concrete has matured, and such shuttering shall be prominently marked with a warning against premature removal.

The structure shall not be assumed to be capable of carrying its full load until 28 days have elapsed from completing the placing of the concrete.

All False work materials shall be completely removed. False work piling shall be removed to at least 0.5m below the surface of the original ground or original stream bed.

4.9. Construction joints

Suspended concrete slabs are generally to be cast using alternate bay construction in bays not exceeding 20 meters in length. No two adjacent bays are to be cast within a minimum period of 48 hours of each other. The joints between adjacent bays are to be in positions agreed with the IOM Engineer.

Under no circumstances shall concrete be allowed to tail off, but it shall be deposited against stopping-off boards

Before placing new concrete against concrete already hardened, the face of the old concrete shall be thoroughly hacked, roughened and cleaned, and laitance and loose materials removed there from, and immediately before placing the new concrete the surface shall be saturated with water and covered with a coat of mortar at least 25 mm in thickness composed of cement and fine aggregate in the proportion used in the concrete.

4.10. Curing and Protection

Care must be taken that no concrete is allowed to become prematurely dry and the fresh concrete must be careful]y protected within two hours of placing from rain, sun and wind by means of Hessian sacking, polythene sheeting, or other approved means. Curing by covering with sand will no longer be accepted. This protective layer and the concrete itself must be kept continuously wet for at least seven days after the concrete has been placed. The Contractor will be required to provide complete coverage of all fresh concrete for a minimum period of 7 days. Hessian or polythene sheeting shall be in the maximum widths obtained and shall be secured against wind. The Contractor will not be permitted to use old cement bags, sand, Hessian or other material in small pieces

Concrete in foundations and other underground work shall be protected from mixture with falling earth during and after placing.

Traffic or loading must not be allowed on the concrete until the concrete is sufficiently mature, and in no case shall traffic or loading be of such magnitude as to a cause deflection or other movement in the formwork or damage to the concrete members. Where directed by the IOM Engineer props may be required to be left in position under slabs and other members for greater periods than those specified above.

4.11. Faulty Concrete

Any concrete which fails to comply with these preambles, or which shows signs of setting before it is placed shall be taken out and removed from the site. Where concrete is found to be defective after it has set, the concrete shall be cut out and replaced in accordance with the IOM Engineer’s instructions.

On no account shall any faulty, honeycombed, or otherwise defective concrete be repaired or patched until the IOM Engineer has made an inspection and issued instructions for the repair. The whole of the cost whatsoever, which may be occasioned by the need to remove faulty concrete, shall be borne by the Contractor.

4.12. Rod Reinforcement

The steel reinforcement shall comply with the latest requirements of the following British Standards: -

Hot rolled bars to B.S. 4449 (metric units)

Reinforcement of concrete

Cold worked steel to B.S. 4461 (metric units)

Reinforcement of concrete.

Unless otherwise agreed the Contractor will be required to submit a test certificate of the rolling. Reinforcement shall be stored on racks above ground level. All reinforcement shall be free of loose mill scale or rust, grease, paint or other substances likely to reduce the bond between the steel and concrete.

4.13. Fabric Reinforcement

To be electrically cross-welded steel wire mesh reinforcement to B.S. 4483, 1969 and of the size and weight specified.

4.14. Fixing Rod Reinforcement

Reinforcement shall be accurately bent to the shapes and dimensions shown on the Drawings and Schedules and in accordance with B.S 4466 (1969). Reinforcement must be cut and bent cold and no welded joints will be permitted unless so detailed.

Reinforcement shall be accurately placed in position as shown on the Drawings, and before and during concreting, shall be secured against displacement by using No. 18 S.W.G annealed binding wire or suitable clips at intersections, and shall be supported by concrete or metal support, spacers or metal hangers to ensure the correct position and cover.

No concreting shall be commenced until the IOM Engineer has inspected the reinforcement in position and until his approval has been obtained and the Contractor shall give two clear days' notice of his intention to concrete.

The Contractor is responsible for maintaining the reinforcement in its correct position, according to the Drawings, before and during concreting. During concreting a competent steel fixer must be in attendance to adjust and correct the position of any reinforcement which may be displaced. The vibrators are not to come into contact with the reinforcement.

4.15. Position and Correctness of Reinforcement

Irrespective of whether any inspection and/or approval of the reinforcement has been carried out as above, it shall be the contractor's sole responsibility to ensure that the reinforcement complies with the details on the Drawings or Schedule and is fixed exactly in the positions shown therein and in the positions to give the prescribed cover. The Contractor will be held entirely responsible for any failure or defect in any portion of the reinforced concrete structure and including any consequent delay, claims, third party claims, etc. where it is shown that the reinforcement has been incorrectly positioned or is incorrect in size or quantity with respect to the detailed Drawings of Schedules.

4.16. Spacer Blocks

Spacer blocks of approved size and shape made of concrete similar to that used in the surrounding construction and fixed to the reinforcement or formwork by No. 18 S.W.G. wires set into the spacer blocks or other approved means shall be provided where necessary to ensure that the requisite cover is obtained.

Where hollow concrete block construction is used, spacer blocks are to be provided as described above made to fit the width of the rib less 3 mm tolerance and with single or double grooves (depending on the number of reinforcement bars used per rib) in the top surface with wire ties at each groove.

4.17. Concrete Cover to Reinforcement

Unless otherwise directed the concrete cover to rod reinforcement over main bars on any face shall be:

Foundation against each face 75 mm

Foundations against blinding 50 mm

Columns 40 mm

Beams 25 mm

Slabs 20 mm

5. WALLING

5.1. Stone

Stone for wall shall be hard, dense stone, obtained from an approved quarry. Samples of stones shall be deposited with the IOM Engineer at least 14 days prior to the start of the works. Stone walling described as load-bearing shall have a minimum crushing strength of 3.50N/sq.mm and shall comply with CP. 111: Part 2.

5.2. Concrete Blocks

All hollow or solid concrete blocks for general use shall comply with B.S. 2028 Type 'A' of minimum crushing strength of 3.5 Newton's per square millimeter, and must be obtained from an approved manufacturer, equal to samples deposited with and approved by the IOM Engineer.

All concrete blocks must be cured for a minimum period of four weeks before use and all testing of blocks is to be carried out by an approved Ministry of Works Materials Testing Laboratory.

5.3. Bricks

All bricks shall be of sizes as required and shall be hard, sound, square, well burnt, uniform in shape and free from cracks, stones and other defects. Samples of bricks shall be deposited with and be approved by the IOM Engineer before being used and all subsequent bricks in the works shall be equal to the approved samples.

5.4. Concrete Vent Blocks

Concrete vent blocks or air bricks shall be standard louver type, size 225 mm x 22 5mm high.

5.5. Wall Reinforcement

All 150 mm and 100 mm walling shall be reinforced with 20 Gauge hoop iron 25 mm wide, or similar reinforcement centrally in joints at approximately 450 mm centers (vertically for the full length of the walls, lapped and crimped 300 mm at running joints and full width of wall at angles and intersections).

5.6. Wall Ties

20 Gauge hoop iron ties 25 mm wide and 450 mm long to be provided at every alternate course at all connections between block wall and reinforced concrete columns or walls, one end to be cast into the concrete and the other bent and built into mortar joint of walling.

5.7. Chasing

Chasing in load-bearing walling of electrical conduit, pipes, etc, is to be kept to a minimum size of cut and positions and runs chases are to be approved by the IOM Engineer before any cutting is commenced. Horizontal runs will not be permitted.

5.8. Mortars

Cement mortar shall consist of one part of Portland cement, to three parts of sand by volume.

The cement/lime mortar shall consist of one part of Portland cement, one part of lime and six parts of sand by volume.

The ingredients of mortar shall be measured in proper gauge boxes on a boarded or metal platform, the ingredients being thoroughly mixed dry, and again whilst adding water. In the case of cement lime mortar, the sand and lime shall be mixed first and then the cement added.

All mortar is to be thoroughly mixed to a uniform consistency with only sufficient water to obtain a plastic condition suitable for troweling. No mortar that has commenced to set is to be used or remixed for use.

5.9. Setting Out

The Contractor shall provide proper setting out rods and set out on the same all work showing opening, sills and lintels and shall build the various walls and piers to the thickness, widths and heights shown upon the Drawings.

No part of the walling shall be carried up more than 1 meter higher at one time than any other part and in such cases the jointing shall be made in long steps so as to prevent cracks arising and all walls shall be leveled round at floor and wall heads. At no time shall more than 5 courses of blocks be laid in any one day during construction.

5.10. Bonding Walling

All blocks shall be properly bonded together and in such a manner that no vertical joint in any one course shall be within 100 mm of a similar joint in the courses immediately above and below. Alternate courses of walling at all angles and intersections shall be carried through the full thickness of the adjoining walls.

All reveals, quoins and other angles and joints of the walls, etc., shall be built strictly true and square. New walling is to be bonded into existing at junction, except at expansion joints.

5.11. Laying and Jointing

All bricks and blocks are to be well wetted before laying and tops of walls left off shall be well wetted before commencing building. All joints are to be 10mm thick and flushed up and grouted in solid as the work proceeds

All exposed faces of walls for plastering are to be left rough and the joints raked out while mortar is green to form adequate key.

All other shall be cleaned down on completion with a wire brush or as necessary and mortar dropping, smear marks, etc., removed and rates must include for this.

5.12. Fair face

Walling described as fair faced shall be built with selected blocks and pointed with neat flush joints. Stone walling shall be fine chisel dressed.

5.13. Damp-proof Courses

Damp-proof courses shall be bituminous felt to B.S 743, weighing 4 Kg per square meter, free from tears and holes and be laid with 150 mm minimum laps on and including a leveling screed of cement mortar.

5.14. Prices to Include

The prices for walling shall include for all straight cutting, bonding, plumb angles, forming reveals, pinning up to underside of concrete soffits and cutting up to sides of columns and cutting and pinning ends of lintels and sills.

6. ROOFING AND RAINWATER DISPOSAL

6.1. Preparation of Surfaces

All materials to receive roofing shall be clean, dry, free of fins or projections and loose materials, and with cracks or voids filled with cement mortar.

6.2. Protection

All roofing surface shall be kept clean and protected and handed over watertight at completion.

6.3. Concrete Tile Roofing

Concrete single lap tiles fittings shall be to B.5 473 & 550 Part 2, Group B, of the color, finish, type, and manufacturer approved by the U IOM Engineer. A full range of fittings must be available to match the tiles and shall be specified.

Tiles and fittings must be true to shape and uniform structure. Surface coating shall be firmly bonded. Fixing shall include nailing to battens at every third course, at eaves, verges, and at the top course under the ridge. Ridge and hips shall be bedded in cement mortar and roofs shall be left water tight.

6.4. Rainwater Disposal Goods

Gutters and down-pipes shall be in 24 gauge galvanized mild steel.

7. CARPENTRY AND JOINERY

7.1. Species of Timber

The following timber shall be used:

Standard Common Name: Botanical Name

Cypress: Cypress spp.

African Mahogany: (Munyama) Khaya anthotheca

Pine:

7.2. All Timber

All timber shall be accordance with the latest approved Grading Rules issued by the Government of Somalia (Legal Notice No. _____).

All timber for permanent work on the building shall before use be approved by the IOM Engineer and shall be of the best quality in accordance with the timber Grading Rules.

All carpentry timbers are to be used seasoned to moisture content of not more that 18% of the dry weight. All joinery timbers are to be seasoned to moisture content of not more than 10% of the dry weight.

Plywood shall be in accordance with B.S 1455.

Timber for structural use to be Special Structural, Pine or Cypress.

Timber for Carpentry shall be SECOND (OR SELECT) GRADE and timber for joinery shall be FIRST (OR PRIME) GRADE.

7.3. Generally

All timber as it arrives on Site shall be inspected by the Contractor, and any timber brought on the Site and not complying with the Specification or not approved, must be removed forthwith from the Site and only timber as approved shall be used in the Works

The Contractor shall upon signing the Contract purchase sufficient supplies of specified hardwoods to avoid possible shortage at a later date.

7.4. Insect Damage

All timber 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 any work necessary to eradicate insect attack of timber which becomes evident, including the replacement of timber attacked or suspected of being attacked, notwithstanding that the timber concerned may have already been inspected and passed as fit for use.

7.5. Seasoning of Timber

All timber shall be seasoned to a moisture content of not more than 18% for Carpentry and 10% for joinery.

7.6. Pressure Impregnated Preservative Treatment

All carpentry timbers, sawn joinery and timber grounds for fixing joinery shall be treated with pressure impregnated “Celcure” or “Tenalith” solution with a minimum net retention of 0.35 lbs of dry salt per cubic foot. If so required “charge sheets” issued after treatment with “Celcure” or “Tenalith” shall be submitted by the Contractor to the IOM Engineer for his retention. All cut ends and any other faces of timbers sawn after treatment shall be treated before fixing with” Celcure B” or “Wolmanol” solution brushed on.

The Contractor’s prices for such timber hereinafter must allow for the above treatment.

7.7. Clearing up

The Contractor is to clear out and destroy or remove all cut ends, shaving and other wood waste from the parts of the buildings and the Site generally, as the work progresses and at the conclusion of the work.

This is to prevent accident borer infestation and to discourage termites and decay.

7.8. Workmanship

All Carpenter's work shall be accurately set out in strict accordance with the Drawings and shall be framed together and securely fixed in the best possible manner with properly made joints; all brads, nails and screws, etc., shall be provided as necessary, directed and approved, and the Contractor's prices shall allow for all the foregoing.

All workmanship shall be of the best quality.

All Carpenters' work shall be left with sawn surfaces except where particularly specified to be wrought.

7.9. Jointing

All timber shall be as long as possible and practicable to eliminate joints. Where joints are unavoidable surfaces shall be in contact over the whole area of the joint before fastenings are applied.

No nails, screws, or bolts are to be fixed in any split end. If splitting is likely, or is encountered in the course of any work, holes for nails are to be prepared at diameter not exceeding 4 of the diameter of the nails. Clenched nails must be bent at right angles to the grain.

Lead holes are to be bored for all screws. When the use of bolts is specified the holes are to be bored from both sides of the timber and are to be of the diameter D + D/6, where D is the diameter of the bolt. Nuts must be brought up tight but care is to be taken to avoid crushing of the timber under the washers.

8. JOINERY

All joinery shall be accurately set out with all joints, ironmongery and other works connected there with fully delineated.

All joinery shall be executed with workmanship of the best quality. All work must be planed, sanded and finished to the approval of the IOM Engineer. All joinery has been described by nominal sizes and a 3mm reduction off specified sizes will be allowed for each wrought face except where described as finished sizes in which case joinery shall hold up full dimensions

All framed work shall be cut, properly tendoned, shouldered and framed together.

Any fixed joinery, which is liable to become bruised or damaged in any way shall be properly, cased and protected by the contractor until completion of the works.

All wrought timber dimensions given in the bills of quantities are finished sizes unless otherwise stated.

Should any of the joinery shrink, warp, wind, or develop any other defects within the defects liability period specified in the contract, the same shall be removed and new fixed in its place together with all the other work that may be affected thereby all at the contractor's expense.

Reasonable tolerance shall be provided at all connections between the joinery works and the building so that any irregularities or other movements shall adequately be allowed for.

All cornice, architrave, frames and other joinery works shall be accurately scribed to fit in the contour of any irregular surfaces against which they may be required to form a close butt connection.

The arrangement, joinery and fixing of all joinery shall be such that shrinkage in any part and in any direction shall be compensated for and not impair the strength or appearance of the work or cause damage to adjacent structures.

All pencil marks are to be removed before oiling or varnishing joinery work. All joinery work to be finished perfect and clean without nail holes, clean up all waste and protect finished work from staining or damage.

Woodwork to receive finishes other than paint shall have all stains and pencil marks removed, be well rubbed down and all defects leveled up with hard stopping of a color to match the adjoining surface.

Woodwork to be clear varnished shall be well rubbed down and the varnish is to be applied with a fine hair brush, rubbed back with the fine graded steel wool between coats and afterwards buffed up to produce an approved finish.

Insulating boards or similar surfaces shall be filled and made good as necessary and lightly brushed down to remove all dirt, dust and loose particles.

8.1. Fixing Joinery

All beads, fillets and small members shall be fixed round or oval brads or nails well punched in and stopped. All larger members shall be fixed with screws. Brass screws shall be used for fixing of all hardwoods, the heads let in and pelleted over with wood pellets to match the grain.

8.2. Bedding Frames, etc.

The Contractor's rates must include for bedding frames, sills, etc., in mortar or dressing surfaces of walls, etc.in lieu.

8.3. Plugging Concrete and Walls

Round wood plugs shall not be used. All work described as plugged shall be fixed with screws to plugs formed by drilling concrete, walls, etc., with a proper tool of suitable size at 750 mm spacing and filling the holes completely with" Philplug" rawl plastic or "Rawlplugs" in accordance with the manufacturer's instructions. Alternatively, and where so agreed by the IOM Engineer, hardwood dovetailed fixing slips, dipped in "Wolmanol" or"Celcure B" solution cut and pinned or bedded in cement mortar (1:3) may be used.

8.4. Fiberboard

Fiberboard shall be 12mm "Celotex", or other equal and approved termite-proofed soft board, cut to panels with V-edges.

8.5. Plywood

Plywood shall be manufactured to comply with B.S. 1455 (Grades br 2, Type INT for Interior work"; type WPB for "exterior work) Marine plywood shall comply with B.S. 1088

8.6. Block board

Block board shall be laminated board to approval, and exposed edges shall be lipped with 20 mm hardwood and rates shall include for lipping.

8.7. Chipboard

Chipboard shall be manufactured to comply with B.S. 5669

8.8. Flush Doors

Semi-solid flush doors shall be manufactured to the thickness specified and consist of 100 mm wide framing all round with minimum 25 mm thick horizontal core battens at not more than 75 mm centers, pressure-impregnated as described and bored with 15mm diameter ventilation holes at 300 mm centers. Doors shall have two lock blocks and be faced both sides with 6mm plywood requirement of B.S 459 Part 2A, and equal to an approved sample.

8.9. Ironmongery

All locks and ironmongery shall be fixed with screws, etc., to match. Before the woodwork is painted, handles shall be removed, carefully stored and re-fixed after completion of painted and locks oiled and left in perfect working order. All keys shall be labeled with the door reference marked on labels before handling to the IOM Engineer on completion.

Rates for fixing are to include for all cutting, sinking, boring, mortising and fitting in hardwood or soft wood or metal sections and for supplying all necessary and matching screws.

Rates for door furniture shall also include for fixing prior to painting and for labeling all keys with door references and handing to the Client.

All locks, springs and other items of the ironmongery with movable parts shall be properly tested, oiled, cleaned and adjusted where necessary and left in a perfect working condition upon completion of the works by the Contractor.

All ironmongery already fixed to be covered before painting doors. If any paint should get on to the ironmongery, it must be removed with chemical solvents and not scratched off.

All door ironmongery to be checked and adjusted and all moving parts lubricated. Faulty or weak springs are to be replaced at no extra cost to the contract.

8.10. Prices to Include

Prices of items hereafter shall include for the foregoing labor etc., and in addition the prices of linear items are included all internal and external angles, either mitred or tongued, all fair, fitted, stopped notched or returned ends, all similar incidental labors and all short lengths.

8.11. Nails, Screws and Bolts

Nails, screws and bolts shall be of best quality mild steel of lengths and weights approved by the IOM Engineer. Nails shall be to B.S. 1202 and bolts to B.S. 916

Bolts shall project at least two threads through nuts and all bolts passing through timber shall have washers under heads and nuts.

9. METAL WORK

9.1. All Materials

All materials shall be the best quality, free from defects. The materials in all stages of transportation, handling and pilling shall be kept clean and damage from breaking, bending and distortion prevented.

9.2. Strut and Steel Work

Materials and workmanship shall conform to the requirements of B.S. 449 Steel frames, trusses and purlins shall be carried out by a Nominated Sub-Contractor.

9.3. Nails Screws and Bolts

Nails, screws and bolts shall be of best quality mild steel of lengths and weights approved by the IOM Engineer. Nails shall be to B.S. 1202 and bolts to B.S. 916

Bolts shall project at least two threads through nuts and all bolts passing through timber shall have washers under heads and nuts.

9.4. Workmanship

All work shall be neatly carried out in the most workmanlike manner and strictly as directed by the IOM Engineer. Welding shall be neatly cleaned off and units shall be prefabricated in the workshop wherever possible, the minimum of site welding being employed.

All screwed work shall have full internal and external threads and holes shall have been cleaned off.

Countersinking must be concentric.

9.5. Rainwater Goods

Prices shall include for building in, casting in or cutting mortices for fastenings, all making good, jointing, short lengths and all extra joints in the case of fittings.

9.6. Metal Windows and Doors

Metal windows and doors shall be manufactured to B.S. 990 from hot rolled mild steel sections produced by reputable mills and to be of dimensions and weights laid down in B.S. 990. All large casements and doors are to be made from heavy sections.

Corners of frames are to be mitred and welded, and glazing bars, etc., either tendon riveted or welded into frames. Top-hung on steel hinges and fitted with bronze peg stays. Side-hung casements are to be hung on projecting hinges and fitted with bronze single point handle and cabin hook with concealed sliding stays.

9.7. Fixing Metal Windows and Doors

The Contractor's prices for fixing metal windows, door, etc, shall include for assembling and fixing, including screwing to wood frames or cutting mortices for lugs in concrete or walling and running with the cement mortar (1:4), bedding frames in similar mortar and bedding sills, and transoms, making good plaster around both sides, and fixing, oiling and adjusting all fittings and frames.

9.8. Quality of Materials and Workmanship

The quality and workmanship of materials used in this Contract shall conform to the requirement of the following British Standard:

B.S. 15 - Mild steel for general structural purposes.

B.S. 449 - The use of structural steel in building

B.S. 442 - Hot Rolled Hollow Sections

B.S. 994 - Cold Rolled Steel Sections

8.5. 938 - General requirements for the Metal Arc Welding of structural steel tubes to B.S. 1775

B.S. 1856 - General requirements for the Metal Arc Welding of mild steel.

B.S. 639 - Covered Electrodes for the Metal Arc Welding of Mild Steel

Materials may be required at any time to be tested in accordance with the British Standards listed above.

The cost of successful tests will be borne by the Client, but the Sub-Contractor shall supply at his own expense test specimens when required. The cost of tests which do not comply with the Standard will be borne by the Sub-Contractor.

9.9. Structural Hollow Sections

All hollow sections are to be connected by electric welding.

For butt welds the fusion surfaces of each member must be properly aligned and prepared.

9.10. Electric Welding

All welding is to be accordance with the requirements of B.S. 1856 and 938 and the electrodes shall comply with B.S. 639.

Fusion faces shall be free from irregularities which could interfere with the welding material. These faces shall also be free from any deleterious material such as rust, grease and paint.

All welds shall be of the specified finished sizes and the sequence of the welding shall be carried out in a manner that will give minimum distortion to the welded parts.

Edges for welding shall be prepared by planning or machine flame cutting

During welding all parts will be maintained in their correct position.

Welding shall be carried out with each closely following the one prior with sufficient time between to allow removal of slag.

Each run of weld is to be inspected and the Sub-Contractor shall ensure that unsatisfactory welds are cut out or remade to the required standard.

The minimum size of fillet weld shall be 6mm

All completed welds shall have a regular and smooth surface. The weld material shall be solid with complete fusion throughout the weld and to the farecut metals.

Any defects shall be out or made good to approval.

External faces of butt welds to be ground smooth.

9.11. Painting

All steel is to be brushed and any loose scale, dirt or grease shall be removed before any painting is commenced. One coat of red oxide primer Type A to B.S. 2523 shall be applied at the shop. Any damage to the priming paint shall be made good to the IOM Engineer's satisfaction at the site.

10. PLASTERWORK AND OTHER FINISHING

10.1. Lime Plaster

Lime plaster shall consist of a backing coat in cement, lime and sand (1:2:9) and a finishing coat of lime putty skim with 10% cement added.

10.2. Polished Terrazzo

Polished terrazzo shall consist of a first coat of cement and sand (1:3) and a 12mm finishing coat of "Snowcrete" and marble chippings (1:2), colored with "Cementone No. 1" coloring compound mix in the proportions of 1:10, compound to cement. The overall thickness will be as specified in the measured work.

10.3. Glazed/Ceramic Wall and Floor Tiles

Wall tiles shall be size 150 x 150 x 6mm thick or as specified in the contract documents, manufactured to comply with B.S. 1281. Floor tiles shall be of size 300 x 300 x 6 mm or as specified in the contract documents. Wall and floor tiles shall always be laid with matching PVC edge strips unless otherwise specified.

10.4. Vinyl Tilling

Vinyl asbestos floor tiles shall be stored and laid in accordance with the manufacturer's written recommendations using a bitumen-based adhesive. The tiles shall be laid with butt joints straight both ways. Tilling shall start from the center of a room or area.

10.5. Quarry Tiles

Quarry tiles shall be bedded in 10mm thick cement mortar (1:3) with 10mm joint laid straight both ways. The joints shall be filled with cement mortar neatly flush pointed. The tiles are to be soaked in water before laying.

10.6. Marble Tiles and Terrazzo Tiles

The tiles are to be bedded in 10mm thick cement mortar (1:3) with fine butt joints. The surface is to be washed and polished on completion.

11. ELECTRICAL INSTALLATIONS

11.1. Compliance with Regulations

The installation shall comply in all respects with:

(i) The current edition of the installation of Electrical Engineers regulations for the electrical equipment of building.

(ii) The requirements of the Kenya Power and Lighting Company Limited.

On completion, if required, the Electrical Sub-Contractor must supply a certificate of completion to the power company, and must make any further modifications which may be called for by them without cost to the Employer.

11.2. Power Supply Line

From a point at the top of the building, provide a 32 mm conduit adjacent where the overhead power line will be connected to the meter board position. The Client must arrange for a connection by the Kenya Power and Lighting Company, but the Contractor is required to provide all necessary facilities to the installation engineers, who will provide a supply to the meter board position.

11.3. Meter Board

At the meter board position, provided a recessed pressed steel meter box of adequate size to house the Company's meters, and having a glazed inspection window, and padlock. Do all necessary writing in the meter board, and provide control switches for sub-mains.

11.4. Earthing

From the metal clad meter box provide a copper earth wire and connect to the incoming power main, using proper earth connecting clips.

11.5. Sub-Mains

From the meter board position, provide sub-mains to the consumer units, situated as shown on the Service Drawings.

11.6. Conduits

The entire installation is to be carried out in conduits whether electric supplies are installed in walls, concrete slabs or roof space.

All conduits shall be solid drawn plastic tubes with metal switch boxes, angles, tees and draw-in boxes with screwed connections of not less than 19mm diameter but of adequate size for drawing-in the specified cables. Where conduits occur in reinforced concrete work these must be fixed at the appropriate time, using extension rings, so that conduits are well clear of reinforcement.

11.7. Cooker Point

Where cooker outlet is shown, the Contractor shall provide a 30 ampere supply and cooker control unit and a short length of conduit to ground floor level to enable the cooker to be wired.

11.8. Light Fittings

Where light fittings are shown, these shall be of the types listed below. The Contractor is required to provide a fluorescent tube in each fluorescent fitting, and an 11 watt energy saving lamp in each tungsten fitting must be provided. The Contractor shall supply and fix the following:

“PENDANT” The outlets where a pendant is shown, this shall comprise a white plastic ceiling rose, short length of white plastic covered flex, and a white lamp-holder.

“GLOBE” Where a bracket is shown on wall outlets, these shall comprise a twin white plastic bracket or other approved.

“BULKHEAD” Where a bulkhead fitting is shown on wall outlets, provide an approved waterproof bulkhead fitting.

“FLOURESCENT” Where a fluorescent fitting is shown, provide a 1,220mm “Atlas” fluorescent slim line fitting.

“BATTEN HOLDER” Where a batten holder is shown on a ceiling outlet, provides an approved plastic batten holder.

“SECURITY LIGHTS” Where security lights are shown on a wall outlet this shall comprise a 500W halogen bulb or other approved

11.9. Schedule of points

A full schedule of lighting and power points on each circuit is to be provided to, and approved by, the IOM Engineer by the Contractor, all in accordance with the electrical layouts shown on the Contractors plan. An electrical design will be provided by the contractor and approved by the IOM Engineer before any installations are carried out.

12. PLUMBING AND DRAINAGE

12.1. Installation

Installation of all pipe work, valves, fittings and equipment shall be carried out under adequate supervision using the relevant codes and standards. All builders' work associated with the piping installation is to be carried out in a satisfactory manner to the approval of the Engineer.

The installation of sanitary appliances shall be in accordance with C.P. 305: 1952 and B.S 3202: 1959. The appliances shall be fixed in the positions shown on the Drawings or as directed by the Architect.

For all sanitary appliances, the necessary number of supports, brackets, plugs, screws, washers, jointing materials, etc shall be provided.

Where supports, brackets, etc, are screwed to wall or structure, Rawl plugs or similar shall be used. No trap for any appliance whatsoever shall be with less seal than 75mm.

Fixing shall, if required by the IOM Engineer, include for temporarily erecting appliances in the required position of service and discharge pipes, taking down, storing, and permanently fixing after completion of wall finishing's and connecting to service and discharge pipes.

Care shall be taken at all times and particularly after fixing, to protect appliances from damage.

Upon completion of the work, all appliances shall be cleaned of plaster, paint, etc. and carefully examined for defects.

12.2. Pipes

Cold water supply to be galvanized steel class B.

All galvanized steel pipe work up to 65 mm bore shall be manufactured in accordance with BS 1387 medium grade with tapered pipe threads in accordance with BS 21. All fittings shall be of malleable iron and manufactured in accordance with BS 143.

The pipes and fittings for UPVC underground drainage systems shall comply in all respects to BS 4660 1973.

The pipes and fittings for PVC soil system shall in all respects to BS 4514:1969.

12.3. Jointing

Pipe joints shall be screwed and socketed and sufficient couplings and unions shall be allowed so that fittings can be disconnected without cutting the pipe.

Where pipe anchors are supplied, they shall be fixed to the main structure only.

Before any joint is made, the pipes shall be hung in their supports and adjusted to ensure that the joining faces are parallel and any falls that shall be required are achieved without springing the pipes.

All screwed joints, piping and fittings shall be made with PTFE tape.

12.4. Sanitary Services

Soil waste and vent pipe systems shall be installed in accordance with the best standard of modern practice.

It shall be ensured that all ground floor waste fittings shall be discharged to a gully trap before passing to the sewer via a manhole.

All necessary rodding and inspection facilities shall be provided within the draining system in positions where easy accessibility is available.

The soil vent stacks shall terminate above roof level and where a stack passes through the roof a weather skirt shall be provided. The roof shall be sealed after installation of the stack.

The open end of each vent stack shall be fitted with a plastic vent stack cowl.

12.5. Testing

The whole of the water and discharge installations shall be tested to the satisfaction of the IOM Engineer. The Contractor shall provide all necessary testing apparatus and facilities for testing the installations and any defective work shall be replaced immediately and shall be the subject of re-testing until found satisfactory

The test pressure shall be applied by means of a manually-operated test pump or, in the case of long mains or mains of large diameter, by a power-driven test pump. Pressure gauges shall be recalibrated before the test.

The test pressure shall be maintained by the pump for about one hour and a leakage as specified in C.P. 310, section 502 j, shall be approved, but any visible individual leak shall be repaired.

Valves, cocks and taps shall be absolutely tight under the test pressure for the corresponding pipes as well as under a small pressure.

Testing of discharge pipes shall be carried out as specified in C.P 304: 1968

Testing drain pipes shall be carried out in accordance with C.P 301: 1950

Tests shall, if necessary, be done in sections as work proceeds without extra payment.

All tests shall be carried out in the presence of the IOM Engineer or his representative.

Upon completion of the work, including re-testing if necessary, the installation shall be thoroughly flushed out.

12.6. Sterilization of Water Supply Pipes

Sterilization shall be carried out strictly in accordance with C.P 310: 1965. The sterilization will not be approved unless the final test for residual chlorine mentioned in the above C.P proves positive.

12.7. Commissioning

Before handing over, the Contractor shall confirm that the installation has been examined, tested, is ready for use, that it will operate and can be maintained efficiently.

When handing over, the Contractor shall demonstrate to the IOM Engineer the methods of operation, limitations, the maintenance requirements and the safety precautions to be observed and shall also hand over any tools for operating, cleaning, testing and maintenance of the installation.

12.8. Measurement

Prices for tubing shall include for all short lengths and sockets. Connectors, elbows, bends, formed bends, tees, reducing pieces which may be required, if the correct reducing tee is not available.

All pipes have been measured over all bends, tees and other fittings and the Contractor shall include in his prices for all cutting and waste.

12.9. Drainage

Setting Out

Lines of drains shall be accurately set out and trenches excavated and bottoms trimmed to accurate gradients to approval before pipe lying commences.

12.10. Drain Trenches

Excavation shall be made to such depths and dimensions as may be required by the IOM Engineer to obtain proper falls and firm foundations. No permanent construction shall be commenced on any bottom until the excavation has been examined and approved by the IOM Engineer.

Should the Contractor in error, or without the instructions of the IOM Engineer, make any excavation below the required level of the drain or bed, as the case may be, he will be required to refill such excavation to the correct level with Class 15 concrete at his own expense.

Prices for excavation must include for excavating in all materials met with and for trimming bottoms to the necessary falls and for any extra excavation required for planking and strutting and working space, all as described under" Excavation", Excavation in hard rock requiring the use of compressors or wedging is measured separately.

12.11. Keep Excavation Dry

The Contractor shall keep the whole of the trenches or other excavations free from water, and he shall execute such works and install such pumps as may be required to keep the excavations dry at all times. No subsoil water shall be discharged from the sewers without the written permission of the IOM Engineer.

12.12. Backfilling

The first backfilling of pipe trenches is to be of soft material free from stones and shall be watered and carefully tamped over and around the pipes in 300mm layers until they are covered to a depth of 600mm. subsequent filling is to be in 150 mm layers, watered and rammed. Only materials approved by the IOM Engineer are to be used as backfilling.

Where hardcore is used for backfilling it is not to exceed 150 mm gauge and all interstices shall be properly filled with small pieces and fine binder. Surplus excavated are to be removed from the Site.

If in the opinion of the IOM Engineer, care has not been exercised in refilling trenches, he may order a fresh test to be made on the drain. In the event of the drain failing to pass the test the Contractor will be required to remedy the fault at his own expense.

12.13. Concrete Beds and Surrounds

Concrete beds and surrounds shall be Class 25 concrete to the thicknesses and widths specified.

Where pipes are specified to be hunched, the concrete shall be carried up from the outside edge of the bed to meet the pipe barrel tangentially.

Where pipes are specified to be surrounded, the concrete shall be carried to form the bed in a square section with a minimum of 150 mm in thickness over the barrel of the pipe.

Rates for beds and surrounds shall include for forming recesses and filling with concrete, for mortar, layer, etc, and for any necessary form work.

12.14. Inspection Chambers

Inspection chambers shall be constructed in the positions indicated on the Drawings or as required by the IOM Engineer.

Such chambers shall be to the depths required to obtain even gradients in the drain and of sufficient size to contain the requisite main channel and any branches thereto and all to the entire satisfaction of the IOM Engineer.

Rendering shall be trowelled smooth, covered at all internal angles and rounded on arises.

Each length of drain and manhole shall be tested as described hereinafter and approved by the IOM Engineer before any backfilling of the trench takes place.

Testing shall not be carried out until at least 12 hours have elapsed after the jointing of the last pipe.

The lower end of the pipe and all junctions shall be securely stoppered and the whole length test filled with water.

13. WORKMANSHIP

13.1. Generally

All screeds and paving shall be finished smooth, even and truly level unless otherwise specified and paving shall be steel troweled.

Rendering and plastering shall be finished plumb, square, smooth, hard and even, and junctions between surfaces shall be perfectly true.

At the junction of all concrete work and block walling a 150 mm wide strip of expanded metal lathing must be included to avoid plaster cracks.

All arises and angles shall be clean and sharp or slightly rounded or thumb coved as directed including neatly forming mitres

All surfaces to be paved or plastered must be brushed clean and well wetted before each coat is applied. All cement paving shall be kept continually damp in the interval between application of coat and for seven days after the application of the final coat

Where dubbing out is required, mix shall be composed of one part cement to six parts of sand,

Partially or wholly set materials will not be allowed to be used or remixed. The plaster, etc. mixes must be used within two hours of being combined with water.

13.2. Samples

The Contractor shall prepare samples minimum one square meter of each of the screeds, paving and plastering for the approval of the IOM Engineer, after which all work executed shall conform with the approved samples.

13.3. Lime Plastering

Lime plastering shall be carried out in two coats having a total thickness of not less than 15mm to walls and 10mm to ceilings.

The first coat shall be troweled to a perfectly true and even surface and finished with a wood float, the surface being sprinkled with water from a brush during the process and before it has set thoroughly scratched to form a key. The finishing coat shall not be less than 1.5 mm thick, thoroughly worked with a steel trowel, sprinkled with water as before and be brought to uniform smooth and hard surface.

13.4. Ceramic Wall and Floor Tiles

Wall tiles shall be fixed with a cement-based adhesive with 3 mm wide joints straight both ways. When an area of tiles is complete the joints should be grouted with white cement. Tiles should always be edged with matching PVC edge strips.

13.5. Beds and Backing

Floor screeds shall not be laid in areas exceeding ten square meters during any period of 24 hours. As bays are formed steel edge strips must be used to retain the exposed edge of the screed.

The thickness and mixes of the screeds shall be adjusted to suit the various top dressing and the Contractor must first ascertain what finish is intended to each specified area before the work of laying screeds is put in hand.

Screed shall be finished with a wood float for wood blocks and steel trowel for thermoplastic and similar tiles.

13.6. Making Good

All making good shall be cut out to a rectangular shape, the edge undercut to form a dovetail key and finished flush with the face of surrounding paving or plaster. Cut out and make good all cracks, blisters, other defects and leave the whole of the work perfect on completion

13.7. Prices Generally

In addition to the foregoing, prices of superficial items are to include for work in narrow widths, all linear labors, angles and arises, all fair edges, for making good up to or stopping to a line at the required level at top of skirting where directed and for making up to windows, door and similar.

The prices for all linear items unless otherwise measured are to include for all short lengths, angles and arises, mitres, and ends or every description.

Prices for paving are to include for adequate covering and protection during the progress of the works to ensure that the floors are handed over in perfect condition on completion.

The prices for all paving and plastering, etc., shall include for hacking concrete surface and for ranking out joints of walls 12mm deep and for cross-scoring undercoats to form a proper key.

Plastering on walls generally shall be taken to include flush faces of lintels, beams, etc., in same

13.8. Painting Generally

All materials are to be of the best quality and shall be of an approved proprietary brand selected from the latest Schedule of approved Paints issued by the Ministry of Works

All materials to be applied externally shall be of exterior quality recommended by the manufacturers for external use.

All materials shall be delivered on Site intact in the original sealed drums or tins and shall be mixed all applied strictly in accordance with the manufacturer's instructions and to the approval of the IOM Engineer.

Unless specially instructed or approved by the IOM Engineer, no paints, distemper, etc. are to be thinned, or otherwise adulterated, but are to be used as supplied by the manufacturers and directly from the tins

The priming, undercoats and finishing coats shall be each of differing tints and the priming and undercoat shall be the correct brands and tins to suit the respective finishing coats, in accordance with the manufacturer's instructions. All finishing coats shall be of colors and tints selected by the IOM Engineer. Each coat must be approved by the IOM Engineer before the next coat is applied.

Each coat shall be properly dry and in the case of oil or enamel paints shall be well rubbed down with fine glass paper before the next coat is applied. The paintwork shall be finished smooth and free from, brush marks

Colors cards of all paints, etc., shall be submitted to, and samples prepared for approval of the IOM Engineer before lying on, and such samples, when approved, shall become the standard for work.

All paints, emulsion paints, and distempers shall be applied by means of a brush or spray gun or rollers of an approved type, where so agreed by the IOM Engineer.

No painting is to be done in wet weather or on surface which are not thoroughly dry.

Prices of paint, distemper, etc., shall include for preparation of surfaces, rubbing down between each coat, stopping, knotting, etc and all other work in connection and as described and as necessary to obtain a first- class and proper finish to approval.

Emulsion paint on ceilings and all undercoats of emulsion paint and complete oil painting on walls shall be completed before thermoplastic floorings are laid. Final coats of emulsion paints on walls shall be applied after such flooring has been laid complete.

13.9. Wood Preservation

All work in contact with walling or plaster shall be treated after cutting and preparation but before assembly or fixing with one coat of "TIMCIDE" or other wood preservative from an approved manufacturer. The solution is to be brushed on at faces of all timbers, unless exposed to view and painted.

The Contractor shall note that this solution is POISONOUS and shall take all necessary precautions and instruct his workmen accordingly.

14. BARRIER FREE DESIGNING

14.1. Universal design.

In conformation with the UN convention on the Rights of persons with Disability, SSI advocates for an accessible approach to construction. Universal design facilitates barrier free environments which enable persons with disabilities to live independently and participate equally and fully in all aspects of life.

All contractors shall take appropriate measures to ensure that all persons with different disabilities access, on an equal basis with others the physical environment: buildings, roads, transportation and other indoor and outdoor facilities, including schools, housing, medical facilities and workplaces; information, communications and other services, including electronic services and emergency services.

The aspirations for accessibility are further developed in article 9 of the UN Convention on the Rights of Persons with Disabilities. Universal design also benefits other groups of the population, elderly persons or women with small children or pregnant women.

14.2. General Guidelines

Incorporate accessibility features into the original design of the construction. With this obstacles and/or barriers for equal access of persons with disabilities will be avoided in the first place. Any fully inclusive design is more cost-effective than making an existing structure accessible.

During the planning, consult people with different disabilities and their families on how to build the most suitable public buildings, primary health care centers or schools in their communities. Ensure that persons with different types of disabilities are consulted in the process. For instance, barriers experienced by persons with visual impairments are different than those encountered by persons with physical impairments. They know what they need and will be able to tell you how to make your planning processes and constructions more accessible.

Ensure that all community facilities/public buildings include latrines, wells and public water points etc are easily accessible for people with different disabilities. Consider gender during accessibility planning and consultations. Consult especially women with disabilities (often vulnerable to gender based violence), for the geographical location of community or camp facilities. Use universal design concepts.

For making existing structures more accessible - A good way to plan, monitor and ensure future accessibility is to involve persons with disabilities and/or technical experts together with your own staff or contractor for performing an “access audit”. With such audits your facilities will be tested and recommendations developed on what needs adjustments.

14.3. Technical Guideline

Public Pathways: should be clear of obstructions and using non-slip materials. It should be at least 1500 mm in width. Where possible also include guiding blocks in bright colors and raised surfaces for people with low – vision and visual impairments. Bright colors indicate changes in pathways. Dotted Tiles say “stop or turn”, lined tiles say “go”.

Entrances: Preferably both a ramp and steps. If not, a ramp is preferable. The ramp should have a gradient of not more than 1:10. It should be 1500 mm wide, and have a smooth, non-slip surface. There should be handrails on each side that extend 1 meter beyond the ramp. If the ramp is more than 5 meters long there should be a level space at each 5 meters where the wheelchair user can stop to take a break. There should be a level space at the end of the ramp to allow the person to stop and enter the building.

Doorways: All of the doorways should be wide enough for a person to be able to get in and out with their wheelchair unassisted - 900mm in total. It is better if doors open out rather than into the room to create more space. Alternatively, sliding doors can be used as well. The door handles should be easy to reach from the wheelchair (Height 85 – 120 cm). Door handles should be wide and easy to turn. Avoid using doorknobs.

14.4. Architectural Accessibility

Strategies and plans for the implementation of access to the built environment have to be developed aiming at the maximum effectiveness but also considering available resources. Architectural designs shall have the inclusion of accessibility standards in the construction of buildings and facilities, which guarantees the full consideration of disability issues.

14.5. Space Consideration;

When creating a barrier-free environment it is important to consider the size of people with the equipment that they are using, such as wheelchairs, crutches etc. This is because when the sizes of these devices are considered then it is possible to decide on things such as the width of the ramps and doorways, the height of benches and toilets, the placement of cupboards etc.

The Interior should have enough room for wheelchairs to turn around (A circle of at least 1500 mm diameter). Workspaces should be at a usable height (850 mm) and with at least 640 mm of free space underneath so that the wheelchair user can park their device comfortably underneath.

14.6. Anthropometrics and Measures of Assistive Devices

The following presents basic dimensional and anthropometrical data that provide a guideline when designing facilities and buildings in an accessible way.

The data provided is based on typical values acceptable worldwide, where appropriate, allowable ranges are given. Wheel chair requires a minimum of 800mm width and 1250mm length with a seated reach height of 300mm and a circumference circle of 1500mm. Persons using single crutch requires minimum 700mm while double crutch requires 900 mm width. Hand propelled tricycle requires a width of 920mm, 2000 length and a circumference circle of 3000mm

14.7. General requirement for barrier free environment.

It must be remembered that barrier-free environments need to be designed for all people, including those with visual, hearing, speech, mental and intellectual impairments. The following Guidelines generally assist with the design of barrier-free environments that will accommodate people with different impairments. This information should be considered when designing buildings, installation of fixtures and finalization of construction.

People with vision impairment:

Ensuring a barrier-free environment for people with vision impairment the contractor should Mark the front edge of steps with a contrasting strip so that they can be easily identified, ensure that all areas are well lit, and that all signage is clear, in large letters and at eye level, preferably with raised letters which can be felt, ensure all pathways and commonly used areas are clear of any objects or debris.

People with hearing and/or speech impairments:

Although people with hearing and/or speech impairment do not necessarily have mobility difficulties, moving around building or camps can present them with problems, ensuring a barrier-free environment for people with hearing and/or speech impairments the contractor should put Clear and visible signs identifying the location of facilities. Good glare-free lighting to aid lip-reading and also the visibility of signs and written communication.

People using a wheelchair or hand-propelled tricycle, crutches, walking sticks or who have difficulty walking:

Not all people with mobility impairment use a wheelchair or hand-propelled tricycle. Some use a Walking stick or crutches or move about slowly. To ensure a barrier free environment for people with mobility issues the contractor should make ramps and verandas that are wide enough and not steep ration of 1: 10.

Installation of utilities such as wash basins, tables, benches, and other facilities without blocking their pathway and that they can be reached from a sitting position and have sufficient space under them so a chair can be wheeled right up to them. Locating toilets and washing facilities so that they are accessible both in terms of location and design. Fix handrails securely to assist with walking up and down slopes and steps/stairs. Make seats/benches available so that people with mobility impairments can rest.

People with intellectual or mental health impairments:

People who have difficulty using their arms and hands may have problems holding and/or moving things, opening a door, turning a tap, or using a water pump. Creating a barrier-free environment for people who have difficulty using their arms and hands, the contractor shall use levers rather than knobs for door handles and taps, Consider the placement of handrails so that they can be easily grasped or lean on by a person with minimal use of their hands.

14.8. An inclusive approach

The most inclusive planning option should always be selected: for example a main entrance to a public building with a gentle slope rather than a monumental staircase is more comfortable for all, and is a more inclusive solution than fitting a staircase for people without disabilities and a ramp for people with disabilities.

Building contractors works should be inspired by the principle of Universal Design which aims to simplify people's lives by producing products, means of communication and built environments that can be used by the maximum possible number of people and which, in addition, result in little or no excess costs.

The principle of Universal Design should be applied to any building or facility intended for the collective use of large numbers of people. In contrast, the work to improve the accessibility of private homes or work stations should be carried out according to the specific impairments of each individual concerned. This work is then closely linked to work on ergonomics (adapted housing, workstations etc.), and is based on a precise diagnosis of the person's situation.

15. ADDITIONAL NOTES TO CONTRACTORS

- Contractors are expected to familiarize themselves with the provisions of all Tender documents including the Specifications before completing their tender and commencement of the Works
- Equipment and resources mentioned in the specifications and or the contractors tender, at the discretion of the IOM Engineer, may be verified before signing and commencement of the Contract
- The materials to be used in construction shall be as prescribed in the specifications and any departures shall be approved by the IOM Engineer before the start of Works.
- Schedule of Site Meetings will be agreed with IOM Engineer prior to start of contract but scheduled meetings may be changed by agreement between both parties in advance of the meetings.
- Any discrepancies or inconsistencies in these Specifications must be drawn to the attention of the IOM Engineer as soon as possible for discussion and interpretation
- Monitoring will be carried out on site with both Contractor Supervisor and IOM Engineer using agreed Site Inspection forms developed by IOM Engineer. The Contractor is also required to make available a Site Instruction Book and ensure it is at the site throughout the duration of the contract.
- Irrespective of whether any inspection, monitoring and/or approval of the Works has been carried out as above, it shall be the contractor's sole responsibility to ensure that the Works complies with the details on the Designs, Drawings, Specifications and is carried out to the highest acceptable standards
- All design works indicated in the Bill of Quantities (Roof trusses, electrical design, mechanical, carpentry etc) shall be presented by the Contractor for approval to the IOM Engineer at least three weeks prior to when it is planned to be implemented so that they can be properly studied and approved in good time.
- Unless otherwise agreed, the contractor shall be responsible for the testing, prior to final certification and handover, to the satisfaction of the IOM Engineer, all electrical, mechanical and plumbing works constructed or installed by the contractor and this should be allowed for in his quotation.