

# COUNTY ASSEMBLY OF KITUI



## OFFICE OF THE CLERK

### CONSTRUCTION OF MODERN OFFICE BLOCK FOR THE COUNTY ASSEMBLY OF KITUI

TENDER NO: CAKITUI/T/03/2021-2022

### VOLUME II

CLOSING DATE: TUESDAY 18<sup>TH</sup> JANUARY 2022

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NEGOTIATION NUMBER: 916557

#### PROCURING ENTITY:

COUNTY ASSEMBLY OF KITUI  
P.O. BOX 694-90200  
KITUI, KENYA

#### CONSULTANT

##### ARCHITECT:

TECTONICS INTERNATIONAL LTD  
P.O. BOX 15311-00509  
NAIROBI, KENYA

##### QUANTITY SURVEYOR:

MARKS & ASHTON CONSULTANTS LTD  
P.O. BOX 22637-00100  
NAIROBI, KENYA

##### CIVIL/STRUCTURAL ENGINEERS:

AFRICON UNIVERSAL CONSULTANTS  
P.O. BOX 3181-00506  
NAIROBI, KENYA

##### MECHANICAL/ELECTRICAL ENGINEERS:

PROFESSIONAL CONSULTANTS LTD  
P.O. BOX 24996-00502  
NAIROBI, KENYA

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PART 3                      – WORKS REQUIREMENTS (BILLS  
OF QUANTITIES)

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## BILLS OF QUANTITIES

### (a) Preambles

1. The method of measurement of completed work for payment shall be in accordance with current Standard Method of Measurement Revised Edition-1-1.
2. The Site is situated in Kitui County Assembly Compound, off Kibwezi-Kitui Road, Kitui County, Kenya. Access to the site shall be through the main road, which is an existing public road. Any damage caused to the surfaces of this road shall be made good at the Contractor's expense. The Contractor shall visit the site and acquaint itself with its nature and position, the nature of the ground, substrata and other local conditions, positions of existing power, water and other services, access roads or any other limitations that might affect his cost or progress. No claim for extras shall be considered on account of lack of knowledge in this respect.
3. The Contractor shall obtain the Architect's approval on the siting of all temporary buildings, spoil heaps, temporary access path, and storage of materials. The Contractor shall also obtain the Architect approval and direction regarding the use of any materials found on the Site.
4. The drawings used in the preparation of these Bills of Quantities can be inspected at the offices of the Procuring Entity or Procuring Entity's Representative during normal working hours. Two sets of the Working Drawings shall be provided to the contractor but additional copies shall be provided at a cost to be determined by the Engineer.
5. The Contractor shall allow for the payment of all bank charges in connection with the procurement of Bank Guarantees and stamp charges in connection with this contract Agreement.
6. The Contractor shall carry out the various sections of the Works in such an order as the Architect May direct. The Procuring Entity reserves the right to occupy the Works by sections on completion provided that such occupation is considered to be both practical and reasonable and will not interfere with the Works. The Contractor shall allow any costs associated with such occupation.
7. The main Contractor will be fully responsible for paying his Sub-Contractor but the Procuring Entity reserves the right in very exceptional circumstances to make such payments direct in the interests of the project where the completion thereof might be jeopardized by any dispute or vicariousness between the Contractor and the Sub- Contractor involve.
8. The Contractor shall complete and deliver the Works in the period inserted in the Form of Tender as his time for completion of the Works from the date for Possession, to be agreed with the Engineer. The Contract Period is presumed to have been calculated making due allowance for seasonal inclement weather conditions. No claim for extension of time due to the normal inclement weather for this area shall be entertained.
9. The Contractor shall, upon receiving instructions to proceed with the Works, draw up a Programme and Progress Chart setting out the order in which the Works are to be carried out, with the appropriate dates thereof. This Chart shall be agreed with the Architect and no deviation from the order set out in it will be permitted without the written consent of the Engineer. The Contractor will be responsible for arranging the above programme with all his sub-Contractors and Specialties. The Contractor shall allow in his rates for carrying out this exercise, and for updating it as required.
10. The Contractor shall submit to the Architect on the first day of each week or such longer period as the Architect from time to time direct, a Progress Report and any information for the proceeding period, showing the

progress during the period and the up-to-date cumulative progress on all important items of each section or portion of the Works.

11. The Contractor shall arrange for photographs of the Site to be taken by a professional photographer approved by the Engineer. The Photographs shall provide a record of the Site and adjacent areas as prior to the commencement of the Works and shall cover such portion of the works in progress and completion as the Architect shall direct. All prints shall be full plate size, unmounted, and marked on the reverse side with the date of exposure, identification reference and brief description. The copyright of all photographs shall be vested in the Procuring Entity. The negatives and four prints from each negative shall be delivered to the Architect within two weeks of exposure.
12. 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 comparable dimensions shown on the drawings. The Contractor shall be responsible for the accuracy of such dimensions.
13. 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, waterpipes or other services in the area and he 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 Architect and the relevant Authority and shall be made good to their satisfaction at the Contractor's expense. Where appropriate the Contractor shall open up the ground in advance of the main work by hand digging, if necessary, to locate precisely the position and details of the services which are likely to affect his operations.
14. The Contractor shall include in his prices for the transport of materials, workmen, etc./, to and from the site of the proposed works, at such hours and by such route as are permitted by the Authorities.
15. The Contractor will be required to make good, at his own expense and damage he may cause to the present road surface and pavements within or beyond the boundary of the Site, during the period of the works. All existing paths, storm water channels, etc., that may be destroyed or damaged during the progress of the Works shall be reinstated by the Contractor to the satisfaction of the Engineer.
16. The Contractor is to allow for complying with all instructions and regulations of the Police Authorities.
17. All water shall be fresh, clean and pure, free from earthly, vegetable or organic matter, acid or alkaline substance in solution. The Contractor shall provide at his own risk and cost all water for use in connection with the Works, (including works of sub-contractors). If need be, he shall make arrangements with the Local Water Authority for the installation of a separate meter for all water used by him throughout the Contract and pay all cost and fees in connection therewith. He shall also provide temporary storage tanks and tubing, etc., as may be necessary, and clear away at completion.
18. The Contractor shall provide all artificial lighting and power for his own use on the Works, (including Sub – Contractor's) 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.
19. 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 his whole time to the superintendence of the works. (Including works of sub – contractors). Such Agent or Representative shall receive on behalf of

the Contractor directions and instruction from the Engineer, and such directions and instructions shall be deemed to be given to the contractor in accordance with the Conditions of Contract. The Agent shall not be replaced without the specific approval of the Engineer.

20. The Contractor shall ensure that the safety of his work people and all authorized visitors to the site are protected at all times. In particular, there shall be the proper provision of guard-rails to scaffolding, protection against falling materials, tools on site, dust, nail and other sharp objects. The site shall be kept tidy and clear of dangerous rubbish. The Architect shall be empowered to suspend work on site should it be considered this condition is not being observed and no claim arising from such suspension will be allowed.
21. The areas available to the Contractor for work yards, offices and other facilities shall be directed by the Architect and any existing features to remain shall be protected from damage throughout the Contract Period and handed back in good condition when they are vacated at the end of the Contract. If additional areas are required, the contractor shall source them at own cost.
22. The Contractor shall give the Architect reasonable notice of the intention to set out or take levels for any part of the Works so that arrangements may be made for checking the work. The accuracy of setting out and leveling shall be within the tolerances specified in the Specifications or on the Drawings. The checking of setting out or leveling by the Architect shall not relieve the Contractor of his duties or responsibilities under the Contract.
23. The Contractor must take steps necessary to safe guard and shall be held fully responsible for any damage caused to existing and adjacent property, including buildings that are not a subject of demolition. He shall make good at his own cost damage to persons and property caused there on, and he shall indemnify the Procuring Entity against any loss or claim that may arise.
24. The Contractor shall take such steps and exercise such care and diligence as to minimize nuisance arising from dust, noise or any other cause to the occupiers of the existing and adjacent property. He must provide such temporary and special screens and tarpaulins or gummy bags, hoarding, barriers, warning signs etc. as he considers necessary and sufficient for the protection of the existing and adjacent property and or prevention of nuisance etc. as directed by Engineer.
25. The Contractor's attention is drawn to the standards levy order which was amended on 15<sup>th</sup> October 1998. Legal notice No.154 of 1998. The Contractor is required to pay a monthly level of 0.2% of his factory price of construction works with effect from January 1999. Tenderer shall allow for this in the build-up of his rates.
26. The Contractor shall provide temporary sheds, offices mess rooms, sanitary, accommodation and other temporary buildings for the use of the contractor and sub-contractors, including lighting furniture equipment and attendance.
27. Contractor shall provide/build labor camp sites to be agreed with the Engineer. Labor camps shall be complete with sanitary accommodation and fencing gates.
28. The Contractor must provide the necessary toilet facilities to the requirement and satisfaction of the Health Authorities 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.
29. The Contractor shall provide at his own risk and cost all watching and lighting as necessary to safeguard the Works, Plant and materials against damage and theft.

30. The Contractor shall provide all necessary hoists, tackle, plant, equipment, vehicles, tools and appliances of every description for the due and satisfactory completion of the Works and shall remove the same on completion. All such plant, tools and equipment shall comply with all regulations in force throughout the period of the Contract and shall be altered or adopted during the Contract period as may be necessary to comply with any amendments in or additions to such regulations.
31. Provide, erect and maintain all necessary scaffolding, sufficiently strong and efficient for the due performance of the works, including Sub-Contract Works, provide special scaffolding as required by Sub-Contractors, alter and adopt all scaffolding as and when required during the Works, and remove on completion. No scaffolding is measured here in after and the Contractor must allow in his rates for this.
32. The Contractor shall take all necessary precautions such as temporary fencing, hoarding fans, planked footways, guard-rails gantries screen, etc., for the safe custody of the Works, materials and public protection and adjacent properties.
33. Cover up all 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 Architect until the completion of the Contract.
34. The Contractor shall, after completion of the works, at his own expense, remove and clear away all surplus excavated demolition 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 Engineer, sheds, camps, etc. Particular care shall be taken to leave clean all floors and windows and to remove all paint and cement all rubbish and dirt as it accumulates. The Contractor is to find his own dump and shall pay all charges in connection there with.
35. Concrete test cubes shall be prepared in a set of three, as described including testing fees, labor and materials, making molds, transport, handling, etc. Allow in your rates for making at least four cubes on each occasion, from different batches; the concrete being taken from the point of deposit.
36. The Contractor shall furnish at the earliest possible opportunity before work commences, and at his own cost, any samples of materials and workmanship that may be called for by the Architect for the approval or rejection, and any further samples in the case of rejection, until such samples are approved by the Engineer. Such samples, when approved, shall be the minimum standard for the work to which they apply. The procedure for submitting samples of materials for testing or approval and the method of marking for identification shall be as laid down by the Engineer. The Contractor shall allow in his Tender for such samples and tests, including those in connection with his Sub-Contractors work.
37. The Contractor's attention is drawn to the Finance Bill of the year 2000/2001 on withholding tax on contractual payment section 35(7)(i)(ii) which became effective on 1<sup>st</sup> July 2000. A 3% withholding tax will be applicable to all interim payments exceeding for work done in respect of building or civil works. The contractor shall allow for any costs arising resulting therefrom in the build-up of rates.
38. Blasting will only be allowed with the express permission of the Architect in writing. All blasting operations shall be carried out at the Contractor's sole risk and cost, in accordance with any Government regulations in force for the time being, and any special regulations laid down by the Architect governing the use and storage of explosives.

39. The National Construction Authority is a state corporation established under the national construction authority Act No.14 of 2011. The broad Mandate of the Authority is to oversee the construction industry and coordinate its development. The National Construction Authority Regulations 2014 with an effective date of 6<sup>th</sup> June 2014, regulation 25, - Allow 0.5% of the tender sum/contract sum for construction levy.
40. The Contractor attention is drawn to Finance Bill of 1993 where VAT was introduced in all contracts for construction services. The tenderer is also drawn to VAT Act Cap 476 clause 19(9). The tenderer must allow for VAT 1.19 as instructed elsewhere.
41. The contractor shall allow and pay for all insurance to cover risks and indemnities required Items 17 and 18 of the Conditions of contract and also specified in the Special Conditions of Contract.

**SECTION NO. 1**

**PRELIMINARIES**

**Carried to Collection**

**SPECIAL PRELIMINARIES****A INSURANCE AGAINST INJURY TO PERSONS AND PROPERTY**

The Contractor shall effect and maintain the following insurances as and shall allow for all costs thereof:

- (i) Third Party (Public liability) for an indemnity of not less than Shs 5,000,000 for any one accident or series of accidents arising from the same event (unlimited in aggregate).

Should the Contractor already hold annual insurances covering the whole of his activities, and the indemnity required under this Contract exceeds the indemnity under the existing policy/ies, then further insurance shall be effected and maintained to cover such excess.

The Contractor shall ensure that all sub-contractors effect and maintain such insurances as are necessary to cover their liabilities in respect of injury to persons and property and Workmen's Compensation.

Item

**B INSURANCE OF THE WORKS (Contractor's liability)**

This shall apply

Item

**C PERFORMANCE BOND**

- i) The Contractor shall provide one surety to the approval of the Employer and who will be bound to the Employer in the amount of 10% of the Contract Sum for the due performance of the Contract until the satisfactory completion of the Defects Liability Period.

- ii) The Contractor shall allow for paying all stamp charges in connection with the Bond.

**Note: As per Clause 4.2.1 of the General Conditions of Contract, "The Contractor shall obtain (at his cost) a Performance Security for proper performance, in the amount stated in the Special Conditions of Contract and denominated in the currency (ies) of the Contract or in a freely convertible currency acceptable to the Procuring Entity".**

Item

**Carried to Collection**

KSHS

Section No. 1

SECTION 1 - PRELIMINARIES

Bill No. 1

PRELIMINARIES

**177 - M&A**

**GENERAL MATTERS****A SUFFICIENCY OF TENDER**

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his Tender for the works and of the rates and prices used in arriving at the lump sum price(s) stated in the priced Bills of Quantities which rates and prices shall cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.

Item

**B DEFINITIONS AND ABBREVIATIONS**

Abbreviations used in these Bills of Quantities shall be interpreted as follows :

|               |            |  |
|---------------|------------|--|
| "Approved"    | Shall mean | approved by the Architect or the Engineers under the delegated authority of the Architect  |
| "as directed" | shall mean | as directed by the Architect   |
| "B.S."        | shall mean | The current British Standard Specification published by the British Standards Institution, 2 Park Street, London W.1. England  |
| "Kg"          | shall mean | Kilogrammes  |
| "No."         | shall mean | Number   |
| "L.M"         | shall mean | Linear Metres  |
| "S.M"         | shall mean | Square Metres  |
| "C.M"         | shall mean | Cubic metres   |
| "Ditto"       | shall mean | the whole of the preceding description except as qualified in the section in which it occurs. Where it occurs in brackets it shall mean the whole of the preceding description which is contained within the approximate brackets. |
| (M.S)         | shall mean | Measured separately  |

**Carried to Collection**

KSHS

Section No. 1  
SECTION 1 - PRELIMINARIES  
Bill No. 1  
PRELIMINARIES  
**177 - M&A**

**Carried to Collection**

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

|   |   |      |      |  |
|---|---|------|------|--|
| A | <p><b>SAMPLES</b></p> <p>The Contractor shall furnish at the earliest possible opportunity before works commences and at his own cost, samples of materials or workmanship that may be called for by the Architect for his approval or rejection and any further samples in the case of rejection until such samples are approved by the Architect and such samples when approved shall be the minimum standard for the works to which they apply.</p> <p>Also to be included are samples for:</p> <p>i) Electrical &amp; Fire Alarm Installations<br/>ii) Structured Cabling, Access Control, CCTV &amp; Audio Visual Installations<br/>iii) Plumbing, Drainage &amp; Fire Fighting Installations<br/>iv) Airconditioning &amp; Mechanical Installations</p> | Item |      |  |
| B | <p><b>SHOP DRAWINGS</b></p> <p>The Contractor shall prepare for scrutiny and issue to the Architect, copies of detailed shop drawings of all specialist works. Following the Architect's checking of these shop drawings the Contractor shall immediately amend them as necessary and when approved, promptly issue to the Architect four copies for general use.</p> <p>The scrutiny of shop drawings by the Architect shall be for general conformity, including conformity with the work of others and to co-ordinate the contract work in space. Such approval shall not imply any further indication of correctness.</p>   | Item |      |  |
| C | <p><b>EXISTING PROPERTY</b></p> <p>The Contractor shall take every precaution to avoid damage to all existing property including beacons, landscaping, roads, cables, drains, other services etc; and he will be held responsible for all damage thereto, arising from the execution of this Contract, and he shall make good all such damage when directed at his own expenses.</p>  | Item |      |  |
| D | <p><b>EXISTING SERVICES</b></p> <p>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 he 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 service shall be reported immediately to the Architect and the relevant authority and shall be made good to their satisfaction at the Contractor's expense.</p>  | Item |      |  |
|   | <p style="text-align: right;"><b>Carried to Collection</b></p> <p>Section No. 1<br/>SECTION 1 - PRELIMINARIES<br/>Bill No. 1<br/>PRELIMINARIES<br/><b>177 - M&amp;A</b></p>   |      | KSHS |  |

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

**A SCAFFOLDING**

All materials and workmanship used in the execution of the works shall be of the best quality and description unless otherwise described. Any materials for the works condemned by the Architect shall immediately be removed from the site at the Contractor's expense.

No timber used for scaffolding, formwork or similar purpose shall be used afterwards in the permanent work.

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.

Item

**B LOCAL REGULATIONS AND BYE LAWS**

The Contractor is to comply with all local regulations and by-laws of the Local Authority including serving of notices and paying of fees.

Item

**C SUPERVISION**

The said Works shall be executed under the direction and to the entire satisfaction of the Architect and Engineer's, who shall have the Architect's specifically delegated authority, and who shall at all times have access to the works and to the yards and workshops of the Contractor or other places where work is being prepared for the building works.

Item

**D ACCOMMODATION ON SITE**

No accommodation on site will be permitted for the Contractors staff or work people including those of sub-contractors, unless agreed to by the Consultants.

Item

**Carried to Collection**

KSHS

Section No. 1  
SECTION 1 - PRELIMINARIES  
Bill No. 1  
PRELIMINARIES  
**177 - M&A**

**A FAIR WAGES**

The Contractor shall pay rates of wages and observe hours and conditions of labour not less favourable than the minimum rates of remuneration and minimum conditions of employment applicable in the district in which the work is carried out. The relevant notice must be posted up and kept posted upon the site where it can conveniently be read by the employees concerned.

The Contractor is to comply with the Regulation of Wages and Conditions of Employment Act, Building and Construction Industry Wages Council and is to be responsible for compliance by sub-contractors employed in the execution of the Contract. If required he is to notify the Project Manager may determine.

Should a claim be made to the Architect alleging the Contractor's default in payment of Fair Wages of any workman employed on the Contract and if proof thereof satisfactory to the Architect is furnished by the Labour Department, the Architect may, failing payment by the contractor, pay the claim out of any monies due or which may become due to the contractor under this contract.

The contractor is to furnish to the Architect, if called upon to do so, such particulars of the rates of wages, hours and conditions of labour referred above, as the Architect may direct.

Item

**B SECURITY OF WORKS AND FENCING**

The Contractor shall be entirely responsible for the security of all the works, stores, materials, plant, personnel, etc., both his own and sub-contractors and shall provide all necessary watching, lighting and other precautions as necessary to ensure the security and the protection of the public.

Item

**C PUBLIC AND PRIVATE ROADS, PAVEMENT, ETC.**

The Contractor will be required to make good at his own expense any damage he may cause to the present approach road surfaces during the period of the Works.

Item

**D POLICE REGULATIONS**

The Contractor is to allow for complying with all instructions and regulations of the Police Authorities.

Item

**Carried to Collection**

KSHS

Section No. 1  
SECTION 1 - PRELIMINARIES  
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PRELIMINARIES  
**177 - M&A**

**A AREA TO BE OCCUPIED BY CONTRACTOR**

The area of the site which may be occupied by the contractor for use as storage and for the purpose of erecting workshops, etc., shall be defined on the site by the Architect.

Item

**B PROGRAMME OF WORKS**

A programme for the works is to be submitted in accordance with clause 18.0 the Conditions of Contract. The programme is to be a computerised critical path programme schedule which the Contractor will prepare, develop and maintain during the course of the Contract. The software programme is to be a specialised critical path programme to the approval of the Architect. The schedule shall include construction and procurement activities as well as other time related factors. The Contractor is to prepare the time related factors. The Contractor is to prepare the time schedule showing the time and order in which he proposes to carry out the works within the total construction time stated in the contract. The schedule shall show in detail the construction time and order in which each section of the work is to be carried out and be sub-divided into elements, trades and tasks. The schedule shall indicate the times when information is required from the Consultants especially in relation to the ordering of imported materials.

The time schedule is to be agreed with the Architect.

At the end of each month the Contractor is to incorporate actual start and finish dates into the time schedule and produce a construction schedule update and analysis for the Architect. The analysis is to show actual start and finish dates, identify out of sequence work, critical activities and any constraints which have or may effect the progress of the works.

During the execution of the works the Contractor will incorporate any changes to the time schedule only if approved 'in writing' by the Architect arising for whatsoever reason, and produce a revised schedule.

The Contractor will provide the Architect with a soft copy of the time schedule including monthly updates and analyses together with four printed copies of the relevant data.

Item

**C SITE PHOTOGRAPHS**

The Contractor shall allow for taking digital site photographs on a weekly basis to the satisfaction of the Consultants. Copies of the photographs shall be provided to the Employer and Consultants as required, and a weekly record shall be placed on a board in the Site Office.

Item

**Carried to Collection**

KSHS

Section No. 1  
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PRELIMINARIES  
**177 - M&A**

**A WORKING HOURS AND OVERTIME**

The working hours shall be 8.00am to 5.00pm Monday to Saturday.

No work shall be carried out on Sundays, gazetted public holidays or after the above working hours unless authorized by the Architect.

The Contractor shall be responsible for any extra costs for overtime working he considers will be necessary in order to complete the work within the contract period or time for completion apart from overtime working which may be authorized by the Architect.

If overtime is worked in accordance with a written instruction issued by the Architect, the Contractor will be reimbursed in respect of such overtime to the extent only of the additional nett cost of unproductive time payable over and above the basic hourly rates as laid down by the Regulation of Wages and Conditions of Employment Act, Building and Construction Industry Wages Council and excluding any bonuses, profits and overheads.

Item

**B WATER**

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; make arrangements with the Local Authority for the installation of a separate meter for all water used by him throughout the Contract and pay all costs and fees in connection therewith. The Contractor may however connect (if he so wishes) into the existing water supply for water for use in connection with the works including the work of specialists and sub-contractors : but he shall make arrangements with the Employer for the installation of a separate metre for all water used by him and the Sub-Contractors throughout the contract and pay all costs and fees in connection therewith at a rate to be agreed with the Employer in advance. The Contractor shall not use existing water services unless the said agreement with the Employer has been effected in writing. He shall also provide temporary storage tanks and tubing, etc., as he may consider necessary and clear away at completion. All tanks for permanent retention/incorporation shall not be used for this item.

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

Item

**Carried to Collection**

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**177 - M&A**

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

**A LIGHTING AND POWER**

The Contractor shall provide at his 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.

All such temporary works shall be cleared away on completion.

Item

**B CONCRETE TESTS**

NOTE: The Contractor must allow in his rate all costs in connection with the making of the cubes, curing, transport, crushing by Local Authority and obtaining the test certificate.

Set of four 150 x 150 x 150 mm concrete test cubes 800 sets (Provisional) @ Shs .....each \* Contractor to insert rate and extend

Item

**Carried to Collection**

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**TEMPORARY WORKS**

**A ACCESS TO SITE AND TEMPORARY ROADS**

Means of access to the site shall be agreed with the Architect prior to commencement of the work and the Contractor must allow for building any temporary access roads for the transport of materials, plant and workmen as may be required for the complete execution of the works including the provision of temporary culverts, crossings, bridges or any other means or gaining access.

Upon the completion of the Works the Contractor shall remove such temporary roads, temporary culverts, bridges etc., and make good and reinstate all works and services disturbed to the satisfaction of the Architect.

Item

**B TEMPORARY BUILDINGS AND SERVICES**

The Contractor shall provide sheds for storage by the Employer for all Client supply goods and materials.

The Contractor shall provide site office, mess rooms and all other buildings required by the contractor for his own use and the use of Sub-contractors.

A Site Office shall be provided for holding of Site Meetings. This shall be fully equipped with a table and chairs of sufficient size and number.

A separate 25m<sup>2</sup> office, equipped with telephone, e-mail facilities and all furniture, shall be provided for the Consultants use.

A separate 50m<sup>2</sup> office, unfurnished, shall be provided for the Clients use.

Notice boards and drawers shall be provided for drawings, photographs, notices, programme, etc.

Artificial lighting and cleaning shall be provided.

The Contractor shall allow for provision of non-alcoholic refreshments during the site meetings.

Consumption of alcoholic drinks and substances is not permitted on site.

The entire site is a non-smoking area.

The Contractor shall keep on the site and maintain in good condition one dumpy or quickset level, metric levelling staff, one 30 metre steel tape for the use of the Consultants.

Upon completion all temporary buildings are to be removed and cleared away.

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|  |   |   |  |      |  |
|--|---|---|--|------|--|
| A  | <p><b>TELEPHONE</b></p> <p>The Contractor shall pay for a mobile telephone on the site, and shall pay all costs and charges in connection therewith.</p>  | Item  |  |      |  |
| B  | <p><b>SANITATION OF THE WORKS</b></p> <p>The sanitation of the Works shall be provided, maintained and removed on completion by the Contractor to the satisfaction of the Architect and Local Authorities.</p> <p>The latrines shall be enclosed with framing and corrugated sheet steel roofs, sides and partitions with concrete floors, steel trowelled smooth to falls to facilitate washing. Their location shall be agreed with the Architect and the Works shall not be commenced before the sanitary accommodation has been approved by the above-mentioned Authorities.</p> <p>The Contractor will be required to pay all conservancy charges and shall ensure clean daily maintenance and disinfecting of the latrines, and not less than once per week, the whole area shall be sprayed with disinfectant and insecticide and on completion of the Works the latrines and any temporary drains shall be removed and all works and surfaces disturbed made good and the whole area disinfected and left clean and free from pollution to the satisfaction of the Architect and Local Authorities.</p> | Item  |  |      |  |
| C  | <p><b>NOTICE BOARD</b></p> <p>The Contractor shall provide and erect where directed and maintain during the whole period of building operations and remove at completion, one approved temporary notice board to the Architects standard design and giving a brief description of the Works and showing the names of the Employer, Project Manager, Architects, Quantity Surveyor, Consultant Engineers and Contractor with sufficient space to append the names of Nominated Sub-Contractors and Suppliers when known. The lettering concerning the Architect, Quantity Surveyor and Engineer is to be not more than 50 mm high.</p>   | Item  |  |      |  |
| D  | <p>The Contractor shall provide individual plot number sign boards measuring not more than 300 x 300 mm fixed onto posts for marking of plots</p>   | No  |  |      |  |
| <p>Section No. 1<br/>SECTION 1 - PRELIMINARIES<br/>Bill No. 1<br/>PRELIMINARIES<br/><b>177 - M&amp;A</b></p> |   | <p style="text-align: center;"><b>Carried to Collection</b></p> |  | KSHS |  |

**A HOARDINGS**

The Contractor shall provide hoardings to the boundaries and other areas of the site.

Hoarding around and within site shall be as stated herein before to contractors design approved by the Architect. The locations shall be as approved by the Architect before erection.

Item

**B PRIME COST SUMS AND RATES**

- i) The words "Prime Cost" (or the initials "PC") wherever appearing in the Contract Documents shall mean net cost exclusive of any trade, cash or other discount whatsoever but inclusive of the cost of packing. Such cost shall be the sums due to the Sub-Contractor or Supplier after adjustment where applicable in respect of measurements or rates.
- ii) Any increases or decreases in these Prime Cost Sums and Rates resulting from the adjustments and properly paid by the Contractor shall be added to or deducted from the Contract Sum in the final account. IN substantiation the Contractor will be required to produce to the Quantity Surveyor all quotations, invoices and receipted accounts as shall be necessary to show the details of the sums actually paid.
- iii) Prime Cost Rates shall be deemed to be exclusive of VAT, delivery to site and fixing. The Contractor shall allow in the overall unit rate or in the VAT element of the Main Summary for these items.
- iv) Any sum added by the Contractor in these Bills of Quantities in respect of profit upon any Prime Cost will be deducted at the final settlement of accounts and a sum will be added the amount of which will bear the same proportion to the sum added as the net amount properly expended bears to the original PC sum.

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**A NOMINATED SUB-CONTRACTORS**

The Contractor shall accept responsibility for providing the following services for Nominated Sub-Contractors :

- i) GENERAL ATTENDANCE. The following services are described as "allow for general attendance" :
  - (a) Use, for the purpose of the Sub-Contract Works of any scaffolding belonging to or provided by the Contractor while it remains so erected upon the site, provided that no warranty or other liability on the part of the Contractor or of his other sub-contractors shall be created or implied in regard to the fitness, condition or suitability of the said scaffolding;
  - (b) Provision of water, lighting, watching and attendance for the purpose of the Sub-Contract Works;
  - (c) Use of sanitary accommodation, messrooms and welfare facilities;
  - (d) Provision of space for erection of offices or stores or space for storage of plant and materials;
  - (e) Clearing away rubbish produced by them.
- ii) SPECIAL ATTENDANCE. The following services are stated under a separate item and where described under the following headings shall mean;

Item

**B NOMINATED SUB-CONTRACTORS**

- (a) "Taking delivery" shall mean the provision of unskilled labour necessary to attend upon the sub-contractor's workmen for the purpose of unloading plant and materials when received upon the site and placing in position within the Sub-Contractor's storage space or store;
- (b) "Hoisting" shall mean the provision of unskilled labour and the use of any Contractor's standing plant for the purpose of assisting the Sub-Contractor's workmen in hoisting the Sub-Contractor's plant and materials to the various levels but not placing in its final position;
- (c) "Providing Power" shall mean the provision of power during the course of the Works and during the period of maintenance

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**A NOMINATED SUPPLIERS**

The Contractor shall take delivery anywhere in Nairobi of all materials or goods supplied by the Nominated Suppliers and shall sign a receipt as having received them in good order and condition. He shall offload, transport to site, unload, hoist, provide safe storage and thereafter be responsible for any loss or damage or replacement of any such lost or damaged articles at his own expense and shall return empty cases if so required.

Provision is made herein following each appropriate P.C. Sum for the cost of the foregoing services against items reading "Take Delivery and Fix Only".

Item

**B PROTECTION OF WORK**

The Contractor shall cover up and protect all finished work liable to damage including provision of temporary roof, gutters, drains etc, until the completion of the Works.

Item

**C STANDARDS LEVY**

The Contractor's attention is drawn to Legal Notice No 267 of 1990, which requires payment by the Contractor of a Standard Levy to the Kenya Bureau of Standards. The Contractor shall allow in the Preliminaries of this Contract for all costs arising or resulting therefrom.

Item

**D VALUE ADDED TAX (VAT)**

The Contractor's attention is drawn to The Finance Bill, 1993 which requires payment by the Contractor of Value Added Tax (VAT) to the Government of Kenya for all contracts entered into after 1st September 1993.

The tender amount shall be considered to contain VAT at current rate.

Item

**E WITHHOLDING TAX**

The Contractors attention is drawn to the Finance Bill 2002.

The Contractor shall ensure that he has full knowledge of the workings of withholding tax.

Withholding tax shall be deducted from all payments, as applicable.

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**A FLUCTUATION**

The Contractor shall ensure that his tender rates allow for fluctuation in prices of materials as indicated in the Joint Building Council (JBC) price list.

The base price list shall be January 2015.

Item

**B COPYRIGHT**

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|---------|---|----------|------|--------|
|         | <b>SECTION NO 2</b>   |          |      |        |
|         | <b>SPECIFICATIONS</b>   |          |      |        |
| A       | <b>GENERAL SPECIFICATIONS</b>                                       |          |      |        |
|         | <b>ARCHITECTURAL SPECIFICATIONS</b>                                 |          |      |        |
|         | Part 1 : General  |          |      |        |
|         | Part 2 : Demolitions and alterations                                |          |      |        |
|         | Part 3 : Site clearance and general excavation                      |          |      |        |
|         | Part 4 : Walling  |          |      |        |
|         | Part 5 : Roofing and rainwater disposal                             |          |      |        |
|         | Part 6 : Carpentry and joinery                                      |          |      |        |
|         | Part 7 : Metalwork  |          |      |        |
|         | Part 8 : Aluminium windows and shop fronts                          |          |      |        |
|         | Part 9 : Finishings   |          |      |        |
|         | Part 10 : Glazing   |          |      |        |
|         | Part 11 : Painting and decorating                                   |          |      |        |
|         | Part 12 : Landscaping   |          |      |        |
|         | <b>STRUCTURAL AND CIVIL ENGINEERING SPECIFICATIONS</b>              |          |      |        |
|         | Part 13 : Excavations and earthworks                                |          |      |        |
|         | Part 14 : Concrete  |          |      |        |
|         | Part 15 : Fencing   |          |      |        |
|         | Part 16 : Pipelines, sewers and drains                              |          |      |        |
|         | Part 17 : Roads (subsurfacing)                                      |          |      |        |
|         | Part 18 : Roads (surfacing)   |          |      |        |
|         | Part 19 : Painting  |          |      |        |
|         | Part 20 : Structural steel  |          |      |        |
|         | Part 21 : Masonry and blockwork                                     |          |      |        |
|         | Part 22 : Materials   |          |      |        |
|         | Part 23 : Testing of materials and workmanship                      |          |      |        |
|         | <b>GENERAL MECHANICAL AND ELECTRICAL ENGINEERING SPECIFICATIONS</b> |          |      |        |
|         | Part 24 : General specifications for plumbing and drainage services |          |      |        |
|         | Part 25 : General specifications for Electrical                     |          |      |        |
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|         | SPECIFICATIONS  |          |      |        |
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Installations

**PART 1 GENERAL****1.1 Materials Generally**

All materials used on the works shall be new and of the qualities and kinds specified herein and equal to approved samples. Deliveries shall be made sufficiently in advance to enable samples to be taken and tested if required. No materials shall be used until approved and all materials which are not approved or which are damaged, contaminated or have deteriorated in any way or do not comply in any way with the requirements of this specification shall be rejected and shall be immediately removed from the site at the Contractor's expense.

**1.2 Materials for which there is a British Standards Specification**

All materials used in the works for which a British Standards Specification has been published shall conform with the latest edition thereof in every way. The Architect reserves the right to demand that the Contractor shall obtain at his own expense a certificate in respect of any material to state that it is in accordance with the British Standard Specification.

**1.3 Alternatives to proprietary brands**

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

**1.4 Samples**

The Contractor shall furnish for approval, with reasonable promptness all samples of materials and workmanship required by the Architect. The Architect shall check and approve such samples for conformance with the design concept of the Works and for compliance with the information given in the Contract Documents. The work shall be in accordance with approved samples -

- a) All material samples shall be delivered to the Architect's Office with all charges in connection therewith paid by the Contractor.
- b) Duplicate final approved samples, in addition to any required for the Contractor's use, shall be furnished to the Architect, one for office use and

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one for the site.

c) Samples shall be furnished so as not to delay fabrication, allowing the Architect reasonable time for consideration of the sample submitted.

d) Each sample shall be properly labelled with the name and quality of the material, manufacturer's name, name of project, the Contractor's name and the date of submission and the specification number to which the sample refers.

#### **1.5 Co-ordination with Other Trades**

Close co-ordination with electrical and plumbing sub-contractors must be maintained by the Contractor from the commencement of the works to avoid chases being cut in hollow block or 100mm solid block work or across any fair faced work or finished plasterwork. If necessary, conduits should be run down the jambs of the door openings behind the door frame and taken to the switch position through a horizontal joint in the masonry.

#### **1.6 Measuring and Testing Equipment**

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

- a) Straight edges 2 metres and 4 metres long for testing the accuracy of the finished concrete.
- b) A glass graduated cylinder for use in the silt test of organic impurities in the sand.
- c) Slump test apparatus.
- d) 150 mm steel cube moulds with base plates and tamping rod to BS 1881.
- e) Two 30 metre steel tapes.
- f) One dumpy or quickset level and staff.
- g) Micrometer.
- h) Moisture meter for testing water content in timber.

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| A | <p><b>PART 2</b></p> <p><b>DEMOLITIONS AND ALTERATIONS</b></p> <p><b>2.1 Demolition</b></p> <p>Demolitions, taking out and cutting away shall be carefully performed and every precaution shall be taken to ensure the safety of the works. If damage should occur in the carrying out of the demolitions or alterations the contractor shall reinstate and made good the same at his own expense.</p> <p><b>2.2 Protection</b></p> <p>Supply, erect and maintain during the cutting of openings etc., all necessary protection to the existing premises against damage by weather or other causes.</p> <p><b>2.3 Laying the dust</b></p> <p>Allow for laying the dust as far as possible during the alteration by watering with a hose or other means.</p> <p><b>2.4 Making good</b></p> <p>All making good of blockwork, building up of openings etc., shall be in solid blockwork unless otherwise described, in cement mortar (1:4) properly cut, toothed and bonded and pinned up to existing work and pointed where necessary.</p> <p><b>2.5 Credit for Materials</b></p> <p>Unless otherwise specified materials arising from the demolitions and alterations will become the property of the Contractor. If the Contractor wishes to allow a credit for any such materials the appropriate allowance should be included in the 'credit' column of the Bills of Quantities.</p> <p>In the event that the Employer wishes to take possession of any such materials the Contractor will only be entitled to receive compensation to the amount of credit indicated.</p> <p><b>2.6 Definitions of Terms</b></p> <p>The following definitions explain and simplify the terms indicated in the description of the works.</p> <p>Removal shall include:</p> <p>dismantling/pulling down/taking down/taking out/taking up/stripping etc., at the site of the works getting from the site of the works to the outside of</p> <p style="text-align: right;"><b>Carried to Collection</b></p> <p>Section No. 2<br/>SECTION 2 - SPECIFICATIONS<br/>Bill No. 1<br/>SPECIFICATIONS<br/><b>177 - M&amp;A</b></p> |  |  |  |
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building by whatever means is necessary and disposal.

Disposal shall include:

handling on site to store or to pick up point for loading

loading into skips or lorries

transporting away from site to yard, store or tip

payment of all tip charges.

Making out shall include:

infilling to voids, openings, gaps and the like and matching materials and construction to existing.

Making good shall include:

work as last described consequent on the carrying out of other work.

Form opening in brickwork or blockwork shall include:

shoring up and needling as required

cutting the opening

designing, providing and inserting required beam or lintol and providing any calculations if required and obtaining building regulation approval

providing and inserting cavity gutters and the like

forming new arches and the like in facework to match existing

quoining up jambs

sealing cavity of hollow walls, at jambs and cill and providing and inserting damp proof course

making good facework and features to match existing

forming new external sub-cills or sub-thresholds to match existing

making good the plasterwork or other applied finishes including making out into reveals and providing metal angle beads to arrises where required

removing debris.

Block in/Blank off/Fill in opening in brick work or block work shall include:

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carefully cutting out any flooring in opening and levelling and preparing for raising new work

cutting toothings for bonding in new work

filling the opening with brickwork or blockwork to match existing

making out facework including cutting out arches, cills or ornamentation around the opening and continuing any general facework pattern

wedging and pinning to existing soffit

providing and inserting matching damp proof course

making out any plasterwork including continuing any existing patterns or labours and making good between new and old work so that after decoration or weathering the original opening cannot be discerned remove debris.

Remove partition shall include:

shoring up if required

sizing, providing and inserting required timber beam if the partition is loadbearing

taking off skirtings, picture rails and the like

stripping off lath plaster or other finished and insulation quilts

taking out doors, borrowed lights, hatches and the like, frames, linings and architraves and the like within any area of partitioning to be removed

dismantling and taking down studding or framed work

making good plasterwork or other wall and ceiling finishes including cornices and other enrichments

making good or making out floor boarding and any applied finishes

taking out timber skirtings, picture rails and the like

removing debris.

Repair roof covering shall include:

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The term repair as applied to a tiled or slatted roof includes any or all of the following operations as are necessary:

renew broken or missing tiles/slates to match existing including nailing with composition nails or securing with copper tingles

re-wedge and repoint flashings and making out with new as required

re-make tile/slate verges or eaves including any bedding and pointing

renew defective or missing ridge or hip tiles

remove debris.

Renew roof covering shall include:

The term renew roof covering as applied to a tiled or slatted roof includes:

lift and afterwards refix flashings, soakers, ridge, hip and valley coverings etc

strip existing roofing and battens, sort and set aside sound tiles/slates

renew battens and re-lay existing tiles/slates together with new tiles/slates as required all to match existing including sarking felt underlay whether previously provided or not, and including any special tiles/slates to eaves, verges, ridges and valleys

re-wedge and repoint flashings

remove debris.

The term renew roof covering as applied to a sheet metal, felt or asphalt roof includes:

strip existing roofing

renovate sub-base as required

lift and afterwards refix flashings

renew roof covering to match existing

re-wedge and repoint flashings

remove debris.

Renew flashings and the like shall include:

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The term renew flashings and the like as applied to pitched or flat roofs any or all of the following as may be applicable:

strip existing flashings, soakers, gutters, ridge and hip coverings

renew all work previously removed in material or similar quality and substance

re-wedge and repoint all new flashings

remove debris.

Ease and adjust shall include:

The term ease and adjust as applied to doors, cupboard doors, casement sashes and the like includes:

rehanging on existing hinges

planing edges as necessary

oiling locks and hinges and leaving in working order

Overhaul shall include:

The term overhaul applied to doors, cupboard doors, casement sashes and the like includes any or all of the following operations as are necessary:

cramp up loose tenon joints and wedge or re-wedge including gluing wedges

piecing in any damaged timber to door, frame and linings or architraves

rehanging on existing hinges or renewing hinges if required

plane edges

plane off protruding tenons

refix ironmongery and locks or renew if required

oil locks and hinges

renew glass where cracked or broken

renew putties where loose, missing or defective

Strip existing installation shall include:

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The term strip existing installation in relation to electrical installation includes:

disconnecting at mains and making safe

disconnecting and taking out all existing conduit, wiring and fittings (except where conduit is to be re-used)

Strip existing installations in relation to plumbing and engineering installations shall include:

turning off incoming supplies

disconnecting and taking out all existing appliances, fittings and pipework

removing defunct pipeclips, fixings and the like

making good walls, floors, ceilings as required

removing debris.

Item

**A PART 3 SITE CLEARANCE AND GENERAL EXCAVATIONS**

**3.1 Other Specifications**

The Engineering specifications for Excavations and Earthworks also apply to these specifications.

**3.2 Codes of Practice**

The Contractor shall comply with the following Codes of Practice:

Site Investigations C.P. 2001

Earthworks C.P. 2003

Foundations C.P. 2004

Protection of building  
against water from  
the ground C.P. 102

**3.3 Inspection of Site**

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The Contractor is deemed to have visited the site and to have ascertained the nature of the soil and sub-soils to be excavated. No claim will be allowed on account of these being of a different nature from that for which he has allowed in his prices.

### **3.4 Procedure**

The excavations and fillings shall be carried out in such a manner and order as the Architect may direct.

### **3.5 Existing trees and shrubs**

Cut down and remove shrubs and trees as directed. No shrubs, trees, plants etc., shall be removed except as directed by the Architect and the Contractor shall be held responsible for any damage caused by the building operations to those shrubs, trees etc., not so directed to be removed and will be required to replace such trees on a like for like basis.

### **3.6 Site Clearance**

All grass, vegetable matter etc., must be removed or burned on site at the commencement of the contract over areas as directed by the Architect.

### **3.7 White Ant - Insecticide Treatment**

The Contractor must destroy any white ants' nests found within the perimeter of the buildings and within a distance of 20 metres from the buildings externally and take out and destroy queen ants, impregnate holes and tunnels with approved insecticide and back-fill with hard material well rammed and consolidated.

### **3.8 Excavation**

i) The excavations are to be executed to the widths shown on the Drawings, and to the depths below existing ground levels as directed by the Architect in order to obtain satisfactory foundations. If the Contractor excavates to any widths or depths greater than those shown on the Drawings or as instructed by the Architect he shall at his own expense fill in such widths or depths of excavation beyond that instructed or shown with concrete to the satisfaction of the Architect.

ii) Level and ram bottoms of all excavations to receive concrete, from steppings if necessary or directed to allow for sloping ground, and well water excavations before pouring concrete.

iii) The Contractor shall report to the Architect 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

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been approved all at the Contractor's expense.

iv) Excavations made below required levels shall be filled with mass concrete (1:4:8) at the Contractor's expense.

### **3.9 Blasting**

No blasting will be permitted without the prior approval of the Architect and Local Authority.

### **3.10 Borrow Pits**

Borrow pits will only be allowed to be opened up on the site on receipt of permission from the Architect.

### **3.11 Hardcore filling**

Hardcore for filling under floors etc., shall be good hard stone, ballast or quarry waste (not Magadi or similar soft stone) to the approval of the Architect 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 the lesser and graded to contain sufficient smaller pieces to fill all voids so that it can be thoroughly compacted. The filling is to be laid in layers each of a consolidated thickness not exceeding 225 mm and well watered and compacted by hand or mechanical tampers. The top surface of the hardcore shall be levelled or graded to falls as required and blinded with a 75 mm layer of similar material finely crushed and well rolled and watered immediately before concrete is laid.

### **3.12 Filling obtained from the excavations**

Filling obtained from surplus excavated materials is to be free from all weeds, roots, vegetable or other unsuitable materials and is to be filled in layers each of not more than 225 mm finished thickness. Each layer to be well watered and consolidated before the subsequent layer is filled in.

### **3.13 Materials found in the excavations**

No sand, aggregate or other materials found in the excavations is to be used in the works without the written permission of the Architect.

### **3.14 Anti-termite treatment**

Anti-termite treatment shall be carried out using Gladiator or other chemical approved by the Architect in writing diluted to a water emulsion in accordance with the manufacturers instructions.

The treatment shall be applied to the whole area of the hardcore bed and all surfaces immediately prior to the placing of the DPM to the concrete floor

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slab.

Treatment shall not be applied whilst it is raining or to surfaces of filling which are wet, and strictly in accordance with manufacturers instructions.

The contractors attention is drawn to the fact that this treatment can be toxic to animals and human life, and he shall prevent contamination of water supply systems, shall cover up and protect treated areas immediately after treatment and post written notices informing of the treatment at prominent points on the site and the building.

Immediately following treatment, the Contractor shall provide to the Architect for onward transmission to the Client, a written five year guarantee which guarantees:

- a) That the chemical used complies with this specification and has been used in accordance with the manufacturers instructions;
- b) That the guarantee shall be continuous for a period of five years from the date of treatment;
- c) That should infestation by any termites appear before the end of the five year period, the Contractor will return and retreat as necessary to eliminate the infestation entirely and at his own cost on each occasion that infestation appears within the five year period.

The contractor shall carry out annual inspections commencing three months after treatment and continuing to the end of the guarantee period to ascertain the presence of termites, and should any presence be found, the Contractor shall retreat as necessary to eliminate any infestation entirely and at his own cost on each occasion that infestation is found.

### **3.15 Protection of pipes, cables etc.**

Before commencing works which include excavations or ground levelling by manual or mechanical excavation the Contractor shall at his expense ascertain in writing from Telkom, K.P. & L. Co. Ltd., Engineer's Department (Water & Sewers section) and all other public bodies, companies and persons who may be affected, the positions and depths of their respective ducts, cables, mains or pipes and appurtenances. He shall thereupon search for and locate such services.

The Contractor shall at his own expense effectually prop, protect, underpin, alter, divert, restore and make good as may be necessary all pipes, cables or ducts, poles or wires and their appurtenances disturbed or damaged during the progress of the works, or in consequence thereof.

Except that such services as required to be removed or altered by virtue of the layout of the permanent work and not the manner in which the work is carried out, shall be so removed or altered at the expense of the Employer.

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The Contractor shall be liable for the cost of repairs to any services damaged as a result of carrying out the works and shall further be liable for any damage which may be shown during the period of maintenance, to have arisen through the execution of these works.

### **3.16 Rates for excavations**

The rates for excavation, including excavation in rock, must include for trimming, levelling 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 levelling and ramming bottoms, forming steppings and trimming excavation or filling of embankments and batters as required.

In his price for the item "Keep excavations free from all water" the Contractor shall allow and make provision for keeping the whole of the work 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 Architect, 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 the 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.

### **3.17 Rates for disposal**

Rates for disposal of excavated material 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 Architect.

### **3.18 Polythene sheeting**

Polythene sheeting shall be 1000 gauge obtained from an approved manufacturer. Joints in sheeting shall be treble folded with 150 mm fold and taped at 300 mm intervals with 50 mm wide black plastic adhesive tape as manufactured by Sellotape Limited. The sheeting shall not be stretched but shall be laid loose with sufficient wrinkles to permit shrinkage up to 15%.

### **3.19 Grassed areas**

Areas to be grassed shall be cleared of all debris, stones and roots and dug up to a depth of 300 mm.

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| A | <p>Where outcrops of rock or murram occur, these will be covered with suitable soil to a depth of 150 mm.</p> <p><b>PART 4 WALLING MATERIALS</b></p> <p><b>4.1 Cement</b></p> <p>Cement used for making mortar shall be as described in the Engineering specifications for Materials.</p> <p><b>4.2 Lime</b></p> <p>The lime for making mortar shall be obtained from an approved source and shall comply with BS 890 Class A for non-hydraulic lime. The lime to be run to putty in an approved lined pit or container. The water to be first run into the pit or container and the lime to be added until it is completely submerged, stirred vigorously until all lumps are disintegrated and shall be kept constantly covered with water and regularly stirred for at least four weeks. The resulting milk-lime then to be run through a fine sieve and run into a pit or other container and kept clean and moist for not less than two weeks before being used in the works.</p> <p><b>4.3 Sand</b></p> <p>Sand used for making mortar shall be clean well graded siliceous sand of good sharp hard quality equal to samples which shall be deposited with and approved by the Architect. It shall be free from lumps of stone, earth, loam, dust, salt, organic matter and other deleterious substances, passed through a fine sieve and washed with clean water if so directed by the Architect.</p> <p><b>4.4 Water</b></p> <p>Shall be as described in "Concrete Work".</p> <p><b>4.5 Concrete Blocks</b></p> <p>Concrete blocks shall comply with the requirements of BS 2028, 1384 except where amended or extended by the following clause. Blocks shall have square arises and corners. For fairfaced work damage to arises and corners shall not exceed the removal of 6 mm of the blocks depth or thickness.</p> <p>Concrete blocks shall have a minimum crushing strength of 3.5 N/mm<sup>2</sup> except when below the damp course level or in contact with soil when they shall have a minimum crushing strength of 7 N/mm<sup>2</sup>, unless noted otherwise on drawings.</p> <p>Hollow concrete blocks shall not be used below the damp course level or in contact with soil.</p> <p style="text-align: right;"><b>Carried to Collection</b></p> <p>Section No. 2<br/>SECTION 2 - SPECIFICATIONS<br/>Bill No. 1<br/>SPECIFICATIONS<br/><b>177 - M&amp;A</b></p> | Item |  |  |
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Concrete blocks used for external walls shall be Class 'A' and for internal load bearing walls they shall be at least Class 'B'. Class 'C' blocks shall only be used for non-load bearing partitions.

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

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

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

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

Blocks shall also be tested to determine the suction rate. The test shall consist of weighing the block, placing in a tray of water such that only 3 mm of the block side is immersed for a period of sixty seconds +/- 2 seconds; quickly wiping off excess water and reweighing. The suction rate is the increase in weight due to water absorbed and shall not exceed 2kg/m<sup>2</sup>/minute. Blocks which have a suction rate exceeding 2kg/m<sup>2</sup>/minute may be used if the Contractor uses an approved water reactive additive in the mortar or can show that the blocks are wetted such that the blocks will have a suction rate not exceeding 2kg/m<sup>2</sup>/minute for a period of 24 hours from being laid and provided the blocks comply with all other requirements.

Concrete blocks shall be stacked on prepared dry areas free of clinker, ashes and sulphate bearing strata. Blocks of different strengths shall be stacked separately and clearly marked to differentiate the strengths.

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

#### **4.6 Hollow Clay Blocks**

Hollow clay partition blocks shall comply with the provisions of BS 1190 Section 1 and are to be hard, well burnt, true to size and shape and with sharp arrises and keyed faces and joints and are to be obtained from an approved manufacturer and to be equal in every respect to a sample to be deposited with, and approved by, the Architect.

Blocks are to be 190 mm high (to give 200 mm course height including the joint) and of the thickness given herein. Cutting of blocks is to be avoided wherever possible and full use is to be made of quarter, half and three-quarter blocks, and blocks with conduit recesses.

#### **4.7 Louvre Block Walling**

i) To be precast concrete mix 1:1.5:3 or 25 N/mm<sup>2</sup> (12 mm aggregate) but with 10 mm finished fair on all exposed surfaces, built in cement and sand (1:5) mortar with straight horizontal and vertical joints to flush pointed both sides.

ii) Each block to be size 200 mm x 400 mm x 200 mm high and consisting of two ends each 200 mm x 200 mm x 50 mm thick joined with a 50 mm thick twice cranked louvre with top end of louvre projecting 40 mm above top of block.

#### **4.8 Stone**

All stone shall comply with the requirements of CP 121.202 for masonry and rubble walls respectively except where amended or extended by the following clauses.

Unless otherwise noted, all masonry walls shall be coursed squared rubble walling with mortar joints.

The size of stones for rubble walling shall be such that the length of stone does not exceed three times its height. For coursed squared rubble walls blocks shall not exceed 300 mm in height and shall be not less than 150 mm in height.

Where snecked rubble walls are specified, the snecks shall not be less than 100 mm square on the exposed face.

Stone for masonry shall have a minimum compressive strength of 10

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N/mm<sup>2</sup>. (Stone shall not be required to be tested to failure). The density of stone for masonry shall be not less than 2300 kg/m<sup>3</sup>. The drying shrinkage of stone shall not exceed 0.05%

Samples of stone provided for testing shall be tested for the following in accordance with the methods given in BS 2028, 1364 and the test results shall comply with the requirements of this specification.

(a) Compressive strength

(b) Density

(c) Drying shrinkage

The colour and texture of stone shall be uniform and consistent. Prior to delivering any stone to site, the Contractor shall supply the Architect with a sample of stone in order that he may approve the colour and texture. The Contractor shall ensure that sufficient suitable stone is available for the whole of the project prior to ordering the stone.

Where cast stone including stone described as artificial stone, reconstructed stone, etc., is specified the stone shall comply with the requirements of BS 1217.

Masonry shall be of stone, having no irregular faces and only the back face if not visible shall be left as from the saw.

Prior to ordering dry stone the Contractor shall demonstrate that the stone is durable. This may be done by supplying details of buildings constructed with stone from the same quarry and which has been exposed to the same environmental condition for at least ten years.

The maximum projection from the face of stone for rubble walls shall be 20 mm beyond the specified face of the wall.

The Contractor shall provide six samples of stone measuring 150 mm x 150 mm for testing prior to delivering any stone to site. As work proceeds the Contractor shall provide six samples 150 x 150 x 150 mm for testing from every 300 m<sup>2</sup> of work.

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

#### **4.10 Fire Bricks**

Clay fire bricks shall be obtained from an approved source and shall be hard, sound, square and clean well burnt and in respect of size shall comply with BS 3921 : 1974 Section 2.

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#### **4.9 Wall Reinforcement**

100mm Thick walls and where described other walls and partitions shall be reinforced with a 25 mm wide strip of No. 20 S.W.G. hoop iron built into alternate horizontal joints in the wall centre. The reinforcement shall be lapped and hooked at running joints, angles and intersections and carried at least 115 mm into abutting walls at junctions.

#### **4.11 Wall Ties**

To be 3 mm diameter galvanized mild steel wire twisted butterfly wall ties.

#### **4.12 Damp-Proof Courses**

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

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#### **4.13 Cement Mortar**

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

#### **4.14 Mixing of Mortar**

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

#### **4.15 General Construction**

##### **(a) Setting out**

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

##### **(b) Building in Wood Frames**

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

**(c) Building in Metal Windows and Doors**

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

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

**(d) Walls to Receive Plaster & Similar Finishes**

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

**4.16 Building Walling**

**(a) Laying and Jointing**

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

**(b) Bonding**

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

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

**(c) Tolerances**

All courses of walls shall be level with a maximum deviation of +/- 3 mm in

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any one metre length and a maximum overall deviation of 10 mm for lengths of wall exceeding 3 metres. Walls shall be plumb with a maximum deviation of  $\pm 3$  mm in any metre height of wall with a maximum deviation of  $\pm 10$  mm in the total height of the wall or any storey.

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

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

**(d) Curing**

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

**(e) Cavities**

Cavity walls shall be of the overall thickness shown on the drawings.

Cavities above ground level between leaves of block or masonry shall be free of mortar droppings or other debris. The Contractor shall take proper precautions to prevent mortar or debris entering the cavity.

Cavities below ground level shall be filled with mortar for cavities up to 75 mm wide and for cavities over 75 mm wide filling shall be concrete mix 1:3:6. Cavities shall be filled such that there is maximum of three times the thickness of the thinner leaf of the wall filled with wet mortar or concrete unless the wall is continuously supported for the depth.

**(f) Backfilling**

Earth backfilling against walls shall be carried out such that the level of the backfill is always equal on each side of the wall.

When a wall has filling material on one side only to a fill width of more than three times the wall thickness, the wall shall be continuously supported during backfilling.

Backfilling shall not be carried out until at least seven days have elapsed since the laying of the blocks or stone.

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#### **4.17 Reinforced Walls**

Steel reinforcing bars in walls shall be carefully placed and spacers used to ensure that a minimum of 20 mm cover is given to the reinforcement unless otherwise specified.

Horizontal reinforcement in mortar joints shall be laid such that the reinforcement is not in contact with the blocks or stone.

#### **4.18 Wall Ties**

Wall ties shall be provided to connect walls to steel or concrete columns and beams to connect two unbounded leaves of wall.

Wall ties shall be provided at 450 mm centres both vertically and 900 mm centres horizontally and shall be staggered when used to connect two leaves of unbonded wall. Wall ties shall be embedded into each material by a minimum of 50 mm.

#### **4.19 Fair Face**

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

#### **4.20 Pointing**

Pointing of walls shall be carried out as the work proceeds wherever possible. When coloured mortar is specified for pointing only the pointing shall be carried out after work has been completed.

Existing walls shall be prepared for pointing by raking out all loose friable material to a minimum depth of 15 mm to form a square recess. The joints shall then be wetted and new mortar shall be forced into the joints and finished as directed.

#### **4.21 Holes, Cutting and Chasing**

(a) All putlog holes shall be not less than one course deep and carefully filled with a block cut to fit size of opening with beds and joints filled with mortar well tamped in after scaffolding is removed, and if in faced walls to match facing.

(b) Where walling is cut, holed or chased for conduits, pipes and the like all such cuttings etc., shall be filled in solid with cement mortar (1:4) prior to the application of finishes.

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**A PART 5 ROOFING AND RAINWATER DISPOSAL**

**5.1 Galvanized steel pre-painted roof sheeting**

Galvanised steel pre-painted roof sheeting shall be 0.7mm thick IT5 Resincot pre-painted box profiled galvanised steel sheets as manufactured by GALSHEET KENYA LIMITED or other equal and approved and shall be laid and fixed strictly in accordance with the manufacturers printed instructions.

The Resincot finish is to be alkyd urea type stoving enamel consisting of two coats to the external face and one coat to the internal face to a colour to the approval of the Architect, which may not be a standard Resincot colour and may be a special colour.

The sheets shall be fixed to steel Z purlins using 6mm diameter galvanised hook bolts with rubber caps. Holes shall be drilled through the ridges of the corrugation and not the hollows. No damaged or scratched pre-painted sheets will be accepted on site and any such sheets will be replaced at the Contractors expense.

Sheeting shall be laid with end laps of 200 mm and one corrugation side laps on the side away from the prevailing wind.

Where shown on the drawings single length roof sheeting shall be provided without any end laps and the contractor shall allow for ordering the required length and for any additional costs associated therewith. Such sheet lengths will be approximately 12.5 metres long.

Ridges and other accessories shall be supplied as shown on the drawing and shall be fixed to timber or steel purlins as above described.

**5.2 Proprietary accessories and closures to steel roof sheeting.**

Proprietary metal ridges, flashings and end closures to fit IT5 profiled sheets with a pre-painted resincot finish of matching colour to the roof sheets are to be provided where specified on the drawings or described in the bills of quantities Fixing shall be undertaken in accordance with the manufacturers instructions.

Polyurethane foam polyclosures as supplied by Galsheet Kenya Limited or equal and approved shall be fixed underneath ridge cappings and at eaves between the purlin and roof sheeting

**5.3 Sealant to galvanised steel roof sheeting**

Where specified on the drawings and described in the bills of quantities a sealant is to be applied to the side and end laps of each roofing sheet.

The sealant shall be a silicone sealing strip size 5 x 9mm as supplied by Galsheet Kenya Limited or other equal and approved and fixed in

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accordance with the suppliers printed instructions.

#### **5.4 Insulation foil underlay**

Insulation foil underlay shall be equal to Super Sisalation as manufactured by Laminated and Coated Products, South Africa and supplied by Galsheet Kenya Limited. Multi-purpose 405 underlay shall be laid under concrete tile roofs and heavy duty 420 underlay under IT5 steel roof sheeting with strainer wires.

The insulation foil shall be fixed in accordance with the manufacturers printed instructions under the IT5 or roof tile coverings. Strainer wires shall be provided between purlins to support the insulation foil which is to be laid level horizontally and fully lapped.

The contractor may propose an alternative product to the Super Sisalation for the Architects approval provided the alternative proposed is equivalent to or better than the Super Sisalation specification.

#### **5.5 Concrete roofing tiles**

Concrete roofing tiles are to be as manufactured by Manson Hart Kenya Ltd or other equal approved. Tiles are to be either 380 x 230mm standard roll mark I smooth finish tiles with through colour and spray on finish or 420 x 330mm bold roll mark II smooth finish tiles with through colour and spray on finish. Generally, the smaller tile is to be used to the verandah roofs and the larger tile to the main roofs as shown on the drawings. Matching accessories including ridge tiles are to be supplied by the manufacturer.

Tiles are to be in colours selected by the Architect and all ridges and other special tiles must be from the same manufacturer and must match the tiles with which they are laid. Samples are to be provided.

All tiles are to be laid to the correct gauge on treated sawn timber battens each slope of the roof being sent out to take an exact number of whole tiles without any cutting at ends and with straight joints true from top to bottom.

The top and bottom courses, every fifth course and verge tiles to be nailed using 50mm galvanised nails.

At verges special left hand verge tiles are to be used.

Ridge and hip tiles are to be bedded in cement mortar (1:4) and visible joints pointed in matching coloured compound obtained from the tile manufacturer.

Any cutting on tiles and specials shall be accurately executed with a power driven masonry saw and any exposed raw edges coloured with compound as before described.

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No cracked, chipped or otherwise broken tiles will be allowed in the Works and all tiles discoloured or defaced by mortar droppings are to be replaced at the contractors expense.

Before delivering up the works, the contractor shall examine the roof coverings and leave the roofs clean, water-tight and drop dry. Tiles are to be uniform in size, shape and colour, hard and free from defects, fittings and accessories must match the tiles.

Battens are to be as recommended by the manufacturer and minimum end lap shall be 75mm as necessary to avoid cutting tiles at eaves or ridges. Battens are to be in lengths exceeding 1500mm and fixed with 7mm screws to each rafter.

#### **5.6 Metal roof flashings**

All metal flashings to be formed in 24 gauge galvanised steel primed in calcium plumbate or red oxide primer with matt painted finish, formed to profile as shown on the drawings, including sleeve flashings to soil and vent pipes and roof protrusions. Cut edges must be primed in calcium plumbate or red oxide primer with matt painted finish to prevent rusting.

#### **5.7 Valley gutters/secret gutters**

Valley gutters to be formed in painted 18 gauge pressed metal galvanised steel profiles, fully supported over entire length with timber branderings. Cut edges must be primed in calcium plumbate or red oxide primer with matt painted finish to prevent rusting.

Secret gutters to be formed in 4mm pressed galvanised steel sheet, suitable for maintenance access, and fully supported over its entire length with t&g boarding, with personnel safety wire and bolt fixings to detail as drawings.

#### **5.8 Roman clay tile roofing**

Roman clay tiles shall be obtained from Kenya Clay Products or equal approved.

Clay tiles shall be uniform in shape and size well burnt, of even colour and free from cracks and other defects. Samples of the tiles the Contractor proposes to use are to be provided to the Architect for his approval. Tiles subsequently supplied shall be equal in all respects to those approved by the Architect.

Tiles are to be laid in level horizontal courses with 75mm end laps between adjacent horizontal courses. Tiles are to be laid reverse overlapping in vertical courses at 110mm centres between adjacent vertical courses.

On concrete roofs of 36 degrees slope Roman tiles are to be fixed to 75 x

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50mm pressure impregnated timber battens fixed at 220mm centres under the reverse tile of vertical courses. Tiles are to be fixed in every third horizontal course with galvanized nails.

Where Roman tiles are fixed to timber roofs fixing shall be as specified for concrete roofs of 36 degrees slope.

Ridges and hips of Roman tiles are to be bedded in cement mortar and flush pointed.

#### **5.9 Underfelting**

Underfelting as specified by the Architect is to be provided to all tiled roofs and fixed under roofing battens with 150mm laps.

#### **5.10 Modified bituminous roofing membrane**

Modified bituminous roofing membrane shall be a reinforced plastomeric polymer-bitumen waterproofing membrane type as Index Fidia and Columba types or equal approved. Felt thickness is to be 4mm with a mineral surface finish.

The membrane is to be applied in strict accordance with the manufacturers instructions including side and end laps.

Before commencement of the roofing membrane works the contractor shall submit to the Architect for his approval the method of application of the membrane.

All work shall be executed by a firm approved by the Architect.

The contractor shall, as and when required by the Architect, submit and deliver samples of any materials for testing.

The contractor is to obtain from the approved sub-contractor a statement in writing to the effect that the screed and/or under bed is clean and otherwise satisfactory before the coverings are laid. A copy of the statement is to be forwarded to the Architect.

After completion of the roofing membrane works the contractor shall test all the roof areas for water tightness and leakage by blocking the rainwater outlets, filling the roofs with water and monitoring and testing over a forty eight hour period.

The contractor is to provide a written guarantee and undertaking to the effect that during a period of ten years from and after the certified date of Practical Completion of the Works, he shall at his own expense, make good to the approval of the Architect all and any leakage or defects in the work which shall be attributable to improper materials or faulty workmanship,

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and shall bear the cost of any consequential damage.

This guarantee in no way compromises or indemnifies the manufacturers guarantee for the material.

#### **5.11 Roof screeds generally**

Roof screeds are to be laid to a minimum fall and crossfall of 27 mm in 3.0 metres with a minimum thickness of 19 mm at rainwater outlets and are to be finished to the entire satisfaction of the sub-contractor executing the roofing.

#### **5.12 Cement and sand roof screeds**

The roof screeds shall be formed of cement and sand (1:3). The screeds shall be laid in bays, square where possible, of maximum 10 square metres. Each bay shall be formed between stop boards of the correct height and cut on each side to indicate the slope required in the roofing. The screed shall be trowelled with a wood float to true and accurate falls or crossfalls up to the stop boards. A 10 mm wide gap shall be left between each screed bay for the full depth of the screed.

The screeds shall be allowed to cure thoroughly to attain maximum shrinkage. Any cracks which appear due to shrinkage shall be made good.

The gaps between the screed bays shall be filled as follows:

- 1) Brush or blow out joints to remove dirt, dust, etc., and prime the sides of the joints using a piece of sponge or similar dipped in a mixture of equal volumes of "Flintkote" Type 1 or Type 3 emulsion and water. Allow to dry.
- 2) Fill up joints slightly proud on the surface using a 1:2:3 mastic. This mastic shall be prepared by mixing one volume of cement with three volumes of sand, adding a little water to dampen the mix, then adding two volumes of "Flintkote" Type 1 or Type 3 emulsion. The mastic is thoroughly mixed together adding further water as necessary until it is a uniform brown colour, without being too sloppy. Allow to set and dry.

The screed joints shall then be covered with a 200 mm wide strip of building paper not bonded to the screed joint and well lapped at angles and junctions before the application of the roof covering.

#### **5.13 Lightweight roof screeds**

Lightweight roof screeds shall be composed of bases of cement, sand and pumice (1:4:8) finished with a 12 mm cement and sand (1:5) topping laid whilst the base is still green and trowelled smooth to the satisfaction of the Architect.

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The screeds are to be laid as described in 'Cement and Sand Roof Screeds'.

#### **5.14 PVC rainwater pipes**

PVC rainwater pipes and fittings are to comply with BS 4576 with rubber ring seal joints.

Pipes are to be fixed to the structure with PVC holderbats or brackets built-in or plugged and screwed at maximum 2 metre centres.

Bends, swan necks, discharge chutes and fittings generally are to be fixed where necessary to facilitate the flow of water.

Rainwater outlets shall be PVC suitable for the roof finish in which they occur with domical PVC grating.

#### **5.15 Steel rainwater pipes and gutters.**

Steel rainwater pipes and gutters are to be 6mm thick steel obtained from an approved manufacturer and finished with calcium plumbate primer.

#### **5.16 Fulbora rainwater outlets**

Fulbora rainwater outlets shall be manufactured by an approved manufacturer to the sizes and profiles manufactured from heavy grade cast iron, including grating, with a minimum 75mm wide flange all round. The top fixing to roof surfaces, is to be fully bedded in hot bitumen and jointed to the PVC or steel rainwater pipes.

#### **5.17 Testing rainwater installations**

Rainwater installations shall be subjected to a water test and proved capable of withstanding a pressure of 1.05m head of water to the approval of the Architect. Any defects are to be made good by the contractor and the whole system left sound and perfect.

#### **5.18 Guarantee**

The contractor is to leave all the roofs complete and watertight, unmarked with cement or bitumen particularly flashings and external finishes and with joints in straight and even lines.

Unless otherwise provided for in the Bills of Quantities, the contractor must submit to the Employer prior to the date of Practical Completion a ten year guarantee for the roof coverings against leakage.

#### **5.19 Protection**

The contractor is to take all necessary precautions to protect the finished

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work and must ensure that no damage occurs to the roofing until completion of the works.

#### **5.20 Completion of the works**

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

Item

### **A PART 6 CARPENTRY AND JOINERY**

#### **6.1 Generally**

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

#### **MATERIALS**

#### **6.2 Qualities of timber**

- (a) The qualities of timber stated hereinafter are in accordance with the latest Kenya Government Grading Rules.
- (b) All timber described as Prime Grade is to be First Grade (Grade 1).
- (c) All timber described as Selected Grade is to be Second Grade (Grade 11).
- (d) All hardwood is to be Prime Grade (Grade 1).
- (e) All timber for permanent work in the building shall before use be approved by the Architect for quality in accordance with the foregoing specification for its respective grade. Any timber not so approved by the Architect shall be removed from the site forthwith.

#### **6.3 Insect damage**

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

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#### **6.4 Seasoning of timber**

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

#### **6.5 Preparation and protection of timber**

(i) All timber necessary for the works is to be purchased immediately the contract is signed, and when delivered is to be openstacked for such further seasoning as may be necessary. Preparation of the timber is to be commenced simultaneously with the commencement of the works generally.

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

#### **6.6 Species of timber**

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

#### **6.7 Pressure impregnated timber**

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

(ii) Any other method of timber impregnation will only be allowed at the Architect's approval.

#### **6.8 Hardwood**

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

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

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

#### **6.9 Softwood**

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

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

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

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

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

#### **6.10 Plywood**

All plywood shall comply with the requirements of BS 1455, be obtained from a manufacturer to be approved by the Architect and be of the thicknesses shown on the drawings.

Plywood shall be Exterior Grade except where otherwise stated. Plies shall be bonded together with adhesives complying with the requirements of BS 1203 grade WBP.

Plywood shall be free from end joints (including joints in veneers) overlaps in core veneers, dead knots, patches and plugs, open defects, depressions due to defects in cure, insect attack (except isolated pinworm holes through face veneers only), fungal attack and from discolouration differing from that normally associated with species.

Face veneers shall be hard and durable and shall be capable of being finished to a smooth surface. Face veneers shall closely match the general joinery timber supplied.

#### **6.11 Chipboard**

Chipboard shall be medium density wood particle board complying with BS

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2604 Part 2, produced in factories by an approved process.

#### **6.12 Blockboard**

Blockboard shall be of approved local or imported manufacture to BS 3444 glued throughout and softwood or hardwood faced as hereinafter specified and equal to a sample to be deposited with the Architect for approval and which when so approved shall form the standard for the works.

#### **6.13 Fibreboard**

Shall be insulating board to comply with BS 1142 of the types specified and of approved manufacture.

#### **6.14 Medium density fibreboard**

Medium density fibreboard (MDF) shall be obtained from an approved manufacturer. Panels are to have a moisture content of 6% and the contractor shall provide to the architect for approval a manufacturers certificate of origin and detailed specifications of the manufacturers board.

Routed finish to boards is to be finished by the manufacturer at the factory.

#### **6.15 Tempered hardboard**

To be of approved manufacture according in all respects with BS 1142, suitable for painting, prepared and fixed in accordance with the maker's instructions.

#### **6.16 Timber doors**

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

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

#### **6.17 Flush doors**

Flush doors shall be of the sizes and thickness indicated in the Bills of Quantities and shall comply in all respects with BS 459 Part 2 and as shown on the drawings.

- a) Core shall be GJ grade.
- b) Facing is to be 6mm thick MDF board, veneered as specified.

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- c) Hardwood lipping to be 25mm thick tongued on back face into stiles and rails of core, mitred at angles and glued in.
- d) Semi-solid core shall be of 75mm wide stiles, top and bottom rails all framed together with two 450mm x 150mm lock blocks framed in and 20mm intermediate horizontal rails at 60mm centres stub tenoned in each end to stiles. Each horizontal rail and top and bottom lipping to have 10mm diameter hole bored through to ensure air circulation through core.
- e) Solid core to consist of 75mm stiles top and bottom rails with solid core of 13mm horizontal strips glued together under pressure. The strips to be put together with the grain alternating and to be tongued on edge and let into vertical grooves in stiles. MDF facing to be 6mm thick.
- f) Flush doors may be imported or of local manufacture but in either case a sample must be approved by the Architect before an order is placed and all doors must be equal to the approved sample.

#### **6.18 Fire Check Flush Doors**

Fire check flush doors shall comply in all respects other than the following modifications with BS PD 6512 Part I.

- a) To be of the thickness and size stated in the Bills of Quantities.
- b) Core shall be 24mm fibre cement.
- c) Hardwood lipping to be 25mm thick tongued on back face into stiles and rails of core mitred at angles and glued in.
- d) The core to be constructed of 50mm wide stiles and top and bottom rails. Each side to be fitted with 6mm fibre cement lining let in flush to stiles and rails and faced with 1.6mm plastic sheeting.

#### **6.19 Hardwood veneers**

- (a) Veneer facings shall be selected to the approval of the Architect.
- (b) No glass or synthetic fibre stitching will be permitted for jointing veneer leaves together.
- (c) Veneers shall be free from splits, dote, glue, stains, insect or fungi attack and rot.
- (d) Filling or inlaying of any kind will not be accepted.
- (e) All wood veneers shall be bonded to the core material in such a way that no lifting and blistering shall occur.
- (f) All hardwood veneered boards shall have 12mm or 25mm matching hardwood lippings.

#### **6.20 Laminated plastic veneers**

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Laminated plastic veneers shall be a decorative sheet 1.6 mm thick complying with BS 3794 Class 1. The pattern will be selected by the Architect. The laminate shall have decorative (pattern) finish on one face only. Patterns will be selected from the manufacturer's standard range.

#### **6.21 Wood block floors**

(i) To be supplied and laid in 460mmx460mm panels by a specialist all to the approval of the Architect.

(ii) On completion and immediately prior to applying the clear finish, the surface is to be twice machine sanded using first coarse and the fine sandpaper and brushed perfectly clean.

#### **6.22 Miscellaneous material**

(a) Tapered timber pellets for filling screw holes must be cut across the grain and shall be of the colour and grain being plugged.

(b) Metal fixing devices must be fully rust-proofed. Cramps, brackets, plugs, bolts etc., must be of a type, make and pattern approved by the Architect.

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

#### **6.23 Nails and screws**

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

#### **WORKMANSHIP**

#### **6.24 Tolerances**

The method of construction must accommodate tolerances as shown on the drawings and allow for ensuring that repetitive units can be accurately located in relation to grid lines and that tolerances do not accumulate.

Reasonable tolerance shall be provided at all junctions between joinery and the building carcass, whether of masonry or frame construction, so that any irregularities or movement may be adequately compensated.

#### **6.25 Jointing**

(a) All joints must be made as specified or detailed and the execution of all jointing shall be to the satisfaction of the Architect.

(b) Joining surfaces of all connections exposed to the weather are to be thickly primed except where glueing is specified. Surfaces are to be in good

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contact over the whole area of the joint before fastenings are applied.

(c) No nails, screws or bolts are to be placed in any end split. If splitting is likely or is encountered in the course of the work, holes for nails are to be pre-bored at diameters not exceeding  $\frac{4}{5}$  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.

(d) Where the use of bolts and washers is specified the holes are to be bored from both sides of the timber and to be a diameter  $D + D/16$  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.

(e) Joints in joinery must be as specified or detailed and so designed and secured as to resist or compensate for any stresses to which they may be subjected. All nails, sprigs etc., are to be punched and puttied.

(f) Loose joints are to be made where provision must be made for shrinkage, glued joints where shrinkage need not be considered and where sealed joints are required. All glued joints shall be cross-tongued or otherwise reinforced.

(g) Glues for load bearing joints or where conditions may be damp must be of the resin type. For non-load bearing joints, or where dry conditions can be guaranteed, resin or organic glues may be used.

#### **6.26 Framed work**

The word "framed" shall mean and include all the best known methods of jointing woodwork together by mortice, tenon, dovetail or other methods, and for forming all necessary stops, mitres or mason's mitres in members which are moulded, rebated etc.

#### **6.27 Plugging**

Plugging and fixing to walls in all trades shall be executed by "Rawlplugging" or similar approved proprietary methods all in accordance with the manufacturer's printed instructions. Hacking of holes and filling with timber plugs will not be permitted under any circumstances.

#### **6.28 Carpentry work**

(a) All carpentry shall be executed with workmanship of the best quality. Scantlings and boards shall be accurately sawn and shall be uniform in width and thickness throughout and shall be as long as possible and practicable in order to eliminate joints.

(b) All work shall be left with a sawn surface except where specified to be wrot.

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(c) All work shall be accurately set out and in strict accordance with the drawings, and shall be framed together and securely fixed in the best possible manner with properly made joints. Provide all braids, nails, screws etc., as necessary and as directed and approved.

(d) Actual dimensions of scantlings for carpentry shall not vary from the specified dimensions by more than +3 mm or -1 mm. Sizes and thicknesses of wrot carpentry timbers are nominal, that is to say a variation of 3 mm from the specified sizes will be allowed from each wrot surface unless the thickness or size is described as "finished" in which case no variation from the stated thickness or size will be permitted.

#### **6.29 Joinery work**

All joinery work shall be wrot unless otherwise described.

(a) Sizes and thicknesses of joinery are nominal that is to say a variation of 3 mm from the specified sizes will be allowed from each wrot surface unless the thickness or size is described as "finished" in which case no variation from the stated thickness or size will be permitted.

(b) No joinery to be put in hand until the details have been supplied or approved by the Architect and in all cases the details are to be worked to.

(c) All joinery shall be executed with workmanship of the best quality in strict accordance with the detailed drawings, mouldings shall be accurately and truly run on the solid and all work planed, sand-papered and finished to the approval of the Architect. All arrises to be slightly rounded. All framed work shall be cut out, and framed together as soon after the commencement of the building as is practicable but should not be wedged up until the building is ready for fixing the same and any portions that warp, get in winding, develop shakes or other defects shall be replaced with new. In door frames etc., the heart face of the timber shall be fixed away from the wall. As soon as required for fixing in the building the framing shall be glued together with glue as described and properly wedged or pinned etc., as directed.

(d) All beads, fillets and small members shall be fixed with round or oval braids or nails well punched in and stopped. All larger members shall be fixed with screws, the screws let in and pelleted over with wood pellets to match the grain.

(e) Cups and screws for fixing beads and fillets shall be spaced 150 mm apart and 25 mm from angles.

(f) All joinery immediately upon delivery to the site is to be stored and protected from the weather.

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(g) All joinery is to be primed before fixing but no work is to be primed until it has been approved by the Architect.

(h) All 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 work.

(i) When natural finish is specified, the timber in adjacent pieces shall be matched and uniform or symmetrical in colour and grain.

### **6.30 Softwood**

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

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

### **6.31 Hardwoods**

Hardwoods are as described.

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

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

### **6.32 Plywood**

Plywood of the required thicknesses shall be used. The Contractor will not be allowed to make up thicknesses by glueing together sheets of thinner plywood.

Where cutting is required it shall be neatly and accurately performed with fine toothed saws so as to avoid splitting the face veneers and intermediate plies.

### **6.33 Chipboard and MDF boards**

Where cutting is necessary it shall be neatly and accurately performed with fine toothed saws so as to avoid splitting the face veneers. Where raw edges arise from cutting these shall be faced with a matching hardwood fillet cut pinned and glued to match factory produced edges.

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**6.34 Blockboard**

Where cutting is necessary it shall be neatly and accurately performed with fine toothed saws so as to avoid splitting the face veneers. Where raw edges arise from cutting these shall be faced with a matching hardwood cut pinned and glued to match factory produced edges.

**6.35 Laminated plastic veneer**

Laminated plastic veneers are to be fixed with an approved adhesive, care being taken to eliminate all air from beneath the laminate on fixing. The laminate is to be free from chipped or cracked portions and work so disfigured is to be removed and replaced. When the adhesive is set the laminate is to be neatly bevelled off along all arrises with a plane.

Where plastic laminate is fixed to doors or shelves etc., without a laminate to the outer edge, a raised lipping is to be provided and the laminate finished flush against the lipping.

**6.36 Fixing doors and frames**

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

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

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

Door frames shall be treated to match doors.

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

**6.37 Construction of doors**

(a) Flush doors specified as solid construction shall have a 100% solid core of vertical laminated Cedar or equal and approved.

(b) Flush doors specified as semi-solid construction shall be constructed

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with timber stiles and rails, infilled with horizontal intermediate rails spaced equally apart and tenoned into the stiles.

(c) Unless otherwise specified, doors scheduled to receive a clear or veneered finish shall be lipped on all edges.

(d) Where panels over doors are specified, such panels shall be constructed in the same way and with the same materials as the doors above which they are situated, and the panels shall match the doors in every respect.

(e) For doors specified as MDF boards faced, the MDF boards shall not be less than 6 mm thick. Face veneers shall be Grade 1 for painted doors.

(f) All doors shall be provided with lock blocks of a minimum size 300 mm x 75 mm.

(g) Glass beading strips shall be approved washleather self adhesive tape turned up over both sides of the glass and glazing surfaces and turned to the straight line.

(h) All screws shall be countersunk, and screwed and pelleted in un-painted work.

(i) Timber pellets shall be glued and tapped into the hole, making sure the grains line up, and carefully trimmed back flush with joinery to give a clear, smooth overall surface.

### **6.38 Fittings and fixtures**

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

### **6.39 Mouldings**

Moulded work shall be accurately worked to the full size details supplied by the Architect. Mouldings shall be worked on the solid unless otherwise stated.

### **6.40 Circular work**

When circular work is specified it shall be built up with an appropriate number of pieces cut to the required shapes. The pieces shall be put together in two (or three) thicknesses so that they break joint, and shall be secured with hardwood keys and wedges or with hardwood pins (whichever is more appropriate).

### **6.41 Scribing**

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

#### **6.42 Finish**

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

#### **6.43 Completion of works**

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

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

#### **6.44 Defective work**

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

### **IRONMONGERY**

#### **6.45 Generally**

(a) Ironmongery shall be fixed with suitable screws in matching finish and prices shall include for this.

(b) All locks and ironmongery shall be fixed before the woodwork is painted, handles shall be removed before the painting commences, carefully stored and refixed after completion of painting.

(c) All locks, springs and other items of ironmongery with moveable parts shall be properly tested, cleaned and adjusted where necessary to ensure proper working order at the completion of the works and left in perfect working order by the Contractor.

(d) The keys of all locks shall have labels attached with door references marked on before handing to the Architect.

(e) All locks shall be provided with a master key system and prices shall include for this as required by the Client and as instructed by the Architect. The client's requirements are to be obtained by the Contractor before ordering.

All locks are to be provided with two keys and no key is to operate any but its own lock except for master keys. All keys are to be provided with a

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key ring and plastic tag on which is to be firmly written the door reference number.

(f) Unless specified otherwise ironmongery for doors and for aluminium windows to be stainless steel brushed finish or satin anodized aluminium finish.

(g) Where items of ironmongery are not specified by manufacturers catalogue reference, the contractor shall submit proposals for the Architects approval within one month of the date of commencement of the works. Specifications including manufacturers catalogue reference numbers of the items he proposes to purchase.

(h) Prior to fixing any item of ironmongery, the contractor shall obtain the Architects approval of a sample.

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**SPECIFICATIONS METALWORK  
PART 7 METALWORK**

**MATERIALS**

**7.1 Generally**

All materials shall be the best of their respective kinds free from defects and all work is to be carried out in the most workmanlike manner and strictly as directed by the Architect. The materials in all stages of transportation, handling and stacking shall be kept clean and prevented from injury by breaking, bending or distortion and weather action.

**7.2 Mild steel**

Mild steel shall comply with BS 7668-1994.

**7.3 Hollow section tubing**

Square and rectangular hollow section tubing shall be hot rolled mild steel in accordance with Grade 43C of BS 4360 or the equivalent grade in BS 7668.

**7.4 Bolts, nuts and washers**

These shall be fabricated from materials which comply with BS 7668 and each manufactured item shall comply with the appropriate BS.

**7.5 Galvanized sheet steel**

To be No. 24 S.W.G. of approved manufacture to BS EN 10143-1993 of best quality mild steel sheets cold rolled close annealed patent flattened and hot dip galvanized.

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**7.6 Aluminium**

Aluminium shall be extruded sections with an anodised or powder coated finish, either natural or coloured, to give a 25 micron minimum depth to European norm EWAA.

The Contractor shall submit with each item or batch of items delivered, test certificates or such other documentary evidence as the Architect shall require that the depth of anodising or powder coated finish specified has been achieved.

**7.7 Stainless steel**

Stainless steel shall be Austenitic steel BS 6323 comparable to BS 1449 type 316 S 16.

**7.8 Metal door frames**

Metal door frames are to be steel to comply with BS 1245 of profile to suit the wall thickness.

Door frames are to be provided with the following:-

- (a) Two priming coats of paint
- (b) Fixing lugs for building into walls
- (c) Three galvanized steel hinges per door
- (d) Adjustable lock strike plate
- (e) Two shock absorber buffers.

**7.9 Steel windows**

Steel windows shall be manufactured from sections conforming with BS 6510 of heavy duty sections of the metric W20 range of approved manufacture and design approved by the Architect.

After manufacture and before delivery to site steel windows are to be hot galvanized by dipping in a bath of molten zinc or painted with one coat primer.

**WORKMANSHIP****7.10 Welding**

All welding is to be in accordance with the requirements of BS 5135 and the electrodes shall comply with BS EN 499.

Fusion faces shall be free from irregularities which could interfere with the

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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 of welding shall be prepared by planning or machine flame cutting.

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

Welds shall be carried out with each run closely following the one prior with sufficient time between to allow for 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 5 mm.

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 cut out or made good to approval.

External faces of butt welds to be ground smooth.

#### **7.11 Painting**

All steel is to be wire 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 BS 2523 shall be applied at the shop.

Any damage to the priming paint shall be made good to the Architect's satisfaction.

#### **7.12 Fixing of steel windows**

Fixing of metal windows shall include for assembling and fixing, including screwing to sub-frames or cutting mortices for lugs in concrete or walling and running with cement mortar (1:4), bedding frames in similar mortar, pointing in mastic, bedding sills, transomes and mullions in mastic, making good finishings around both sides and fixing, oiling and adjusting all fittings and frames.

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**A PART 8 ALUMINIUM WINDOWS AND SHOP FRONTS**

**GENERAL**

**8.1 Scope of Work**

The work generally comprises the design, fabrication and installation of fixed and opening glazing shop fronts, windows and doors.

The contractor shall be responsible for the design, sourcing, fabrication, testing, delivery to the works, storage, setting out, installation, removal of any protection, cleaning down, inspection, supervision and co-ordination of the work, all in accordance with the requirements of the drawings and bills of quantities.

Within the scope of the dimensions and general requirements shown on the drawings, the contractor is to propose the type and sections of all extrusions and provide typical drawings of the sections.

The work includes but is not necessarily limited to the following:

- (a) Extruded aluminium frames to fixed and opening glazing complete with glass units, and all associated plates, joint sleeves and decorative caps etc, finished in polyester powder coating.
- (b) Fixing plates, brackets, minor framing, anchors, screws, bolts, butts and washers etc.
- (c) Windows complete with glass units, glazing gaskets and seatings and ancillary glazing components, metalwork finished in polyester powder coating.
- (d) External seals and flashings
- (e) Finishings in polyester powder coating

The drawings are schematic and indicate requirements only. This specification sets out the minimum standards of performance to be achieved and the minimum standards of materials and workmanship required.

The contractor shall be responsible for developing his design proposals as necessary to provide a detailed solution to the Architects approval and for ensuring that the whole of the work meets or exceeds the minimum performance levels and materials and workmanship standards specified herein.

Dimensions : The dimensions shown on the contract drawings are structural opening dimensions. It will be the responsibility of the contractor to check

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all sizes before manufacture commences.

Samples : Before a firm order is placed the contractor will be required to provide, as required by the Architect, samples of extrusions, fittings, ironmongery and typical finished windows for approval.

The work shall comply with the Building Regulations and all current amendements thereto.

The contractor will be deemed to have allowed in the contract sum for full compliance with all current Building Regulations, Local Building Bye-Laws, Safety Regulations, Fire Regulations and all other statutory regulations.

British Standards with current amendements referred to in this specification shall be the latest edition.

Materials and components of foreign origin shall comply with the relevant national standard but shall not be inferior in any way to the quality specified in the most relevant British Standard.

## **8.2 Inspections and Sample Approvals**

The contractor shall allow the Architect and his representative(s) unrestricted access to his office and factory and those of his contractors or suppliers to inspect materials, components, assembled units, manufacturing methods and processes and all related quality control procedures etc. Control samples of all materials to be incorporated in the contractors works must be submitted to the Architect for approval.

## **MATERIALS**

### **8.3 Aluminium**

Aluminium extrusions shall be from alloys designated 6060, 6063, 6261, 6282 and sheet alloys designated 1200 and 3004 or 5251  
The extrusions shall comply with BS 1474

### **8.4 Powder coated finishes**

Certain references under this specification refer to the South African Bureau of Standards (SABS). Powder coating substrates is to be to SABS 1274 - 1979. No powder coating is to be carried out on a fabricated product. Coatings are to be applied by the Powder Coating Process.

All surfaces shall be coated with a nominal thickness of between 50 and 80 microns.

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The powder type to be used in the coating process shall be either Interpon D or Vedoc HI-Q or other equal and approved and shall comply with the requirements of BSS 6426 of 1984 with particular reference to Section 2, and moreover carry a manufacturers guarantee of a minimum of 10 years. This guarantee must be valid in the Republic of Kenya. The guarantee is to be provided by the Architect on completion of the work.

The applicator shall be on the approved list of applicators as published by the powder manufacturer and shall comply with the requirements as stated above.

Colours will be established from the FA2 standard published architectural range.

The gloss level shall be satin.

The process conditions must comply with the requirements of and as described in Section 3 of BS 6496 and where applicable SABS 1274 1979.

The contractor shall immediately repair any damage that occurs by using the repair procedure as recommended by the powder manufacturer. These repair materials are to be confined to the repair of minor scuffmarks or small scratches.

Scratch and blemish inspection will be viewed at a distance of three metres under normal lighting conditions. Normal lighting conditions shall mean reasonable lighting conditions under which the product is normally viewed.

Scratches in aluminium are defined as being a mark on the aluminium surface which penetrates the painted surface thereby exposing the natural metal. If blemishes are visible when viewed from a distance of three metres under the lighting conditions described, the product will be rejected.

Prior to the installation of the work, a thorough check is to be made by the contractor for compliance with this specification and he is to submit this in writing to the Architect. This is to include, inter alia:

1. The production of relevant AAAMSA test certificates
2. Proof that the powder coat finishes comply with this specification.

## **DESIGN AND PERFORMANCE**

### **8.5 General**

The work provided shall exclude wind and rain from the buildings interior and shall assist in maintaining the desired internal environment. All elements shall be strong enough to resist the forces that are likely to act upon them, but they should achieve this necessary strength and rigidity without adding undue load to the building structure. They shall be durable

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and perform their functions for the life of the building which will be in excess of 50 years.

#### **8.6 Rainwater penetration**

The shop fronts, windows and doors shall be designed, fabricated and installed to prevent leakage to the interior even during periods of heavy rain combined with high winds.

The cladding system in all elements shall incorporate two positive lines of defence against the passage of rainwater to the interior by way of a drained framing system. The space between the two lines of defence shall be drained and ventilated to the exterior.

The outer line of defence shall comprise neoprene, EPDM or silicone gaskets which shall be designed, manufactured and installed to prevent rainwater penetrating into the aluminium framing members/glazing chambers.

#### **8.7 General**

The design and construction of the aluminium framing members shall be such that all corner, butt and angular joints which are intended to remain closed are sufficiently strong and rigid to remain completely and permanently watertight when the joints are subjected to the effects of repeated thermal movements, building movements, fluctuating wind forces, impact forces and the forces generated during transportation and handling.

#### **8.8 Construction tolerances**

Adequate allowances shall be made for all relevant construction tolerances associated with the building structure which will be concrete framed.

All structural fixing brackets shall be designed to provide adequate three way adjustments which does not rely on the use of an excessive thickness of packing shims, the combined maximum thickness of which shall not exceed 10mm.

#### **8.9 Manufacture of frames**

Joints in frames and sashes shall be made by mechanical means (cleating, screwing, etc) or by welding. Joints may have flush, stepped or lapped surfaces to approval. Mitred joints shall only have flush surfaces. The windows, doors, etc shall be free from all sharp edges, burrs and the like. Welded joints shall be cleaned off smooth on surfaces abutting closing faces, ie glazing rebates, etc. Hardware and fittings shall be removable without removing the aluminium frames from the structure. Sliding members shall be constructed so that no metal to metal sliding contact occurs.

Corners, joints and glazing beads are to be accurately mitred or notched and

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there must be no sharp edges or unsightly gaps when viewed from a distance of 3 metres under normal lighting conditions.

All corners and intersections vulnerable to water penetration should have adequate sealant applied to ensure weathertight installation.

#### **8.10 Sealing of frames**

The external perimeter of the frames is to be continuously sealed against the surrounding structure.

Weathersealing shall be of materials that are compatible with aluminium and shall be such that any degradation, shrinking, warping or adherence to sliding or closing surfaces does not impair the performance of the installation.

No contact of dissimilar metals is to be permitted. PVC or other approved separators are to be provided in all such conditions.

Glazing beads, gaskets and glazing compounds shall be of materials that are compatible with the aluminium, finishes, the glass and any other glazing materials.

Hardware, bearing devices and fittings in general must be made of materials resistant at atmospheric corrosion, and shall be of a design so as to be accessible for adjustment, repair and replacement after the windows etc have been installed.

Fastenings shall be of material which is compatible with aluminium and aluminium finishes.

#### **8.11 Ancillary members**

Ancillary members such as cills, flashings, infill panels and the like which may be formed from flat sheet material shall be made from an appropriate alloy selected from alloy designations - 1200 or 3004 or 5251, of a temper suitable for the method of forming, and a composition suitable for anodising or painting as required. Alloys shall comply with BS 1470.

#### **8.12 Thermal movement**

The design of all aluminium framing members shall take into account external surface temperature extremes in the range 10 degrees C to 80 degrees C and will permit any glazing panel to be partially shaded/partially exposed to sun, without any risk of cracking or damage to glazing due to thermal shock and temperature differentials.

Greater surface temperature extremes shall be allowed for should the contractor be of the opinion that it is necessary to do so in order to provide

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a problem-free installation which satisfied the minimum standard of performance specified therein.

Differences between these surface temperatures and the ambient temperatures at the time of fabrication and installation shall also be taken into account.

The design, fabrication and installation of the work shall be such that thermal and other movements and the effects of wind and air movements do not cause cracking, rattling, whistling or any other noise.

### **8.13 Opening windows**

All opening windows shall be gasket glazed units fabricated from extruded aluminium sections. Opening windows other than central pivot windows, will be restricted to a maximum opening of 300mm. This restricter will be key operable to allow window cleaning where required.

The windows shall be fully weather-stripped. The weather-stripping shall take the form of compressible neoprene, EPDM or silicone gaskets extruded complete with integral projections designed to engage in grooves in the aluminium framing components.

The windows shall be capable of adjustment to achieve adequate and uniform compression of the weather-stripping.

The windows shall be fitted with :

- i) Locking lever handles to all ground floor opening lights. Lever handles to upper floors.
- ii) Sliding friction stays restricted to limit the open angle of the lower window to 300mm.
- iii) Central pivoting hinges, reversible for cleaning.
- iv) Permanent ventilation slots with mosquito gauze to Nairobi City Council, or similar, regulations.

All window ironmongery shall be finished in satin anodised aluminium.

### **8.14 Cleaning and hand-over**

Prior to hand-over of any sections of the work, such sections inclusive of any adjacent areas dirtied by the contractor, shall be thoroughly cleaned by him.

The contractor shall remove any protective material and clean down and hand over reasonably sized sections of the work at such times as are mutually agreed upon between the contractor and his subcontractor, subject to approval. Provided further that the removal of protection and cleaning down and the subsequent hand over shall be done as soon as is possible.

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**8.15 Testing**

One sample of each fully finished element shall be submitted to the Architect for testing for weathertightness. This is to be done in due time for detailed modification of the units and any retesting necessary, so as to allow for the whole of the work to be manufactured and installed in accordance with the contractors programme.

The test is to include for a procedure that will establish whether the system will produce any audible whistling noises above 25 db, measured 2000 from the work, in winds of a velocity of more than 26 kph. Wind noise in excess of this is not acceptable.

**8.17 Damaged work**

All aluminium damaged prior to the date of hand-over of the work shall be timeously replaced at the cost of the contractor.

**8.18 Protection of aluminium**

All aluminium delivered to site shall be protected by tightly wrapping all members in plastic strip and/or by robust self-adhesive material, to approval.

Item

**A PART 9 FINISHINGS****GENERAL****9.1 Other specifications**

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

**9.2 Samples**

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

**9.3 Finished thicknesses**

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

Suspended floors shall have a constant structural thickness and have level top surfaces. The finished floor surface will equally have a constant level

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and any adjustment needed to achieve this effect with the varying floor finish materials is to be made in the screeds beneath the same.

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

#### **9.4 Materials generally**

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

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

#### **9.5 Bonding**

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

#### **9.6 Chases, openings and holes**

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

### **INSITU FINISHINGS**

#### **9.7 Generally**

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

#### **9.8 Mixes**

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

| <u>Item of Work</u> | <u>Mix</u> | <u>Minimum<br/>Thickness<br/>and Finish</u> |
|---------------------|------------|---|
| Internal Plaster    | 1 part     | 12 mm finish to                             |

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|                          |   |
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| cement ¼<br>4 parts sand | walls and ceilings part lime steel trowelled<br>finish<br>unless otherwise<br>specified |
|--------------------------|---|

|  |  |
|--|--|
| External Render 1 part<br>cement<br>4 parts sand | 12 mm finish<br>with<br>woodfloat<br>finish unless<br>otherwise<br>specified |
|--|--|

|                       |  |
|-----------------------|--|
| Tyrolean finish Ditto | 6 mm finished<br>thickness in two<br>coats on 10 mm<br>plastered backing |
|-----------------------|--|

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

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

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

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

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

#### **9.9 Preparation of surfaces for plaster etc.**

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

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

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

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

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

#### **9.10 Application of plaster and render**

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

All plastering and rendering shall be executed in a neat workmanlike manner. All faces except circular work shall be true and flat and angles shall be straight and level or plumb. Plastering shall be neatly made good around pipes or fittings. Angles shall be rounded to 6 mm radius.

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

#### **9.11 Curing of plaster**

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

#### **9.12 Angle beads**

Where required by the Architect, salient external angles of plastered walls shall be protected with galvanized mild steel angle beads complying with BS 1246 Fig. 7 Profile C3.

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

#### **9.13 Plaster stops**

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

#### **9.14 Textured decorative plaster finishes**

Textured decorative plaster finishes shall be a pre-mixed textured finish as manufactured by Conmix Ltd, P.O. Box 5936, Sharjah, UAE email [conplast@conmix.com](mailto:conplast@conmix.com) and obtained through The Building Centre, P.O. Box 56597, Nairobi or equal approved.

The finishes shall be applied by trowel or roller as stipulated by the manufacturer for the particular finish as specified in the bills of quantities.

The finishes shall be applied strictly in accordance with the manufacturers instructions and to the approval of the Architect. Finished thicknesses shall be in accordance with the manufacturers recommendations.

Finish Type SP2 is to be applied to external walls and finish Type SP3 is to be applied to internal piers and columns and external verandah columns.

#### **9.15 Cement and sand screeds**

Screeds shall be mixed and formed as described.

#### **9.16 Terrazzo and granolithic work**

The whole of the terrazzo and granolithic work is to be carried out by a specialist sub-contractor who is to be specifically approved by the Architect and the contractor will be required to make arrangements for the execution of this work and bear all expenses incurred.

The materials used and method of construction for terrazzo work are to be in accordance with the BS Code of Practice CP 204/1951.

The surface finish to terrazzo is to be polished to comply with samples approved by the Architect.

The terrazzo topping is to be 20mm thick with imported white cement and 12mm marble aggregate, rolled and trowelled to a dense even surface and rubbed down at completion to a grit finished surface free from holes and blemishes.

Terrazzo features for capitals and bases will be either pre-cast or in-situ with

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the approval of the Architect. Colours shall be as selected by the Architect.

The paving is to be laid in squares divided by divided strips anchored securely in the screed and having their top edges truly level with the finished floor surface. The terrazzo work is to be laid and finished complete to the approval of the Architect.

The granolithic topping is to be 15mm thick and shall consist of one part coloured cement to two parts aggregate to 6mm gauge mixed with 15% fine dust. Aggregate is to be 70% black trap and remainder approved local coloured stone. Colours shall be as selected by the Architect. Paving is to be rolled and trowelled to a dense even surface and rubbed down at completion to a grit surface free from holes and blemishes. The paving is to be laid in squares divided by plastic strips anchored securely in the screed and having their top edges level with the finished floor surface.

The granolithic work is to be laid and polished complete to the approval of the Architect. The screed between the granolithic topping and the concrete floor is to be cement and sand (1:3)

The contractor is to twice scrub the topping with soap and water before twice wax polishing and handing over.

#### **9.17 Dividing strips**

Dividing strips shall be 3mm thick plastic and of a similar height as the paving in which they are embedded. Strips shall be cut to lengths and embedded in the pavings to form margins or bays to a detailed pattern or between differing floor finishes.

Dividing strips are to be cut as required to ensure a flush level surface with the paving.

#### **9.18 Non-slip polished pavings**

Where pavings are described as non-slip they shall have carborundum dust sprinkled evenly over the surface at the rate of one kilogram per square metre lightly trowelled in whilst still green.

#### **9.19 Surface hardeners**

Floor hardeners shall comprise an approved type guaranteed by the makers to produce a hard dense concrete with high abrasive resistance, impervious to the penetration of heavy oils, acid or alkali solutions and to be used strictly in accordance with the maker's instructions.

The first dressing of sodium silicate for granolithic flooring shall be one part of sodium silicate to six parts of water by volume.

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Subsequent dressing shall be composed of one part of sodium silicate to four parts of water by volume, for all surfaces. The two liquids shall be well mixed together, sprayed over the flooring and spread evenly with a mop or soft brush, any excess being wiped off and the flooring allowed to dry for at least 24 hours after each dressing. After final drying, floors shall be washed with clean water.

#### **9.20 Rates of in-situ work**

The rates for in-situ work shall include for raking out joints of blockwork or bonding coat or spraying cement slurry on new concrete surfaces to form key, for work in narrow widths, small and isolated areas, rounded arrises, fair and chamfered edges, for making good up to boundaries of other work for making good and working around pipes, brackets etc., and for all other incidental labours.

Rates shall also include for masking before the application of spray finishes work executed overhead, temporary rules, supports, screeds and templates.

#### **TILES, SLAB AND BLOCK FINISHINGS**

##### **9.21 PVC Vinyl floor tiles**

PVC vinyl floor tiles shall be imported as Marleyflex or other equal approved manufacturer.

PVC vinyl floor tiles shall be 2.5mm thick and comply with B.S. 3260 of an approved manufacturer to patterns as directed by the Architect. Adhesives are to be as recommended by the manufacturer in writing and approved by the Architect. Bitumen is not an approved adhesive.

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

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

On completion the PVC vinyl tiles are to be sealed and polished with wax all in accordance with the manufacturer's printed instructions.

Adhesives are to be polychloroprene as approved by the manufacturer and the Architect.

##### **9.22 Clay tile paving**

Clay tile pavings are to be in 200 mm x 200 mm tiles obtained from an approved manufacturer, and are to be laid on prepared screeds. The tiles are to be bedded in cement and sand (1:4) with straight joints in each

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direction. Upon completion grout in cement and wash and clean down.  
Tiles are to be cut with an electric tile cutting saw.

Finish to clay tiles to be three coats Transeal by Sadolin Ltd applied strictly in accordance with the manufacturers instructions.

### **9.23 Ceramic wall and floor tiles**

The ceramic wall and floor tiles shall be from an approved manufacturer, and shall conform with the requirements of BS 1281. Tiles shall be of standard quality of the colours specified or approved. Tiles shall be laid with continuous straight joints and internal angles shall be butt jointed. Rounded on edge tiles shall be used at all external angles and at edges of panels. Cut tiles will be used in internal corners, full tiles in external corners.

Maximum joint size is 3mm when grouted.

Movement joints are to be at maximum 6m centres

Skirtings are to be formed in matching tiles, fixed with tile adhesive

300 x 300 special ribbed tread nosing tiles are to be utilised on all stair treads.

Tiles shall be well soaked in water, bedded in approved proprietary tile adhesive, pointed in an imported proprietary coloured grouting material, and cleaned and polished on completion.

### **9.24 Granite and marble tiling**

Marble Tiling

20mm polished marble tiling in colours and sizes approved by the Architect. All tiles shall be carefully chosen for consistency in colour, size and texture.

Tiles to be bedded in sand cement bedding, and to be laid level with other adjacent finishes

Granite Vanity Tops

Vanity tops to be formed in 600 x 400 x 20mm thick polished granite tiles, bedded in mortar on concrete vanity substrata. Edging tile to front edge to have rounded nosing, with vertical fascia panel, fixed with Laticrete or equal and approved bonding agent.

### **9.24 PVC bead protection to wall tiling**

PVC corner and edge beads to the Architects approval are to be provided to external corners and edges of ceramic wall tiles.

### **9.25 Expansion joint covers**

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Expansion joint covers are to be a proprietary imported stainless steel sliding cover with PVC infill strips fixed on both sides of structured movement joints. The contractor shall provide samples for the Architects approval.

#### **9.26 Precast concrete paving slabs**

To be all in accordance with B.S. 368. The slabs are to be of the sizes given herein and bedded, jointed and pointed in cement lime mortar (1:2:9).

#### **9.27 Rates**

The rates for tile, slab and block finishings shall include for rounded edge tiles and angles, cutting and fitting up to boundaries and around pipes, brackets, etc., and waste; for work in narrow widths, small and isolated areas and for all other incidental labours.

### **SUSPENDED CEILINGS**

#### **9.28 Generally**

The Contractor shall provide shop drawings to show the final layout and sizes of members of all suspension systems and to co-ordinate the design and work of suspended ceilings with other trades to provide for the reception and installation of outlets, fixtures etc., pertaining to mechanical or electrical work, all for the Architect's approval before any work is commenced.

Ceilings shall be erected by workmen skilled in this work in a rigid and secure manner so that the final surface is free from any waves, buckles or sags.

#### **9.29 Acoustic ceilings**

Acoustic tile ceilings shall be 600 x 600 x 15 mineral fibre tiles, fine fissured finish, with tegular edge in shops and WCs with exposed powder coated suspended aluminium 24mm T frame grid system. All ceilings to have shadow gap trim to junction with wall, and to be set out with full tile at centre line in both directions of room or space ceiling installation. Manufacturer to be Armstrong or approved alternative, and to be installed entirely in accordance with the manufacturers instructions, incorporating all fittings and accessories, including suspension cable wires and hanger system.

The ceilings shall include a proprietary suspension system as recommended by the manufacturer. The suspension system shall be suspended from wire hangers fixed to concrete soffit and steel roof structures by an approved method. All to be fixed strictly in accordance with the manufacturers instructions.

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### **9.30 Gypsum Plasterboard Ceilings**

Plasterboard for ceilings to comply with the requirements of BS1230 Part I and to be manufactured under BS 750 Part 2 12.7mm thick . Fixing, installation and filling of joints to be strictly in accordance with manufacturers instructions. Plasterboard to have tapered edge, with taped and filled joints, finished in accordance with the manufacturers instructions.

The joints between boards shall be provided with a fine metal or plastic scrim tape, nailed or stapled to the boards so as to fully cover the joints and ready for a plaster skim.

Gypsum plaster skim coat

All joints between boards and blemishes in boards are to be skimmed with a fine proprietary gypsum plaster specially manufactured for that purpose. A gypsum plaster skim coat is to be applied to the whole surface of the gypsum plasterboard in accordance with the manufacturers instructions and to the approval of the Architect.

Plasterboard is to be fixed to a proprietary pressed metal brandering system to Architects approval.

### **9.31 Expanded metal lathing ceilings**

Framework for expanded metal lath ceilings shall be as specified. Straps shall be bolted either to steelwork or to steel angle cleats raw bolted to concrete soffit.

Covering shall be galvanized expanded metal lathing Ref. 264 fixed to underside of suspension grid with 16 gauge soft galvanized tying wire or to underside of timber framing at maximum 356mm centres.

The whole to form a suspension grid ready and of adequate strength to receive plaster or other applied finish and with supports for lighting fittings where required.

The Contractor shall submit to the Architect for approval prior to erection, shop drawings showing the precise layout of suspended ceiling systems.

### **9.32 Rates for suspended ceilings**

Rates shall include for shop drawings as specified; all hangers and supports as required including fixing same to concrete or ductwork; for angles at edges, for corner angles at upstands, for cutting and fitting around grilles and registers and light fixtures and for leaving in a perfect condition to the entire satisfaction of the Architect.

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Rates shall also be deemed to include the use of plaster stops and angle beads around the edges and at all corners.

Rates shall include for all edge details, angle runners and light fitting frames as required.

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**A PART 10 GLAZING**

**MATERIALS**

**10.1 General**

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

**10.2 Standards**

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

**10.3 Clear sheet glass etc.**

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

**10.4 Plate glass**

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

**10.5 Obscured glass**

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

**10.6 Solar glass**

Solar control glass is to be obtained from a manufacturer approved by the Architect. Details of the characteristic and properties of the glass are to be provided to the Architect before ordering.

Solar glass is to be the spectrafloater type incorporating metallic ions in the glass with a bronze tinted colour. Unless otherwise specified thickness of glass is to be 6mm.

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### **10.7 Laminated glass**

The contractor shall provide details of the specification and manufacturers of laminated glass for the Architects approval before ordering.

Laminated glass in this specification is referenced to the South African Bureau of Standards (SABS)

Laminated glass is to be installed in accordance with:

- a) The recommendations of the glass manufacturer
- b) SABS Code of Practice 0137 and SABS 1263

All safety glass is to be clearly marked by means of either sandblasting, acid-etching or the application of transparent labels in accordance with the requirements of SABS 1263.

Part 1 : Safety Performance of Glazing Materials under Human Impact.

The marking is to be to the minimum SABS marking requirement and is to state the type of materials ie laminated glass, toughened glass, polycarbonate, etc.

All glass is to be cleaned prior to inspection.

Scratches in glass which are acceptable, are those which are less than 75mm long in any area, and those which are longer than 75mm which do not encroach more than 75mm from the exposed visible edge.

No interlayer bubbles will be accepted in the laminated glass.

### **10.8 Glazing method for laminated glass**

There is to be no glass to metal contact.

All opening sections shall be fitted with vinyl or other approved weather strips and draught excluders.

Fittings are to be fitted to the frame with stainless steel set screws. The riveting of screws or brackets will not be accepted.

The bit on the glazing material in the rebate is to be sufficient to meet the requirements of the application, and no edges of the glazing material may be visible.

No excess sealant or spillage shall be visible when viewed from a distance of three metres.

Sealants used are to have no gaps or air pockets and are to be visible on both sides of the glass when bead glazed. Where translucent structural silicone sealant is used without glazing beads, small air bubbles are accepted

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provided these are not at the exposed surfaces.

Gaskets are to be continuous and not loose or unsightly at corners. If mitred corners are used, only corner joints are permissible.

#### **10.9 Glazing gaskets**

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

#### **10.10 Washleather**

Washleather shall be best quality chamois oil cured natural coloured. Where washleather is called for an approved substitute may be employed.

#### **10.11 Putty**

(a) The putty for glazing to wood sashes is to be linseed oil putty all as B.S. 544.

(b) The putty for glazing to metal windows is to be gold size metal window putty specially designed for tropical use, or patent mastic putty if approved by the Architect.

(c) All putty shall be delivered on site in the original manufacturer's sealed cans or drums and used direct therefrom, with the addition only of pure linseed oil if necessary. No mineral or other oils may be used in the putty except genuine linseed oil.

#### **10.12 Mirrors**

Mirrors shall be polished float glass silverin quality with bavelled edges protected at back with electro-copper backing coated with Shellac varnish and paint. The mirrors are to be fixed with chromium plated dome headed mirror screws with plastic or rubber distance pieces and washers unless otherwise stated and rates shall include for this.

### **WORKMANSHIP**

#### **10.13 General**

Glazing of all types and in all locations shall be carefully executed by artisans skilled in this type of work and in conformance with the recommendations of C.P. 152. Glazing shall be carefully fitted so that it is not subject to pressure and stresses imposed by being an overtight fit within the framing.

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**10.14 Measurements**

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

**10.15 Single glazing**

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

**10.16 Wired glass**

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

**10.17 Laminated glass**

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

**10.18 Storage and handling**

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

**10.19 Protection**

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

**10.20 Damage**

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

**10.21 Defective work**

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

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**10.22 Glazing to wood**

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

**10.23 Glazing to metal**

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

**10.24 Glass thickness**

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

**10.25 Cleaning**

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

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**A PART 11 PAINTING AND DECORATING****MATERIALS****11.1 Manufacturers**

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

Painting products shall be obtained from one of the following approved manufacturers

- a) Crown Paints
- b) Basco Paints
- c) Sadolin paints
- d) Dulux Paints

All paint shall be grade A quality

**11.2 General**

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

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

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

### **11.3 Emulsion paints**

Emulsion paints shall be matt or satin finish vinyl emulsion paint. Silk vinyl finish shall be used where specified.

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

### **11.4 Gloss paint**

Gloss paint shall be hard gloss finish oil paint.

### **11.5 Bluchearing paint**

Bluchearing paint for door handles and gutters is to achieve a wrot iron effect to be obtained from Sadolin paints or equal approved.

### **11.6 Automotive paint**

Automotive paint is to be two pack epoxy paint on specified surfaces factory applied, with baked finish, by Sadolin or other approved manufacturer. Colour selection is to be to the Architects approval.

### **11.7 Bituminous solution**

Bituminous solution for use on coated pipes, RC and blockwork faces beneath ground level shall be obtained from a manufacturer approved by the Architect.

### **11.8 Traffic paint**

To be as Crown Paints, Road Paint or other approved for use on concrete block paving.

### **11.9 Lead based paints**

The use of lead based paints will not be permitted.

### **11.10 Clear finishes**

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Clear finishes internally shall be clear polyurethane varnish one or two pack as specified.

#### **11.11 Varnish**

Varnish is to be an imported water based varnish/stain by Sadolin Paints or other equal approved.

#### **11.12 Primers and undercoats**

Unless otherwise specified, primers and undercoats shall be the type recommended by the manufacturer of the finishing coats specified for a particular surface. Primer for external bare metalwork surfaces shall comply with B.S. 2523.

#### **11.13 Knotting**

Shellac knotting shall comply with B.S. 1336.

#### **11.14 White spirit**

The white shall comply with B.S. 245.

#### **11.15 Timber stain**

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

#### **11.16 Textured coating**

Textured coating is to be of proprietary manufacture approved by the Architect of an approved colour.

Technical information concerning the coating is to be submitted to the Architect before ordering, but the minimum qualities of the coating are to be as follows:-

- (a) Suitable for application internally and externally to plastered, rendered, concrete, block, stone, brick, asbestos and timber surfaces.
- (b) Minimum durability of 10 years even in exposed conditions.
- © Maintenance free.
- (d) Built-in mould resistant fungicide.

#### **11.17 Stopping**

The stopping shall be as follows:-

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

#### **11.18 Fillers**

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

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

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

#### **WORKMANSHIP**

#### **11.19 General**

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

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

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

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

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

No dilution of paint materials shall be allowed except strictly as detailed by the manufacturer's own direction, either on the containers, or their literature, and with the special permission of the Architect. For external work dilution of paints will not be allowed whatsoever. For internal work, where permitted by the Architect, undercoats may be thinned by the

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addition of not more than 5% thinners. Gloss finish shall not be thinned at all.

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

#### **11.20 Brushwork**

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

#### **11.21 Stopping and filling**

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

#### **11.22 Stirring**

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

#### **11.23 Inspection**

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

#### **11.24 Paint application**

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

#### **11.25 Drying**

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

#### **11.26 Unprimed woodwork**

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

#### **11.27 Primed woodwork**

Woodwork delivered primed shall be lightly rubbed down with abrasive paper, and dusted off. Touch up bare areas with a similar priming including open grained ends. After touch priming all joints, holes, cracks and open grained ends shall be stopped and filled, rubbed down and dusted off.

#### **11.28 Plywood and blockboard**

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

#### **11.29 Clear finished woodwork**

All woodwork scheduled to receive a clear finish shall be well sanded with the grain removing all dirt etc., to give as smooth a surface as possible. Resinous timber shall be swabbed down with white spirit and dried thoroughly. Split or end grain shall be filled with suitable filler recommended by the clear lacquer manufacturer, in accordance with their instructions, and of the appropriate shade.

#### **11.30 Bare metalwork**

Bare metalwork shall be thoroughly cleaned off all dirt, grease, rust and scale by means of chipping, scrapping and wire brushing; particular attention should be given to the cleaning of welded, brazed and soldered joints. Wash down with white spirit and wipe dry with clean rags. Apply a coat of metal primer immediately the cleaned surfaces have been approved by the Architect.

#### **11.31 Galvanized metalwork**

Galvanized metalwork scheduled for painting shall be thoroughly cleaned of dirt, grease, dusted and washed down with white spirit and wiped dry with clean rags. Any minor areas of rust shall be removed by wire brushing and spot primed with a zinc rich primer. Apply at least one coat of calcium plumbate primer to all surfaces subsequently to be painted.

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**11.32 Primed metalwork**

If the priming coat of pre-primed metalwork has suffered damage in transit, or during erection on site, the affected areas shall be cleaned off by wire brushing, abrading and dusting off, the bared patches touched up with a primer of a similar type to that already applied.

**11.33 Copper**

Copper scheduled for painting shall be lightly abraded with emery cloth, washed with white spirit and wiped dry with clean rags. Apply a coat of etch primer immediately the cleaned surfaces have been approved.

**11.34 Brickwork, concrete etc.**

All brickwork, blockwork, concrete, rendered and plaster surfaces scheduled to be painted shall be brushed down, all holes and cracks filled, all projections such as plaster, or mortar splashes etc., removed to leave a suitable dust free surface. All traces of mould oil shall be removed from concrete surfaces by scrubbing with water, detergent and rinsing with clean water. All these surfaces shall be thoroughly dry before any primer or paints are applied. Apply a coat of alkali resisting primer where surfaces are to be finished with oil paints or alkyd resin type emulsion.

Asbestos cement surfaces scheduled for painting shall be brushed down to remove powdery deposits, and a coat of alkali resisting primer applied where such surfaces are to be finished with oil paints or alkyd resin type emulsion.

**11.35 Colours**

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

**11.36 Toxic wash**

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

**11.37 Protection**

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

**11.38 Damage**

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

#### **11.39 Cleanliness**

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

#### **11.40 Performance**

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

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

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

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

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

#### **11.41 Packaging, delivery and storage**

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

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

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

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

#### **11.42 Vinyl emulsion paint**

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

#### **11.43 Gloss finish paint**

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

#### **11.44 Clear polyurethane varnish**

Surfaces to be clear varnished shall be treated with two coats water based as Sadolins (UK) Ltd or equal approved.

#### **11.44 Textured Coating**

The manufacturers instructions concerning application of the coating are to be strictly followed under the direction of the Architect.

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

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

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**A PART 12 LANDSCAPING**

**12.1 Related documents**

Drawings and general provisions of the Contract, including other sections of the bills of quantities and specifications, apply to work of this section.

**12.2 Description of work**

The term "landscaping" covers all soil preparation for planting work and all planting of trees, shrubs, grass and other plant materials. Landscaping works shall only be undertaken by a qualified landscape contractor or specialist to the approval of the Consultant.

The contractor will be required to produce a programme, available for inspection by the landscape consultant, of his expected operation from the date of arrival on site until the date of practical completion, within 14 days of appointment.

**12.3 Product handling**

All plant material is to be supplied to site by the contractor and maintained on site until such time as the site is handed over to the Client. The contractor is to be responsible for all ordering, inspections, and handling procedures and expenses which may be incurred through supply of plant materials.

**12.4 Job conditions**

- a) Prior to excavation of the planting areas and planting pits the contractor shall ascertain the location of all utility lines, electric cables and conduits so that proper precautions may be taken not to disturb these, both above and below ground level. Any damage caused by the contractor shall be rectified at his own expense.
- b) Existing vegetation: No existing trees or shrubs shall be removed, cut, or pruned, without specific written instructions from the Consultant.
- c) Storage of Materials and Working Areas: Within a tree's "dripline" the lighting of fires, erection of temporary building, the temporary or permanent storage of building materials of any description, the preparation of any building materials, (such as stone dressing, or carpentry workings), or any other activity which may also be deemed detrimental to the health and vigour of the trees by the Consultant shall be expressly forbidden.
- d) Cutting and Pruning: Branches larger than 50mm in diameter may not be removed from any tree without the approval or instructions of the Consultant. Roots larger than 50mm diameter uncovered during the course of excavation may not be cut without the approval of the Consultant.

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e) Excavation: Where the drawings necessitate work to be carried out beneath existing trees, all care must be exercised during excavation. Hand tools are to be used whenever roots are encountered.

f) Felling: Only those trees as directed by the Consultant may be removed. All other large trees, small trees, shrubs and hedges are to be retained. and protected.

g) Plant Storage: Prior to plant material being delivered to the site, the Contractor must construct a shade house for storage of the plants until planting. The shade house is to be constructed with a flat roof covering of split bamboo poles (or approved equal) to allow filtered light through to the plant material to be stored below. The sides of the shade house are to be similarly constructed of split bamboo poles (or approved equal) to protect the plant material from intense solar radiation.

h) Planting of Plant Material: Plant material which has been supplied to the site "bare-rooted" must be immediately planted into heavy-duty polythene plant bags in good quality top soil approved by the Consultant. This is to be done under the constant supervision of the contractor. The plants are then to be stored in the shade house until they have fully recovered from transplantation prior to planting on site.

i) The contractor is to provide all plants as specified, all red forest topsoil for planting areas, dry well-rooted manure, bone meal and fertilizers as required.

## **PRODUCTS**

### **12.5 Acceptable products**

All plant materials must be obtained from reputable suppliers. The Contractor must supply a list of his intend suppliers to the Consultant for approval prior to ordering.

### **12.6 Plant materials**

#### **Substitutions**

No substitutions shall be accepted, except with the written permission of the Consultant.

#### **Quality**

a) All plants shall have normal, well developed branches and vigorous root systems. They shall be sound, healthy, vigorous, free from defects, disfiguring knobs, abrasions of the bark, sunscald injuries, plant diseases, insect eggs, borers and all other forms of infections.

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b) All plants shall conform to the measurements and requirements in the plant list and measurements specified shall be the minimum acceptable size for each species.

c) All shrubs and trees shall be container grown.

d) Plants must be well established in order that on removal, the root ball remains intact throughout the planting operation.

a) Broad leaved trees are to be supplied to site in a healthy condition, with a well developed root ball and crown with a clear, strong central leader with a minimum height of between 2.10 and 2.50 m and a clear stem free from side branches to a height of between 1.50 to 1.80m from ground level and to the Consultant's approval. Such trees are to be planted as described below and as shown in detail drawings.

b) Palms are to be supplied to site in a healthy condition with well developed root ball and a clear strong central leader, to a minimum height of between 1.00 and 1.5m and to the Consultant's approval.

c) Deciduous trees shall have straight bodies according to their habit and growth and shall be well branched and rooted.

d) Evergreens shall be well branched and have ample well balanced root systems capable of sustaining vigorous growth.

#### **Nursery stock**

a) Deciduous shade trees shall be straight and symmetrical with crown having a persistent main leader preferred. The amount of crown shall be in good overall proportion to the total height of the tree. Where a clump is specified, a plant having a minimum of 2 stems originating from a common base at ground level shall be furnished.

b) Evergreen trees of all sizes will be in pots or bags. Tops shall be of a form typical to the species and not unnaturally sheared.

#### **Plant size**

a) Plant larger than specified in the plant list may be used if approved by the landscape consultant, but use of such plants shall not increase the contract price. If the use of the larger plants is approved the spread of the roots or ball of earth shall be increased in proportion to the size of the plants.

b) Upto 10% of under-size plants in any one variety of grade may be used, provided that there are sufficient plants above size to make the average equal to or above specified grade.

#### **Plant allowance**

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Plants shall be selected by the landscape consultant.

Preparation of planting beds, planting, feeding and watering of plants, staking and all other operations in connection with planting of items selected under this allowance shall be done in accordance with directions of the landscape consultant.

**Preparation of plants**

- a) All plants shall be dug immediately before moving unless otherwise stated. In preparing plants for moving, all precautions customary in good trade practice shall be taken.
- b) All necessary pruning shall be done at the time of planting.
- c) Fresh young growing tips of Kikuyu grass are to be used for all grass areas unless otherwise specified. The tips must average 150mm in length and be approved by the landscape consultant.

**Inspection**

- a) No plant material shall be planted until it is inspected and approved by the landscape consultant or his representative at the site of the project. They shall be the sole judge of the materials.
- b) All plants shall be inspected for approval for variety, size and health, but approval from this inspection shall not preclude rejection of plants for defects which may appear later during the progress of the works.
- c) All rejected material shall be immediately removed from the site and replaced with acceptable material at no additional cost.

**Delivery**

- a) All plants shall be packed, transported and handled with utmost care to ensure adequate protection against injury.
- b) The contractor shall ensure that adequate protection is given to all plants and their root systems to preclude failure due to lack of moisture or exposure during transport to the site.
- c) Where plants cannot be planted immediately upon arrival they shall be stored in the site nursery until required.
- d) All plants shall be tagged with plastic labels when delivered to the site with the full latin botanical name clearly printed thereon in indelible ink. Labels shall be removed after planting with the approval of the landscape

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consultant.

#### **Staking**

Broad leaved trees shall be staked and tied in accordance with the detail drawings and to the Consultant's approval.

#### **12.7 Supervision**

The Contractor must employ to the satisfaction of the Consultant, an approved landscape contractor to supervise all landscape works. This person must be on site throughout the period of the landscape works from the time of arrival of the plant materials to completion of the maintenance period. The landscape contractor must also be a fluent kiswahili speaker or have a translator available for his use at all times.

#### **12.8 Installation**

All materials are to be checked and approved by the Consultant prior to installation. All landscape procedures are to be carried out under the supervision of the landscape contractor.

#### **12.9 Reinstatement**

The Main Contractor is further responsible for reinstatement of all landscaped areas which are not specifically designated for renovation, to their original condition where construction works take place and damaged or contaminated existing landscape areas, or existing top soil.

#### **12.10 General maintenance requirements**

a) The Contractor is to be responsible for all landscape maintenance in areas of the site where construction work is to take place or is taking place. The Contractor is to submit his maintenance program to the Consultant prior to commencement of the building contract on site.

b) The Contractor shall maintain during the period of the contract all trees, shrubs and other plants, also the grass areas within the contract boundaries at the end of the Defects Liability Period.

General maintenance shall include watering, weeding, mowing, cutting, cultivating, control of insects, fungi and other diseases by means of spraying with an approved insecticide or fungicide, pruning, adjustments and repair trees ties, repair of minor washouts and other horticultural operations necessary for the proper growth of grass and plants and for keeping the landscape neat in appearance.

#### **12.11 Lawn maintenance**

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Shall consist of watering, weeding, fertilising, disease and insect pest control, aerating, replacement of unacceptable material, cutting and any other procedure consistent with good horticultural practice necessary to ensure nominal, vigorous and healthy growth.

a) Grass General: The grass should be cut regularly during the growing season. In the dry season cut to 50mm in length and in the wet season cut to 25mm in length. Weeded regularly to prevent being choked. The edges of the lawn should be trimmed and kept tidy to prevent grass creeping into shrub beds.

b) Fertilisation: Grass Should be fertilized regularly for a good lawn to be maintained:-

c) Top Dressing: Apply in April after the first rains; Apply a top dressing of 4 parts red topsoil and 1 part dry, well-rotted manure (well mixed together) to the lawn to a depth to 13mm. Rake top dressing over lawn and use it to fill in any uneven patches. (If there is no rain, water heavily after application). Repeat top dressing application in October or after the start of the rainy season.

Compound Fertilization: In June/July, apply a compound chemical fertilizer (15-10-10). This can be done by hand at the rate of 15 grammes per square metre.

Ammonium Sulphate: Every 2-3 months, (in between top dressing and compound fertilization) apply Ammonium Sulphate at a rate of 15 grammes per square metre. Water thoroughly after application. Heavy watering after application of fertilizer is essential to prevent "burning".

d) Aerating: Periodic tests should be made during the maintenance period to determine the degree of compaction existing in all planting areas and containers. If soil is compacted to a degree that water and air penetration is impaired. These areas shall be aerated by light digging with a long-toothed garden fork or spiked roller, in a manner not harmful to the plant material and to the satisfaction of the landscape consultant.

Aeration should not be done when the soil is either too wet or too dry.

In hot dry weather aeration should be followed by thorough watering.

Under normal conditions, aeration should be done at least twice a year.

e) Watering

During drought periods thorough soaking should be carried out once or twice a week. It requires from 2000 litres to 3000 litres of water for every 93 metres squared of lawn for each application to give an equivalent of 20mm to 40mm rain. This will moisten the soil from 80 -130mm deep.

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Continuous heavy watering favours diseases. Water should be applied to new vegetative plantings in a fine spray that will not wash the soil away from the base of the young plants. It must be applied slowly so that the surface will not puddle and crust. Water lightly twice a day during establishment, then water heavily once a week. Grasses need about 25mm of water per week.

f) Protection of lawns

Maintenance shall also include all temporary protection fences, barriers and signs and all other work incidental to proper maintenance. The contractor shall provide at his own expense, protection for all planted and seeded areas against trespassing and damage at all times. If any lawns, slope areas, trees or other plants are damaged or injured in any way, they shall be treated or replaced as required by the landscape consultant.

**12.13 Shrubs**

a) General: Shrubs should be weeded regularly, every two weeks. Inspected every two weeks for pests and diseases. Do not fertilize newly planted shrubs for three months. Remove ground cover plants from around the base of shrubs to avoid strangulation.

b) Fertilization: Fertilize shrub three times a year, starting three months after planting. Alternate major fertilization with manure and compound fertilizer; Manure fertilization. In April and in October, apply 6mm of well-rotted manure to all shrub beds. Water well after application.

c) Compound fertilization: In July and January, apply 15 grammes of 20N-10P-10K compound chemical grammes of bone meal. Lightly fork the fertilizer into the soil without disturbing the roots. Water well after applications. Minor Fertilization: Once a month apply BAYFOL or equal approved folia feed to all plants. This is applied as a spray and should be done before 9.00 a.m. and after 4.00 p.m. on dry days.

d) Watering: The Contractor will be required to water all plants as necessary, at any time as may be necessary or as directed by the landscape consultant.

During the hot season watering shall be carried out before 10.00 a.m. and after 5.30 p.m.

Watering to be applied through sprinklers or shower attachments to the hose pipes. Water administered directly from hose causes damage to the plant material and deteriorates the soil condition.

Damage caused by moving hoses pipes must be avoided and if occurred is to be rectified at the contractors expense.

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e) Pruning and repair: Upon completion of planting work, trees may be pruned and any injuries repaired where necessary. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots and the result of transplanting operations. The plants shall be pruned in such a way as to preserve the natural character of the plants.

The pruning cut on small branches and shoots shall be made just above a bud and slanting downwards away from the side the bud is on. The cut should be 4mm above the bud.

Large branches shall be cut right back to level with the main trunk or stem and the edges of the cut shaved clean with a sharp knife to allow the plant to grow a protective cover quickly.

On all cuts over 75cm in diameter and on bruises and scars on the bark, the injured cambium shall be traced back to the living tissue and removed. The wound shall be coated with Arbex or any other approved tree wound paint not containing lead.

The exercises shall be carried out under supervision of the landscape consultant.

f) Mulching: Rake up leaves which fall on the lawns and use these as a mulch on all the shrub beds. Make sure that only the leaves are placed in the shrub beds and no branches as this will attract white ants. Apply the dead leaves to the shrub beds to a depth of 100mm. The leaves will act as a mulch; it will provide humus to the soil, prevent weed and help retain moisture in the soil.

#### **12.14 Trees**

a) Watering: This should be as for shrubs but care must be taken to water heavily to encourage deep rooting.

b) Pruning: Prune the side branches (flush with trunk) to a height of 2m where they are to be walked under in lawns. Paint the wounds with ARBREX or equal approved.

c) Climbing plants: Ensure that the soil level is maintained around the base of the climbing vines and that the stems are encouraged to adhere to the wall surface, by use of steel wires as detailed or as instructed by the Landscape Architect.

d) Pests and Diseases: All plants should be regularly inspected for pests and diseases. Some plants are very susceptible to pests and diseases and should be sprayed once a month with ROGOR or equal approved.

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For specific pests and diseases, spray as follows:-

Powder Mildew: spray with BAYLETON or BAYCOR or DITHANE-45, or equal approved.

Insects: Aphids, caterpillars, beetles:- spray with METASYSTOX or bury FUARANDAN around the roots, or equal approved systemic insecticide.

Spider Mites: Spray with GUSATHION or CITRINOL, or equal approved.

White ants: bury ALFRIN or equal approved around the roots.

e) Surrounding each tree within the public open spaces a ring of protective stakes shall be maintained around the tree at a distance that will give protection to the canopy from damage by people and livestock.

## **SOIL**

### **12.15 Soil preparation**

a) Description of Work: This section includes the removal of weeds, rocks and debris from the soil surface, cultivation of the soil and addition of manure and fertilizers to the soil in preparation for planting. Where topsoil is to be imported, clear area of debris. Imported topsoil must be free of roots, weeds and debris.

Soil levels in all raised planter beds must be brought to within 35mm of the dpc level of the building, or to within 50mm of the top edge of the masonry where no dpc is installed.

b) Job conditions: Soil preparation is to be carried out after completion of building works in that area. This work is to be co-ordinated by the Contractor with other trades to ensure there will be no subsequent contamination of the prepared soil by building and other debris.

c) Materials: All manure is to be dry, well-rotted and a minimum of 12 months of age. It must be either horse, cow or chicken manure.

Compound fertilizers are to be 15N-10P-10K or approved equal and are to be of dry, granular consistency. Top soil obtained locally must be neutral, ph free of excess salt, and must be approved by the Consultant. Tests may be required by the Consultant at the expense of the Contractor.

d)Preparation: All weeds, rocks and building debris are to be removed prior to execution.

### **12.16 Installation**

a) Remove soil to depth specified for each type of plant. Remove all large

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rocks (over 75mm diameter), root and debris from the excavated soil and then prepare soil planting mixture as follows. Mix together 4 parts excavated soil, 2 parts manure, 1 part imported topsoil, and 1/8 part compound fertilizer. Mix all components of the planting mixture together well and replace into the planting hole. Fill the hole with the soil mixture to a level above the original to allow for soil settlement. Thoroughly water the planting area until well soaked. Leave the area for 2 days before installation of plant materials.

b) The black soil is to be thoroughly mixed with cow manure and red soil at a ratio by volume of 1 part cow manure, 2 parts black soil, 4 parts red soil and the mixture is to be brought to a workable consistency.

If possible all landscaping ground preparation should take place one month before planting to allow for natural soil settlement.

Soil shall be disked to a depth of 10 to 15cm. If heavy equipment has been used, subsoiling shall be used before disking. After disking, fertilizer shall be spread. Soil shall then be harrowed to reduce size of soil particle. A heavy float or drag harrow should be used to smooth surface.

c) The Contractor is to check that the required levels in all planting areas are satisfactory prior to commencing any works.

All subsoil must be broken up as described and the contractor must remove from the site all stones, timber and any other foreign objects larger than 50mm in any dimensions which are uncovered.

The Contractor shall ensure that subsoil be broken up to a depth of 300mm by hand fork or agricultural sub-soiler. Under no circumstances must the contractor carry out these works when the soil is in a saturated or unworkable condition. Any subsoil arising from the landscape operations such as tree pit excavations etc., must be deposited where directed by the landscape consultant. Excess of the subsoil to be removed from the site prior to planting.

d) Areas to be stripped of topsoil shall first be scraped clean of all brush, weeds, grass, roots and other material that will interfere with plant bed maintenance.

All topsoil to a maximum depth of 300mm must be stripped in case of a raise or reduction in level and deposited where directed by the landscape consultant. The topsoil to be put back when the final level of the sub soil has been established. Excess subsoil to be removed from site prior to planting.

The Contractor is to check all final levels given on the drawings, prior to final cultivation operations, ensuring that the topsoil level is free of pernicious weeds, large stones (diameter 5cm) and other foreign objects.

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Final grading of the topsoil is to be carried out by ploughing, hoeing, compacting and raking to ensure a true specified level, profile and slope to avoid dishing or other depressions where water may collect. All areas to be cultivated to be brought to a fine tilth before planting.

Topsoil shall be placed so that after final settlement there will be good drainage (and conforming to the elevations shown on drawings.) Maintain surfaces and place any additional topsoil necessary to replace that eroded before acceptance.

e) Materials used as additions to the soil or mulching shall be procured from sources approved by the landscape consultant and the Contractor shall notify the landscape consultant of the materials he proposes to use before carting to the site.

Cow manure and compost must be well rotted and matured. Compost must consist of wholly vegetable matter and shall contain no domestic or waste foods.

f) Inspection: Areas of soil prepared for planting are to be inspected and approved by the Consultant prior to planting.

#### **GRASSING**

##### **12.17 Description of work**

This section includes the planting of grass plugs to create a grass sward.

##### **12.18 Job conditions**

Areas to receive grass are to be properly prepared prior to planting. Soil in this area is to be prepared in accordance with the soil preparation section.

##### **12.19 Materials**

Grass "plugs" are to be Kikuyu type or of the same uniform species as specified. "Plugs" are to be free of weeds and any other grass species. "Plugs" are to be freshly uprooted, no longer than 12 hours prior to replanting in the grass area. "Plugs" are to be no less than 100mm in length with both leaves and roots visible.

##### **12.20 Area**

a) All exterior ground areas within the limit of the contract, except surfaces occupied by buildings and structures and paving, except areas indicated to be undisturbed, shall be seeded or planted as shown on the drawings.

b) Furnish topsoil, finish grading, prepare bed, plant and maintain areas on

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the drawings.

#### **12.21 Bed preparations**

- a) Grading - grade lawn areas to finished grades, filling as needed or removing surplus dirt and floating areas to a smooth, uniform grade as indicated on the plans. All lawn areas shall slope to drain.
- b) Fertilizers: All lawn areas on the plans shall receive one handful of NPK (17:17:17) fertilizer, or equal approved, per 50cm x 50cm of surface area.
- c) Thoroughly and evenly incorporate fertilizer with the soil to a depth of 8cm by disking or other approved methods. In areas inaccessible to power equipment, use hand tools. Adjacent to existing trees, the depth shall be adjusted to avoid disturbance to the roots.
- d) General: Grasses are very heavy feeders on nitrogen and respond in proportion to the amounts available in the soil.
- e) Ground preparation should ideally be carried out 6 months before planting.
- f) Soil preparation is to be carried out to a depth of 300mm.
- g) The top 150mm shall be well pulverised and levelled with a rake. One or two days before planting the ground shall be thoroughly watered.
- h) The fresh young runner cuttings shall be planted at a depth of 70-100mm with 100mm centres in each direction. The cuttings shall be pressed in with the hand as planting proceeds. Once the planting is finalized a fertilizer to stimulate root growth shall be applied. Top dress CAN, or equal approved, fertilizer at a rate of one handful per 50cm x 50cm of surface area.
- i) The ground shall be well watered after planting.
- j) After one week all areas planted with grass are to be rolled and cross-rolled with a light weight roller and again 2 weeks later. This operation must not take place when the ground is in a saturated condition.
- k) In grass areas the final level of topsoil is to be level with paving, manholes, etc., and a minimum of 150mm below the finished floor level of buildings where directly abutting the walls.

#### **12.22 Sprigging/cutting**

All cuttings heat readily when in large piles. Every effort should be made to keep them covered and damp until used. Only as many cuttings should be on hand as can be planted in one day.

#### **TREES AND SHRUBS**

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**12.23 Description of works**

This section includes the planting procedure for shrubs and trees.

**12.24 Time of planting**

- a) The planting shall be commenced when other divisions of this work, including placing of topsoil, to the finished grade, has progressed sufficiently to permit planting.
- b) Initiation of planting shall coincide with the start of the rains, the overall programme of the project permitting.

**12.25 Layout**

Planting shall be located as indicated on the plan except where obstructions overhead or below the ground are encountered or where changes have been made in the construction. Necessary adjustments shall be approved by the landscape consultant or their representative.

**12.26 Setting plants**

- a) No planting pits or trenches shall be dug until the proposed locations for tree and grass positions have been staked out on the ground and approved by the landscape consultant.

The dimensions should be followed as per the plan, wherever possible. If changes are necessary the landscape consultant's confirmation must be obtained.

- b) All holes shall be dug with straight vertical sides in a square shape with a crowned bottom.
- c) All plants shall be set to the ultimate finished grade, so that they will be left in the same relation to the surrounding grade as they have stood before being moved.
- d) Excess excavation shall be removed from the site.

- e) No plant shall be bound with rope or wire at any time so as to damage bark, break branches or destroy its natural shape.

- f) Each back-filled pit is to be partially dug out to a sufficient width and depth adequate to accept the root ball. The required amount of fertilizer is to be spread on the bottom before the actual planting exercise.

- g) Care must be taken in removing the root ball from its container so as to cause the minimum disturbance to the fibrous roots. The topsoil/manure

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mixture is then to be firmed around the root ball whilst keeping the stem upright, the stem base slightly below or at ground level.

h) A slight saucer with a lip of 10cm shall be formed around each tree and shrub to hold additional water.

i) At the end of the raining season a layer of 50cm of dried grass or dried leaf cuttings, for mulching purposes, is to be laid over the soil in the prepared saucer and cover that whole area, in order to minimise evaporation.

#### **12.27 Planting season**

a) Planting shall be done within the following dates, contract programme allowing.

Long rains from March until the end of May.

Short rains from October through to December.

- If special conditions exist, which may warrant a variance in the above planting dates, a written request shall be submitted to the landscape consultant, stating the special conditions and the proposed variance. Permission for the variance will be given if, in the opinion of the landscape consultant, the variance is warranted.

b) The Contractor shall commence work within 10 days after receiving notice from the landscape consultant and shall continue until completion as indicated in the progress schedule.

c) At the opinion and the full responsibility of the contractor, planting operations may be conducted under unseasonable conditions without additional compensation.

#### **12.28 Backfilling of planting pits and planting beds**

a) Planting pits and beds to be back-filled carefully to fill all voids and avoid breaking or bruising the roots.

b) The backfill is to be carried out in 150mm layers and well compacted by ramming. Finally the area to be brought to a fine tilth at planting depth.

c) Water the filled pit thoroughly and allow water to soak away. If necessary add more back-fill to bring to level.

#### **12.29 Tree Pits**

a) Tree pits

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**A 14 CONCRETE**

**14.1 GENERAL**

The standard of materials and of workmanship shall not be inferior to the recommendations of the current:

*ntbl(a) British Standard Code of Practice BS 8110 - The Structural Use of Concrete Or) whichever is ) applicable ) to the ) particular ) structures ntbl*

*(b) British Standard Code of Practice BS 8007 - Design of concrete structures for Retaining Aqueous Liquids*

*(c) Appropriate British Standards*

*(d) Approved Kenyan Standards*

*or*

*(e) Other equivalent and approved international standards*

*The requirements outlined in the above documents must be read with those of this Section of the Specification and where any conflict exists between the recommendations of the above and of this Specification, the requirements of the Specification shall prevail.*

*As and when required by the Engineer the Contractor shall prepare and submit, before commencing the work, a time chart (additional to the general programme) detailing the various operations for concrete work.*

*No material shall be used in the Works until prior approval for its use has been given by the Engineer; neither shall any change in the nature, quality, kind, type, source of supply or manufacture be made without the Engineer's permission.*

*Names of manufacturers and test certificates for materials not supplied by the Employer shall be supplied as soon as possible to the Engineer.*

*The cost of providing samples and the cost of carrying out tests required by 14.6 (except as otherwise provided in the Conditions of Contract) together with the cost of supplying equipment for sampling and site testing indicated in columns 3 and 4 of Table 14.8 of this Section of the Specification shall be borne by the Contractor (see also Clause 14.6).*

*During the progress of the Works, consignment notes for materials not supplied by the Employer shall be supplied to the Engineer giving details of each consignment.*

*The Contractor shall provide all samples required by the Engineer as soon as possible after contract award. No deliveries in bulk shall be made until the samples are approved by the Engineer. All condemned material shall be removed from the site within 24 hours.*

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rdrs rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rds  
rdw15rdsrdw15rds ntbl 1.0 - 2.0 250 - 500 OPC Not permitted -rdw15  
rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rds  
rdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15  
rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds  
rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15  
rdsrdw15rds ntbl SRPC 340 370 410 0.45rdw15rdsrdw15rdsrdw15  
rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rds  
rdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15  
rds rdw15rdsrdw15rdsrdw15rdsrdw15rds ntbl > 2.0 SRPC Ditto but  
with protective coating 0.45

OPC - Ordinary Portland Cement

SRPC - Sulphate Resisting Portland Cement

#### Strength

The characteristic strength of concrete means that value of the 28 day cube strength below which 5% of all possible test results would be expected to fall.

The relationship between grade of the concrete and its characteristic strength shall be as given in BS 5328. The grade of concrete to be used in particular locations shall be as given in Table 14.2 unless noted otherwise on the drawings.

**Table 14.2 Concrete Strength Requirements**

rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15  
rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds ntbl Location  
Maximum Coarse Aggregate Size (mm) Grade of Concrete (BS 5328)rdw15  
rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rds  
rdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds ntbl Blinding  
Concrete - General Structures - Liquid Retaining Structures 20 or 40 20  
C15P C20Prdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15  
rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds  
ntbl Blinding Concrete - Sulphate Condition 20 C25Prdw15rdsrdw15rds  
rdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15  
rdsrdw15rdsrdw15rdsrdw15rds ntbl Substructure thickness less than  
400 mm 20 C30Drdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rds  
rdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15  
rds ntbl Substructures, walls and slabs more than 400 mm 20 or 40 C30D  
rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15  
rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds ntbl  
Superstructures, Normal Concrete 20 C30Drdw15rdsrdw15rdsrdw15  
rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rds  
rdw15rdsrdw15rdsrdw15rds ntbl Liquid Retaining Structures 20 C30A  
rdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15  
rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15rds ntbl Fine  
Concrete 10 C30Drdw15rdsrdw15rdsrdw15rdsrdw15rds rdw15rds  
rdw15rdsrdw15rdsrdw15rds rdw15rdsrdw15rdsrdw15rdsrdw15

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**rdrs ntbl Precast Concrete 10 or 20 C30D**

*In the above table suffix P means a prescribed mix, D means a designed mix and A means a design mix complying with the requirements of BS 8007.*

**Mixes***(a) Designed Mixes*

*Proportions shall be determined in accordance with the "Design of Normal Concrete Mixes" published by the United Kingdom Department of The Environment and obtainable from:-*

*Building Research Establishment and Bookshop  
Garston  
Watford  
WD2 7JR  
ENGLAND*

*Tel: +44 1923 894040*

*Fax: +44 1923 664010*

*Tlx: 923220 BRSBRE G*

*or other approved methods, for the requirements set out in this Specification.*

*For the purpose of determining the design mean strength of the concrete a margin shall be added to the characteristic strength for the particular grade of concrete. This design margin shall be assessed on the degree of control reasonably to be expected in the manufacture of the concrete and shall not be less than 5N/mm<sup>2</sup> nor less than 1.64 times the standard deviation. Until such time as the standard deviation has been assessed the margin shall be not less than 7.50N/mm<sup>2</sup>.*

*Details of the designed mixes shall be forwarded immediately to the Engineer for his approval.*

*(b) Prescribed Mixes*

*Proportions for the several grades of concrete shall conform to the requirements of Tables 14.3 and 14.4.*

*(d) Chloride Content*

*The total chloride content of the concrete mix shall comply with the requirements of BS 8110: Part 1: Section 6.*

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*The principal basis of control shall be by comparison of the results of the compression cube tests at 28 days, except for small quantities of concrete whose strength can be otherwise derived and which is permitted for use by the Engineer. 40 sample cubes shall be made initially in eight samples each day for five days of concreting and thereafter one sample per 25 m<sup>3</sup> of concrete but not less than one sample for each day's concreting.*

*Where materials are of an unfamiliar grading or type, compression cube tests shall be carried out at 7 days and adjustments made in advance of the main control methods outlined above.*

*Cube test results will be examined individually in 10 consecutive sets of four and the standard deviation and mean strength of each set calculated. The concrete mix proportions will only be acceptable if all of the following requirements are complied with:-*

*(i) Not more than two results in 40 are less than the characteristic crushing strength.*

*(ii) No value of the average for any set of four results is less than the characteristic strength plus one-half of the design margin (Clause 14.2).*

*(iii) When 40 results have been obtained and the mean strength and standard deviation are calculated, the mean strength minus 1.64 times the standard deviation shall be greater than the characteristic strength.*

*Where the results do not conform to the above requirements the following action shall be taken:-*

*- Adjustments to the mix shall be made to obtain the strength required.*

*- In the case where any result is less than 80% of the characteristic strength the structural implications shall be considered and action taken as ordered by the Engineer (as provided for in Clause 14.5).*

*For those Prescribed Mixes required to be tested, requirements (i) and (ii) only will be applicable.*

**Production**

*Aggregates and cement shall be proportioned by weigh-batching, and water shall be proportioned by volume. Subject to the prior approval of the Engineer volume-batching of aggregates may be used for small sections of works, but volume batching of cement will in no case be accepted. The Contractor may, however, so proportion the mix that each batch shall use a whole bag or bags of cement, the weight of which is known precisely. Where permission has been given for volume batching of aggregates, all gauge boxes shall be accurate and due allowance shall be made for the bulking of the aggregates in assessing the correct volume to be used.*

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[illegible]

**Table 14.4 Prescribed Mixes - Percentage by Mass of Fine Aggregate to Total Aggregate**

**A PART 25 GENERAL SPECIFICATIONS FOR ELECTRICAL INSTALLATIONS**

## 25.1 General Electrical Specification

The work shall be carried out as described in this specification and as shown on the drawings which are to be read together with each other.

If applicable Engineering Consultants Specifications will take precedence over these specifications.

The sub-contractor will be required to liaise with the Kenya Power & Lighting Company Limited in order to determine the most appropriate and the most economical method of bringing in the service line cable, which is considered acceptable by the Authority. Any changes required to the proposed position of the service ducts will be advised through the Architects and the service ducts will be advised through the Architects and it shall be ensured that this work is carried out to the requirements of the power supply company.

The sub-contractor carrying out the electrical installations work will be registered with the Ministry of Energy under an appropriate class of registration and shall be authorised to issue a Commencement of Work Notice and a Completion Certificate once the installation work has been completed. He must be conversant with the latest statutory requirements

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of the Kenya Power & Lighting Company Limited to ensure that only the installation practice acceptable to them is followed. The statutory requirements shall over-rule the requirements stipulated in the I.E.E. Regulations for the electrical equipment of buildings, 14th Edition issued by the I.E.E. London, which shall generally be the basis for the electrical installation work through out.

The sub-contractor shall allow for liaising with the Kenya Power & Lighting Company Limited to ensure that the electricity supply is made available by the Company at the appropriate time and to suit the programme of construction work. An enquiry for a Supply of Electricity supply Form shall be submitted to the power supply company giving details of the electrical installations.

### **25.2 Submain cables**

PVC insulated single core cable shall be supplied by the sub-contractor. The cables shall be drawn in heavy gauge high impact PVC conduits such that a space factor of 45% is not exceeded. No conduit shall contain more than three circuits (pairs of cables) single phase a.c; 3 cables per circuit, or 4 where one is neutral; 3 phase a.c). Suitable number and sizes of draw-in boxes shall be supplied and installed enroute of cables, where necessary, to facilitate drawing of cables.

Cables shall not be jointed at intermediate positions in between the switchgears.

Conduits for cables shall be laid with a minimum of 300mm clearance from any other service pipes including lagging if any. Where it is found that this condition cannot be complied with the Engineers shall be advised prior to installation being commenced.

Cables of appropriate colours shall be used, distinctly indicating different phases of the supply voltage.

PVC SWA PVC copper conductor cables to BS6346 including brass compression glands shall be provided by the sub-contractor in accordance with the layout drawings and the schematic wiring diagrams.

### **25.3 Distribution Boards and Consumer Units**

All the distribution boards and consumer units are indicated on the drawings. At the positions indicated, the sub-contractor shall supply and install the switchgear of the type and rating as specified on the drawings. The MCB units on distribution boards G1 and G2 shall be rated at 10KA.

The distribution boards and consumer units shall be from one manufacturer, locally assembled where necessary, by an approved supplier. Such a supplier shall be able to provide a guarantee of being able to stock and

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provide adequate spares for at least five years.

The consumer unit in the offices shall be fixed flush with the wall whereas distribution boards shall be fixed on surface.

An independent earth continuity conductor shall be provided at each distribution board and consumer unit.

#### **25.4 Lighting installations**

From the MCB panels or sub-boards the sub-contractor shall supply and install PVC cables enclosed in:

- a) Metal trunking and HG high impact PVC conduit fixed on surface for lighting installations in the Warehouses. The vertical drops for wiring to switches shall be galvanised steel conduit.
- b) Heavy gauge high impact PVC conduit concealed in the fabric of the building in all the remaining areas except those surface installations which will be exposed to rain and where only galvanised steel conduit shall be used.

to the various lighting outlets and switch positions. The W/T switches outside the Warehouses shall be rated at 6 AMps and shall be suitable to accepting wiring in galvanised steel conduit. In other areas the switches shall be of standard MK logic pattern. Where more than one phase is brought into the switchbox, suitable barriers between the phases shall be provided and a label indicating the voltage present shall be fixed on the inside of the switchbox.

The conduit layout throughout shall be such that rewiring of the lighting circuits will be possible without disturbing the building fabric. The sub-contractor is advised to examine the relevant Architects' and Structural Engineer's drawing for detailed plans and sections of the building.

The height above floor of wiring accessories shall be checked with the Architects before commencing installation work.

The tenderer shall allow in his price for supplying installing, connecting, wiring and testing of all the specified light fittings complete with lamps of appropriate wattage and colour rendering. All fixings and suspensions. Sample of each type of light fitting shall be submitted for the approval of the Engineer.

#### **25.5 Power Installations**

From the MCB panels or sub-boards the sub-contractor shall supply and install PVC cables enclosed in:

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HG high impact PVC conduit concealed in the fabric of the building for power installations in the Warehouses and offices.

To various power outlets. 13 amps switched socket outlets in the warehouses shall be Mk 2977 ALM whereas in the remaining areas, they shall be provided 200mm above the worktops or finished floor levels unless indicated to the contrary. All cable trunking shall be fabricated from 18 SWG galvanised sheet steel. Linking trunking and conduits to the Consumer Units and between any two section of the trunking shall be provided by the sub-contractor and they shall be equal in capacity to the cable carrying capacity of the connecting compactments. Suitable adaptable boxes where necessary shall be provided behind the metal cable trunking in order to link the conduits in a manner agreed with the Engineer.

A sample of the metal cable trunking shall be submitted for the approval of the Engineer before commencing fabrication.

The copper e.c.c. shall be in accordance with Table D.2.M. of the I.E.E. Regulations for the Electrical Equipment of Buildings - 14th Edition. All metal boxes shall be provided with e.c.c.

#### **25.6 Telephone Conduit Installations**

Telephone outlets positions are shown on the drawings. The sub-contractor shall provide the necessary HG PVC conduits for the KP&T Corporation to carry out the wiring and installation of equipment. A minimum size of 20mm dia conduit with intermediate draw-in boxes where necessary shall be run to various outlet positions, where such outlets are not indicated on the metal cable trunking. Not more than three telephone outlet positions shall be connected to each 20mm dia conduit. Each conduit shall be provided with a draw-wire. Telephone cord outlet plates shall be MK 427 WHI or equal approved.

#### **25.7 Security Lighting Installations and Area Lighting**

The layout of external security lighting and area lighting installations is shown on the layout drawing. The sub-contractor shall provide lighting fittings in compliance with the details shown on the relevant drawings. The outreach bracket shall be primed and after installation painted to the approval of the Engineer.

The cabling to various lighting fittings Type 'D' shall be PVC SWA cables of the size and type as shown on the drawings. The cables shall generally be laid direct in ground at a depth of 500mm with 50mm sand bed under and over and provided with Danger Hatari concrete tiles throughout their length. Where cables cross roads or permanently finished surfaces these shall be drawn through PVC or concrete ducts. Type K light fittings shall be wired in galvanised conduit. The cables at the positions of the lighting fittings shall be terminated by using brass compression glands.

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The lighting installations with light fittings Type K shall be controlled by means of photoelectric cell operating a suitably rated contactor.

#### **25.8 Fire Alarms System**

The sub-contractor shall be responsible for supplying, installing, wiring and commissioning the complete Fire Alarm System in each unit. The Fire alarm system in each unit shall be independent and shall not be connected to other units.

The system shall consist of manual break-glass points, bells, optical smoke detectors and a fire alarm panel complete with charger and batteries installed in the positions shown on the drawings. The fire alarm panel shall be connected to 240v, 50Hz A.C. panel supply through a 13 amps metal clad unswitched fused spur unit incorporating a pilot light.

The system shall work in the event of signal being installed from any optical smoke detector or break-glass contact and all bells shall ring simultaneously. The bells shall continue ringing until manually reset at the panel.

On silencing the bells, the buzzer within the panel shall remain operative until such time that the glass for the break-glass contact has been replaced.

The wiring to call initiating points shall be carried out in 1.5mm<sup>2</sup> and to bells shall be done in 2.5mm<sup>2</sup> PVC cables, enclosed in steel conduit or impact concealed conduit. A completely separate and independent conduit system shall be used for wiring to fire alarm equipment.

The operation of Fire alarm system on completion shall be demonstrated to the Engineer and the client and one copy of the Operating Instructions shall be provided to the Engineer and two copies to the client.

#### **25.9 Testing**

On completion, the installation must be tested in accordance with Section E of the I.E.E. Regulations for the electrical equipment of buildings and the sub-contractor must allow for preparing a test report for submission to the Engineers and the Kenya Power & Lighting Company Limited.

#### **25.10 Earthing**

The earthing of the installations shall comply with Section D of the I.E.E. Regulations for the Electrical Equipment of Buildings 14th Edition and in accordance with the requirements of Kenya Power & Lighting Company Limited.

#### **25.11 Commissioning**

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The entire electrical installation shall be commissioned and all items of switchgear, socket outlets, light fittings, motor starters shall be checked for correct functioning before handing-over.

#### **25.12 Handing Over**

After testing and commissioning the sub-contractor shall hand-over the entire installation together with "as built" drawings etc. Clear away all debris and surplus materials leaving all work sites in clean and tidy state.

#### **25.13 Light Fittings**

All the specified light fittings shall be supplied complete with lamps of appropriate wattage and colour rendering. The fluorescent lamps unless otherwise indicated shall be of "warm-white" type.

#### **NOTES**

- 1) Samples of each type of light fitting to be submitted for approval before placing orders with the suppliers.
- 2) All fluorescent light fittings and discharge lighting fittings shall be of power factor corrected type.
- 3) All light fittings shall be supplied complete with lamps of appropriate voltage, wattage and colour rendering.

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#### **A SECTION 13**

#### **EXCAVATIONS AND EARTHWORKS**

##### **13.1 Formation Level**

Formation level on embankments and in cuttings shall be the surface level of the ground obtained after completion of the earthworks, i.e. the underside of the sub-base, or where no sub-base is specified, the underside of the base. Any excess depth unnecessarily excavated below formation level shall be backfilled with material acceptable for construction and compacted as directed by the Engineer and no payment shall be made for the excess excavation or for the filling and compacting. The levels and tolerance of irregularity of the surface of the course shall be within the limits specified in Clause 17,7 for sub-grade.

##### **13.2 Surface Soil**

Unless otherwise directed by the Engineer all surface soil shall be removed from the area to be used for cuttings and embankments and stockpiled for re-use and for any purpose such as the soiling of slopes of cuttings and

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embankments, herms, verges, central reserve and the preparation of beds for the cultivation of trees and shrubs.

Surface soil shall be regarded as soil which on visual examination can be seen to have been broken down by agricultural cultivation and/or is seen to be capable of supporting vegetable growth.

Surface soil shall be removed to an average depth as shown on the Drawings or specified in the Bills of Quantities.

The Contractor shall make his own arrangements for temporary storage sites for heaps of surface soil either inside or outside the Site of the Works to suit his convenience. The cost of all operations needed in excavating, loading, carting, depositing and stacking, together with arranging for the storage sites, the hire or purchase of land therefore and all necessary access roads for this purpose is to be included in the item in the Bills of Quantities for stripping surface soil and is to be quoted whatever the nature of the underlying sub-soil.

All unsuitable soil comprising or underlying surface soil shall be excavated and run to spoil in accordance with Clause 2.7.

### **13.3 Soiling of Side Slopes and Verges**

Soiling and compacting of the side slopes of cuttings and embankments shall be carried out to an even surface with a thickness within the range 100 mm - 200 mm, or in the case of verges as stated in the Bills of Quantities with surface soil as previously stockpiled or from an approved source.

Grass planting shall be carried out in accordance with Clause 13.42.

### **13.4 Definition and Classification of Excavated Material**

Excavation in solid rock in the Bills of Quantities will be itemised in three Classes:

(i) Class I:

Soft rock of the type known locally as "tuff" or "magadi" which in the opinion of the Engineer cannot be considered as hard rock but which considerably increases the amount of labour needed for its removal shall be known as Class I rock. Murram and Kunker is specifically excluded and will be reckoned as common excavation.

(ii) Class II:

Very weathered blacktrap or lava containing many fissures and faults shall be known as Class II rock. This type of rock contains stones and boulders of unweathered or incompletely weathered blacktrap or lava. A boulder or

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outcrop of harder rock 13.5 cu. metre or less, and first quality Nairobi blue, grey or green building stone in a formation which is massive and geologically homogeneous, will be deemed to be Class II rock.

(iii) Class III:

Blacktrap in a formation which is massive and geologically homogeneous shall be known as Class III rock.

The opinion of the Engineer in classifying rock shall be final and binding.

Common excavation shall mean excavation in any material which are not solid rock as defined in this Clause.

All excavation shall be classified either as unsuitable materials or as suitable material. Unsuitable material shall comprise:

- (i) Material from swamps or marshes, silt, perishable material, slurry or mud;  
or
- (ii) Any material:
  - (a) which is a highly organic clay or silt;
  - (b) which is clay having a liquid limit exceeding 8. and/or a plasticity index exceeding 55;
  - (c) which is outside the limits of moisture content specified in the earthworks series of Clauses either when excavated or thereafter;
  - (d) which is susceptible to spontaneous combustion;
  - (e) consisting of such domestic refuse which by virtue of its physical or chemical composition or moisture content will not compact to form a stable fill.

Suitable material shall comprise all that which is acceptable in accordance with the requirements of the Specification for use in the Works, whether obtained from within or without the Site. Any reference in this and other Clauses of the Specification to suitable material and unsuitable material shall have the meanings defined above.

For the purpose of selection for use in earthworks all common excavation shall be classified as either plastic or non-plastic. Non-plastic materials shall be defined as those on which it is impossible to carry out a plasticity index test and shall include "coarse-grained, non-cohesive materials" included in Table 1 of British Standard Code of Practice CP 2001.

### **13.5 Storage and Handling of Explosives and Blasting**

The removal of hard materials by use of explosives will normally be permitted subject to compliance by the Contractor in all respects with the Explosive Laws of Kenya.

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In the Bills of Quantities rock may be sub-classified into rock where blasting will be permitted subject to this Clause and rock where blasting will not be permitted.

The Contractor shall provide proper buildings or magazine in suitable positions for the storage of explosives in manner and quantities to be approved; he shall also be responsible for the prevention of any unauthorised issue or improper use of any explosives brought on the Works and shall employ only experienced and responsible men to handle explosives for the purpose of the Works.

The shots shall be properly loaded and tamped and, where necessary, the Contractor shall use heavy mesh blasting nets. Blasting shall be restricted to such periods and such parts of the Works as the Engineer may prescribe. If, in the opinion of the Engineer, blasting would be dangerous to persons or property or any finished work or is being carried on in a reckless manner, he may prohibit it, and order the rock to be excavated in other means and payment will be made at the rate for rock excavation where blasting is permitted. The use of explosives by the Contractor in large blasts, as in seams, drifts, shafts, pits, or large holes, is prohibited unless authorised in writing by the Engineer. In the event of wasting of rock through any such blasting, the Contractor shall, if required by the Engineer, furnish an equivalent amount of approved materials for embankments, 1 cu. metre or rock insitu being taken to equal 2.5 cu metre of material in embankment.

### **13.6 Excavation of Cuttings**

The Contractor shall carry out the excavation of cuttings in accordance with the Drawings and shall adhere to the slopes, levels, depths and heights shown thereon.

The sloping sides of all cuttings shall be cleared of all rock fragments which move when prised with a crowbar and are therefore liable to cause injury or damage through falling.

Where excavation reveals a combination of suitable and unsuitable materials, the Contractor shall, wherever the Engineer considers it practicable, carry out the excavation in such a manner that the suitable materials are excavated separately for use in the Works without contamination by the unsuitable materials.

If any suitable material excavated from within the Site is, with the agreement of the Engineer, taken by the Contractor for his use (i.e. as material for pavement courses) and not in consequence for the forming of embankments, or soiling of slopes of cuttings and embankments or verges, sufficient suitable filling material to occupy, after full completion, a volume corresponding to that which the excavated material occupied, shall, unless otherwise directed by the Engineer, be provided by the Contractor from his own resources.

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No excavated material shall be dumped or run to spoil except on the direction or with the permission of the Engineer, who may require material which is unsuitable to be retained on Site. Material used for haul roads shall not be re-used in embankments, or elsewhere without the permission of the Engineer.

The completion of cuttings shall, unless otherwise permitted by the Engineer, be undertaken in two stages. First the area between the extremities of the carriageway(s), including verges, shall be excavated to a level 300 mm above formation level whereupon constructional traffic may continue to be allowed to use the surface so formed.

Second, when it is necessary to complete to formation level, this excess of material shall be trimmed off as a single operation and disposed of either elsewhere in the Works if regarded by the Engineer as suitable material, or if not run to spoil. When the height above formation level has been reduced below 300 mm the movement and use of constructional plant other than that used to complete this operation shall be in accordance with Clause 17.18. This trimming operation shall be regarded as the commencement of construction of the pavement.

### **13.7 Forming of Embankments**

The Contractor shall carry out the forming of embankments in accordance with the Drawings and shall adhere to the slopes, levels, depths and heights shown thereon.

Unless otherwise directed or permitted by the Engineer, all suitable excavated materials shall be used to form embankments. Any such excavated material which is surplus to this requirement shall be disposed of in tips to be provided in accordance with Clause 13.39. Any material which according to the Specification requirements is unsuitable for forming embankments shall be similarly disposed of.

All filling material other than rock in embankments or below formation level in cuttings shall be deposited in layers not exceeding 225mm loose depth unless as a result of compaction trials the Engineer approves spreading to a greater depth up to a maximum of 375mm loose depth. Each layer shall extend over the full width of the embankment and shall be compacted in accordance with the requirements of Clause 13.10.

Rock used in rock-fill embankments shall be of such size that it can be deposited in horizontal layers each not exceeding 450 mm loose depth and extending over full width of the embankment except for any specified external cover to slopes or new formation level. The materials shall be spread and levelled by a crawler tractor weighing not less than 15 tonnes. Each layer shall consist of reasonably well-graded rock and all large voids shall be filled with broken fragments before the next layer is placed. The top

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surface and side slopes of embankments so formed shall be thoroughly blinded with approved fine graded material to seal the surface. Such material may be surface soil on side slopes.

Isolated boulders each within the range 0.05 cu. metre to 0.3 cu. metre in size may be incorporated more than 600 mm below formation level in embankments not or rock-fill at the discretion of the Engineer, provided that the specified compaction requirements are met. No stone exceeding 0.05 cu. metre should be placed less than 600 mm below formation level of carriageways and verges.

During the construction of embankments the Contractor shall control and direct constructional traffic uniformly over the full width.

Fill material shall not be stockpiled on embankments, unless this is permitted by the Engineer.

Should the quantity of excavation from the Works, including that from any widened cuttings, be insufficient to make up the embankments, the deficiency shall be made good by approved imported suitable material and the Contractor shall be responsible for locating and obtaining such material.

Where materials of different characteristics are readily available those of relatively high bearing capacity shall be placed in the topmost 600mm below formation level.

The completion of embankments shall unless otherwise permitted by the Engineer be undertaken in two stages. First the area between the extremities of the carriageway(s), including verges, shall be brought up to a level 150 mm above formation level whereupon constructional traffic may continue to be allowed to use the surface so formed.

Second, when it is necessary to complete to formation level this excess of material shall be trimmed off a single operation and disposed of either elsewhere in the Works if regarded by the Engineer as suitable material or, if not, run to spoil.

When the height above formation level has been reduced below 150 mm the movement and use of construction plant, other than that used to complete this operation, shall be in accordance with the requirements of Clause 17.17.

This trimming operation shall be regarded as the commencement of construction of the pavement.

### **13.8 Side Slopes**

Should the slopes of any cutting be excavated beyond the widths shown on the Drawings or directed by the Engineer the Contractor shall make good

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each affected area in a manner satisfactory to the Engineer.

### **13.9 Surface Treatment of Formation**

If required, after final preparation of the sub-grade, the surface of the formation shall within 24 hours of such final preparation or as soon as practicable thereafter be surface dressed with bitumen, as stated in the Bills of Quantities. The surface dressing shall be carried out as specified in Clause 18.13 and shall include blinding with 5mm - down crushed rock at the rate of 6Kg per sq. metre. Where a particular area of formation is to be covered with a compacted and sealed sub-base within 24 hours of its preparation the surface dressing of the formation may be omitted. If, inspite of such sealing membrane for the formation or the sub-base having been ordered promptly by the Engineer, the Contractor allows the moisture content of accepted compacted materials to increase to a value above that which would have been acceptable for compaction, the Contractor shall allow the material to revert to such an acceptable moisture content and, if so directed by the Engineer, recompact the surface before sealing.

### **13.10 Compaction of Earthworks**

All filling material used in earthworks shall be compacted to specification by plant approved by the Engineer for that purpose.

The Contractor shall submit to the Engineer for approval his proposals for the compaction of each main type of material to be used in the embankments, including those in relation to the types of plant, the number of passes and the loose depth of layer. The Contractor shall carry out compaction trials, supplemented by any necessary laboratory investigations, as required by the Engineer, using the procedure proposed by the Contractor for earthworks, and shall satisfy the Engineer that all the specified requirements regarding compaction can be achieved. Compaction trials with the main types of material likely to be encountered shall be completed before the Works with the corresponding materials will be allowed to commence.

Work on the compaction of plastic materials in embankments shall proceed as soon as practicable after excavation and shall be carried out only when the moisture content is not greater than 2 percent above the plastic limit for that material. Where the moisture content of plastic material as excavated is higher than this value the material shall, unless otherwise directed by the Engineer, be run to spoil. If the Contractor allows the moisture content of suitable plastic materials to increase to a value which is unacceptable for compaction he shall, unless he prefers at his own expense to wait until the material has dried sufficiently for acceptance again as suitable material, run such materials to spoil and provide an equal volume of material suitable for filling, both without extra charge.

Work on the compaction of non-plastic materials in embankments shall be

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carried out only when material has such a moisture content as is within the range from 1 percent wetter to 2 percent drier than the moisture content of the material in cuttings or borrow pits when measured on samples obtained from at least 300 mm above the level of the water table as indicated by the presence of free water in the excavation. Nevertheless if with any material the Engineer doubts whether satisfaction will be obtained within the above moisture limits he may require compaction to proceed only when the limits of the moisture content for the compaction of non-plastic materials are within the range of the optimum moisture content and 3 percent below the optimum moisture content as determined by the laboratory compaction test method described in British Standard 1377 : Methods of Test for Soil Classification and Compaction.

If any such non-plastic material on excavation is too wet for satisfactory compaction and the Engineer orders the moisture content to be lowered or raised such work shall be treated as included in the rates. All adjustment of moisture content shall be carried out in such a way that the specified moisture content remains uniform throughout compaction.

If the Contractor allows the moisture content of suitable non-plastic material to change after excavation to a value unsuitable for compaction he shall raise or lower the moisture content as required above, or the Contractor shall, if so directed by the Engineer, run the material to spoil and replace it with an equal quantity of material suitable for compaction.

Work shall be continued until a state of compaction is reached throughout the embankments, including especially the slopes of embankments and the immediate approaches to bridge abutments such that at least 9 out of every 10 consecutive samples taken of the compacted material have a relative compaction determined according to BS 1377 of at least the following percentage of the maximum density at the optimum moisture content:

- (a) for the topmost 600 mm below formation level a maximum density of 100 percent;
- (b) for the remainder below formation a maximum density of 95 per cent.

If with non-plastic materials the compacted material has become drier in the interval between the completion of compaction and the measurement of the state of compaction, then the moisture content to be used for the calculation of the air content shall be the mean moisture content for the compaction of such materials as specified above.

Each layer of rock used as rock-fill in embankments shall be systematically compacted by at least 8 passes of a towed vibrating roller weighing not less than 3 tonnes or a grid roller weighing not less than 13 tonnes dead weight or other approved plant. Where, however, it is established that rock can be compacted to the requirements for common excavation, the rock shall be compacted to such latter requirements.

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**13.11 Excavation below Embankment in Materials Unsuitable for Construction**

Before forming the embankment any unsuitable material naturally occurring on the Site shall be removed to such depths and over such area as may be directed by the Engineer and shall be run to spoil. The resultant excavation shall be back-filled with suitable material deposited and compacted as specified for the forming of embankments. Nevertheless where in these circumstances such back-fill has to be deposited below standing water, compaction may be omitted provided that the material used is completely free draining.

If ordered by the Engineer as an alternative method of construction, approved rock-fill material shall be placed directly on the naturally occurring unsuitable material to such total depth that on completion of compaction negligible deflection of the surface occurs due to the passage of vehicles hauling in the rock. The rock-fill material shall be deposited in accordance with the requirements of Clause 13.7, and compacted so as to comply with the requirements of Clause 13.10 for the compaction of rock. Such work will be dealt with as a Variation of the Works.

**13.12 Benching**

Where an embankment is to be placed on appreciably sloping ground, the surface of the ground shall be benched in steps or trenches, as shown on the Drawings or directed by the Engineer including, if necessary, any under-draining of the site.

**13.13 Excavation below Formation in Cuttings in Materials Unsuitable for Construction**

Where unsuitable material is encountered in the sub-grade it shall be excavated to such depths and over such area as the Engineer shall directed and be run to spoil. The resultant excavation shall be back-filled with suitable material deposited in layers each not exceeding 225mm loose depth and compacted in the manner specified for the forming of embankments. Nevertheless, where in these circumstances such back-fill has to be deposited below standing water compaction may be omitted provided that the material used is completely free draining.

If ordered by the Engineer as an alternative method of construction, approved back-fill material shall be placed directly on the naturally occurring unsuitable material to such total depth that on completion of compaction negligible deflection of the surface occurs due to the passage of vehicles hauling in the rock. The rock-fill material shall be deposited in accordance with the requirements of Clause 13.7, and compacted so as to comply with the requirements of Clause 13.10 for the compaction of rock. Such works will be dealt with as a Variation of the Works.

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**13.14 Embankment at Approaches to Bridges**

To avoid interference with the construction of bridge abutments and wing walls, the Contractor shall, at the points to be determined by the Engineer, suspend work on embankments and/or cuttings forming the approaches to any such structures until such time as the construction of the latter is sufficiently advanced to permit the completion of the approaches without the risk of interference or damage to the bridge works. The cost of such suspension of work shall be included in the prices entered in the Bills of Quantities for excavation from which embankments are formed.

**13.15 Embankments over Bridges, Culverts and Drains**

In carrying embankments up to or over bridges, culverts, or pipe drains care shall be taken by the Contractor to have the embankments brought up equally on both sides and over the top of any such structures. Earth embankments shall be formed and compacted in layers as specified in Clause 13.7 and 13.10 and, in rock embankments, the rock filling shall be carefully packed for such distance back as the Engineer may direct. The cost of these works shall be included in the prices entered in the Bills of Quantities for the excavation from which embankments are formed.

**13.16 Side Grips**

Where directed by the Engineer side grips as shown on the Drawings shall be formed through verges for surface water drainage and the excavated material disposed of as directed.

**13.17 Stone Revetments**

Where shown on the Drawings, the slopes of embankments, rivers, streams, watercourses and other surfaces shall be protected against water or other action by hand-set stone - the largest of which shall be used in the bottom or where the current is greatest - shall be roughly dressed on the bed and face, and roughly square to the full depth of the joints. No rounded boulder shall be used, or stones less than 225mm in depth or 0.05 cu. metre in volume. The stones shall be laid to break bond, and shall be well bedded on to a 75mm layer of gravel or fine rubble rammed to a uniform surface and the whole work finished to the satisfaction of the Engineer. Where required, a trench shall be excavated at the bottom of the slope, to such a depth as will ensure a safe foundation for the revetment.

**13.18 Completion of Earthworks**

The formation shall be properly shaped and regulated and compacted in accordance with Clause 13.10. When completed the formation shall be at the required level and generally parallel to the required finished surface of the road.

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**13.19 Curves**

Where the alignment of the carriageway is curved, the bottoms of cuttings and the tops of embankments shall be formed with the super-elevation and increased widths shown on the Drawings or as the Engineer shall direct, to suit the degree of curvature of the alignment.

**13.20 Industrial Refuse on Site**

Industrial refuse other than artificial deposits of industrial waste or shale found on the Site shall be removed and disposed of in a spoil heap to be provided by the Contractor.

**13.21 Removal of Industrial Waste, etc**

Artificial deposit of industrial waste or shale found on the Site shall be removed and disposed of as directed by the Engineer. Should any particular deposits consist of or contain material which in the opinion of the Engineer is suitable for incorporation in embankments, all such material shall be used accordingly and deposited in layers and compacted as specified in Clause 13.7 and 13.10. The priced entered in the Bills of Quantities for the excavation of this material shall include for the excavation of the material and the loading, transportation, disposal and compaction of same as and where directed.

**13.22 Land Slips**

Remedial works and/or the removal of materials in slips, slides or subsidences and overbreaks of rock extending beyond the lines and slopes, or below the levels shown on the Drawings of required by the Engineer, will not be paid for unless such occurrences are shown to have been beyond the control of the Contractor, and not preventable by the exercise of due care and diligence on his part.

**13.23 Classification of Slips**

The classification of material from slips or slides will be in accordance with its condition at the time of removal, regardless of prior condition. Measurement of overbreak in rock excavation shall be that of the space originally occupied by the material before the slide occurred and regardless of its subsequent classification.

**13.24 Borrow Cuttings and Pits**

Where, for any reason, it becomes necessary to form borrow cuttings or borrow pits, these shall be located and the work executed in all respects to the instruction of the Engineer. They shall be regular in width and shape suitable for ready and accurate measurement, and shall be properly graded and drained and finished with neatly trimmed slopes.

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**A PART 15 FENCING**

**15.1 Generally**

The level of the top of fencing is to be as directed by the Architect but is generally to follow the mean level of the ground on the line of the fencing. Any minor excavations on the line of the fencing to enable this to be achieved to be allowed for in the rates.

**15.2 Standards**

Fencing is to comply with the requirements of B.S. 1722 and B.S. 4102 in all respects.

**15.3 Chainlink and timber post fencing**

Fence posts to be 100 mm diameter cedar posts soaked in an anti-termite solution for a period of one week.

Fence posts are to be spaced at 3.0 metre intervals and 2600 mm long overall. The post to be six times holed for wires.

Raking struts to be 3000 mm long with one end splayed to suit notch in main post.

Main posts, spaced at 9.0 metre centres, and corner posts to be 2600 mm long overall. The posts to be six times holed for wires or fixing bolts and twice notched as required to receive ends of raking struts.

Concrete filling around post bases to be one end splayed to suit notch in main post.

Intermediate and main post bases to be excavated to allow posts to be let into the ground for a vertical depth of 600 mm and filled with 600 mm x 600 mm x 400 mm deep concrete well packed around post, the excavated material to be part returned, filled and rammed and the surplus removed.

Raking strut bases to be as last but let into the ground for a vertical depth of 600 mm and filled with 450 mm x 450 mm x 300 mm deep concrete.

Line wires to be No. 8 S.W.G. galvanized mild steel fixed complete with all galvanized eye bolt strainers, winding brackets and other necessary fittings.

Tying wire for securing chain link fencing to line wires to be No. 16 S.W.G. galvanized annealed mild steel wire.

Chain link fencing to be manufactured from No. 16 S.W.G. galvanized annealed mild steel wire woven into 500 mm mesh with barbed top and 2.0 metres high. The fencing is to be supported by three single and one double

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(at top) lines of line wire and fastened to each line at 1 metre horizontal intervals with tying wire.

#### **15.4 Removing Existing Fencing and Gates**

Where instructed by the Engineer the Contractor shall carefully remove existing fences and gates, dismantle the components and stack them in separate heaps where directed. All wires shall be neatly coiled and tied. Materials which in the opinion of the Engineer, are not suitable for re-use shall be destroyed or removed to a tip to be provided by the Contractor.

#### **15.5 Stockproof Fencing**

Where stock proof fencing is called for in the Bills of Quantities or ordered by the Engineer it shall comprise 75mm sawn cedar posts painted with two coats of creosote, firmly fixed into the ground and placed at 2..m centres together with 100mm diameter posts suitably strutted at all changes of direction, and having four six-gauge wires equally spaced throughout its height of 2.1m. The Contractor's rate for stockproof fencing shall include for its provision, erection, maintenance during the period of the Contract. The fence shall remain the property of the Employer.

#### **15.6 Temporary Fencing**

Where temporary fencing is called for in the Bills of Quantities or ordered by the Engineer it shall comprise 75mm diameter sawn cedar posts firmly fixed into the ground and placed at 2..m centres together with 1..mm diameter posts suitably strutted at all changes of direction, and having four wires equally spaced throughout its height. The Contractor's rate for temporary fencing shall include for its provision, erection, maintenance during the period of the Works, and removal on completion of the Contract. The fence shall remain the property of the Contractor.

#### **15.7 Protective Fencing of Trees**

Where ordered the Contractor shall supply and erect around specified single trees or groups of trees to protect them from damage, split bamboo fencing of approved construction, 2.2m high above ground rough posts, firmly fixed in the ground. The posts shall be at 2..m centres or where required for change of direction. The Contractor shall include in his rate for the satisfactory maintenance of this fencing for the period of the Contract.

#### **15.8 Chainlink Fencing**

The fencing will be erected round the perimeter of the site in the position shown on the drawings or as directed by the Engineer. The top of the fence shall have a uniform gradient along each side approximating to the main profile of the ground, any undulation in ground levels being trimmed off. Any major excavation will be allowed for in the Contractor's costs.

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The concrete post for fencing shall be precast concrete post, 3280 mm long but with the last 600 mm curved at an angle of 45 Degrees to the vertical. All the corner posts shall be 140 mm square and the straining posts will be 130 mm square. The intermediate posts will all be 100 mm square. The posts shall be sunk 775 mm into the ground and embedded 450 mm round in a Class 15 concrete base. The posts shall be provided at 3000 mm intervals. The straining posts shall be erected not further apart on straight lengths; at every corner and opening and acute changes in direction or level.

Struts to straining posts shall be 3000 mm long and 100 mm square and set at an angle of 45 Degrees to the vertical. The foot of the strut shall be sunk into the ground to a depth of 775 mm and embedded in 450 mm diameter Class 15 concrete bed.

The chainlink shall be of standard mesh size 50 x 50 mm. It shall be made of annealed mild steel to BS 4102:1990. The mesh tolerance shall also be in accordance with BS 4102. The mesh will be hot-dip galvanised with minimum of 240 g/m<sup>2</sup> Zinc coating and 0.40 mm P.V.C. coating.

The P.V.C. exposed to rapid ageing according to the conditions mentioned below shall not show cracks, abrasion, swelling or appreciable colour changes

1. 2000 hours ageing with ultraviolet rays in accordance with ASTM D 14499 - 64 (77) and ASTM G23-69 (75) apparatus Type E
2. 240 hours ageing at high temperatures, 105 Degs. C. in accordance with ASTM D 2287-798 and ASTM D 1203-67 (74).

The curved top 600 mm shall be strutted with barbed wire galvanised with a minimum Zinc coating of 75 g/m<sup>2</sup> and PVC coating as above. The barbs will be 100 mm long at a spacing of 100 mm. The wires will be spaced at 200 mm intervals.

#### **15.9 Barbed Wire Fencing on Timber Posts**

General:

Survey beacons are on no account to be disturbed in erecting fencing and then posts are to be set out in such a manner that beacons are avoided. Fence lines may if necessary and with the approval of the Consultant be fixed slightly off the pilot boundaries.

Posts:

Fencing posts are to be of gumpole as free from sapwood as possible, reasonably straight, well shaped, free from serious defects and soaked or treated with engine oil.

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**Barbed Wire:**

Barbed wire fences is to be two-ply No 12½ S.W.G. galvanised steel wire with four point barbs at 75mm centres.

**Barbed Wire Fences:**

Barbed wire fences are to have posts not more than 3.0 metres apart and 2.0 metre high above the ground. The post at each end of fences, at each side of each opening and at each change in direction is to be a straining post 2.00 metre long, 150 mm diameter at the top notched to receive strut or struts 1500 mm long x 100mm diameter, each strut with a gumpole base plate 300 x 100 x 50 mm. Intermediate posts are to be 2.0 metre long x 120 mm diameter at the top.

At a height of 300, 600 and 900mm fix stands of barbed wire loosely fixed to intermediate posts with 25 mm galvanised staples, strained taut and securely stapled to the straining posts.

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**PART 16 PIPELINES, SEWERS AND DRAINS****16.1 Excavation for Pipelines, Sewers and Manholes**

Excavations will be considered to be from ground level at the centre line of the pipe measured in the invert level of the pipe. The Contractor must allow in his prices for all extra excavation required to allow for thickness of pipes and concrete beds.

The ground shall be excavated to the lines and depths shown on the Drawings or to such other lines and depths as the Engineer may direct. Excavations taken out to a greater depth than is necessary shall be filled in to the required level with concrete of the appropriate Class as specified for the pipe bed at the Contractor's own cost. Trenches shall be of sufficient width to enable the pipes to be properly laid and jointed. Special care shall be taken to provide a solid and even bed for the barrels of the pipes and, where a concrete bed is not specified, the floor of the trench shall be properly shaped to receive the sockets.

**16.2 Supports for Pits, Trenches and Other Excavations**

The sides of pits, trenches and other excavations shall where necessary be adequately supported to the satisfaction of the Engineer by timber or by other approved means, and all such excavations shall be of sizes sufficient to enable the pipes and concrete to be laid accurately, and proper refilling and compacting to be carried out.

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The Contractor shall take all precautions necessary for the safety of adjoining structures and buildings by shoring, opening in short lengths or otherwise, during the time the trenches are open.

Where directed by the Engineer, the supports shall be left in trenches or other excavations, and any such supports so left in will be measured and paid for as valued by the Engineer except where in the opinion of the Engineer the necessity for leaving the supports in has arisen from carelessness or neglect on the part of the Contractor. The prices inserted in the Bills of Quantities for excavation of trench shall include for excavation of trenches, shoring or timbering as necessary, backfilling after laying pipes and carting away surplus excavated material. The Contractor shall make good at his own expense any overbreak or damage resulting from slips, falls or caving in and all cavities thus resulting shall be filled with dry rubble or Class F concrete at the Engineer's discretion.

### **16.3 Rock Cutting in Trenches for Pipes**

Where solid rock is met with in trenches, it shall be cut out to a depth of 100 mm below the intended level of the bottom of the pipes, and replaced with 100 mm of concrete of the appropriate Class. In measuring such rock excavation the Contractor will be allowed a width of 300 mm more than the external diameter of the pipes to a level of 100 mm below the bottom of the pipes. The price inserted in the Bills of Quantities shall be held to cover all expenses in connection with excavating the rock and disposing of surplus material as directed by the Engineer.

### **16.4 Water in Trenches for Pipelines and Sewers**

Trenches shall be kept free from water until, in the opinion of the Engineer, any concrete or other works therein are sufficiently set, and the Contractor shall construct any sumps or temporary drains that the Engineer may deem necessary.

### **16.5 Putrescent Matter**

The Contractor shall include in his excavation prices for the removal and disposal of all filth or putrescent matter met with in the execution of the Works to suitable places to be provided by the Contractor clear of the Works, and on no account shall it be so placed to allow its gaining admission into the pipes, laid or unlaidd. Such material shall be replaced as required by surplus excavated soil.

### **16.6 Sight Rails**

Before trenches are excavated sight rails shall be provided and erected by the Contractor at convenient intervals not exceeding the distance between those manholes for which an invert level is given in the Drawings, or 50 metres whichever is the less. Rails shall be of substantial construction and

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shall be painted in alternate contrasting colours in such a manner as to indicate clearly the lines and levels, and, for use in conjunction with them, posts shall be firmly planted one on either side of the trench. The Contractor will be held responsible for any errors, which may occur in the execution of the Works through sight rails being disturbed, faulty setting out therefrom, or from any other cause whatsoever and shall make good at his own expense.

The sight rails shall be fixed with the upper edge an integral height in metres above the level of the invert of the pipe being laid.

#### **16.7 Inspection of Trenches**

Before any pipes are laid in a trench the trench shall be inspected and passed as satisfactory by the Engineer.

#### **16.8 Cleaning of Pipes**

Before being laid in the trench each pipe and fitting shall be inspected and any dirt or foreign matter inside the pipe or fitting shall be removed. Spigots and sockets shall also be examined for cleanliness to ensure proper joints.

#### **16.9 Pipe laying**

In any length of drain, laying shall always be carried out from the lower end of the length to the higher. In cases of spigot and socket pipes the socket shall always be at the upper end of the pipe. Pipes shall be laid true to line and grade as directed by the Engineer. In order to prevent stones or soil from entering the pipe a suitable cover or plug shall be provided which is to be used for covering the mouth of the last laid pipe at all times while pipelaying is not proceeding.

#### **16.10 Lengths for Laying**

Pipes shall not be laid in a section of trench unless the whole of the excavation of that section together with the excavation of the intermediate and terminal manholes shall have been completed, inspected and passed as ready for laying, unless otherwise instructed by the Engineer.

#### **16.11 Laying and Jointing Precast Concrete Pipes**

Precast concrete pipes shall be laid true to line and level, each pipe being separately boned between sight rails.

##### Rigid Joints

For spigot and socket joints, the spigot of each pipe shall be placed home in the socket of the one previously laid, and the pipe then adjusted and fixed in

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its correct position with the spigot of the pipe accurately centred in the socket. A ring of tarred rope yarn shall next be inserted in the socket of each pipe previously laid and driven home with a wooded caulking tool and wooden mallet; such yarn when in position shall be 25mm in depth. The socket shall then be completely filled with cement mortar 2 to 1 as specified in Clause 22.10. and a fillet of the same worked all round the side. The fillet shall be levelled off and extend for a length of not less than 50 mm from the face of the socket.

For 'Ogee' jointed pipes, the joints shall be thoroughly cleaned before laying, and cement mortar, shall be applied evenly to the ends for jointing so as completely to fill the joint. The pipes shall then be properly drawn together and the outside of the joint shall be neatly pointed with a band of cement mortar approximately 125mm wide and 20 mm thick. The inside of each joint shall also be pointed up as the work proceeds.

Special care shall be taken to see that any excess of cement mortar, etc., is neatly cleaned off while each joint is being made and any earth, cement or other material thoroughly cleaned out of the pipes by drawing a tight-fitting wad through them as the work proceeds, or by other approved means. A properly fitting plug shall be well secured at the end of the last laid pipe and shall be removed only when pipelaying is proceeding. The trenches, pipes and joint holes shall be kept free from water until the joints are thoroughly set.

Rigid jointed pipes shall be laid on 150mm thick Class 20 concrete bedding as shown on the drawings and as directed by the Engineer.

#### Flexible Joints

These joints will be made in accordance with the manufacturer's instructions and to the satisfaction of the Engineer. The joint and ring shall be kept clean and free from dirt, oil, grease, or petrol or other deleterious matter.

Internally the joints shall have a uniform gap not greater than 6mm nor less than 3mm. Where the gap is outside the permitted limits or varies around the perimeter of the joint, the Engineer shall instruct the Contractor to relay the pipe or to grout the joint internally at his discretion. Such remedial work shall be carried out at the Contractor's expense. Except where ordered by the Engineer to meet the requirements of this Clause grout will not be used in rubber joints.

Where shown on the Drawings or directed by the Engineer, concrete pipes shall be bedded and haunched or surrounded with granular material as specified in Clause 22.19, or concrete as specified in Clause 16.29, all in accordance with the Drawings.

The price inserted in the Bills of Quantities shall include for providing, laying and jointing pipes.

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**16.12 Pipes Laid with Open Joints**

O.G. porous concrete pipes shall be laid unjointed with a space of 12mm between the spigot and the inner end of the socket. All pipes shall be packed and surrounded as directed by the Engineer with approved broken stone, sand or gravel aggregate, to the grading as shown on the Drawings or stated in the Bills of Quantities. The prices inserted in the Bills of Quantities shall include the trench excavation, providing and laying pipes, supplying and placing graded packing material, refilling trench and disposing of surplus all as specified.

**16.13 UPVC Sewer/Drain Pipes**

UPVC sewer/drain pipes shall comply with the latest revision of KS 06-217 (Class 41), and shall have rubber ring joints. Alternatively, sewer pipes shall be to BS 5481 and drain pipes to BS 4660. The suppliers of the pipes shall be able to supply adequate fittings for use with their pipes, particularly saddles, Y-branches, and protection sleeves.

**16.14 Steel Pipes and Fittings for Above Ground Crossing**

Steel pipes shall be in accordance with the latest revision of BS 534. They shall be lined internally with bitumen or coal tar enamel of the thickness specified in BS 534. They shall be sprayed with red oxide primer externally and finished in reflective aluminium paint.

**16.15 Drains to be left clean on completion**

On completion, all drains, manholes, etc., shall be flushed from end to end with water and left clean and free from obstructions.

**16.16 Refilling Trenches**

Trenches shall be refilled with suitable excavated material but not before the work has been measured and approved by the Engineer. For pipes which are not surrounded with concrete, the first layer of filling material shall be freed from stones and shall not be thrown directly on to the pipes, but shall be placed and packed with care under and round them. All filling shall be deposited and compacted in layers, not exceeding 225 mm loose depth, to a dry density not less than that of the adjoining soil. The last 450 mm of filling must be returned in the order in which it has been removed. Timber and framing shall be withdrawn ahead of the layer to be compacted, care being taken to keep the sides of the trenches solid and to fill all the spaces left by the withdrawn timber. Back-filling of trenches in open spaces shall be left 75mm proud of the general ground level.

**16.17 Back filling of Manholes**

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Back-filling round manhole walls will not be started earlier than 3 days after the building or making of the wall nor sooner than 14 days over the cover slabs of manhole after these are cast.

#### **16.18 Sub-Soil and Land Drains**

Sub-soil and land drains shall be laid in trenches excavated to the alignment, widths, and depths shown on the Drawings or to such other lines or dimensions as may be required by the Engineer. The drains shall be formed of approved pipes as specified, laid with open butt joints to regular falls in straight lines, and with the trenches refilled as directed by the Engineer to surfaces or ground level with approved broken stone, sand or gravel aggregate to a grading as shown on the Drawings or stated in the Bill of Quantities.

#### **16.19 Connections of Existing Sewers and Drains and NCC Water Mains**

Where shown on the Drawings existing sewers water mains and drains shall be properly extended, connected and jointed to new sewers, water pipes, culverts, drains or channels after obtaining approval from NCC. All such connections shall be made during the construction of the main sewer, drain or other work and a record of their positions kept for future use or reference. Where pipe connections are made to a sewer, culvert, stone pitched or lined channel, the pipes shall be well and tightly built into the concrete or masonry work and be so placed as to discharge in the direction of flow of the main sewer, drain or channel and with the end of the pipe carefully cut to the necessary angle. Where the connections are between pipe sewers or drains, special connecting pipes as shown on the Drawings shall be supplied and be truly laid and properly jointed. For water connection into NCC mains, the contractor shall confirm size of existing main and have all fittings ready at least 24 hours before commencement of works, all to the approval of NCC.

#### **16.20 Manholes and Inspection Chambers**

Manholes and inspection chambers shall be constructed in accordance with the Drawings and in the position shown on the Drawings or directed by the Engineer. Foundation slabs benching shall consist of concrete of the appropriate Classes

Benching to manhole floors shall have a minimum fall of 1 in 12 from the manhole walls and shall be finished tangentially vertical to the bore of the channels, providing a gross channel depth not less than the channel diameter. The intersection of the channel sides and the benching shall be finished in a sharp curve not greater than 3mm in diameter.

The benching shall be formed of concrete, as specified, floated to a hard smooth surface with a coat of cement mortar (1:1)

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If required half channel pipes, bends and junctions shall be laid and bedded in cement mortar (1:3) to the required lines and levels, and both sides of the channel pipes shall be benched up with concrete to the appropriate lass and finishes smooth to the slopes and levels as shown on the Drawings or directed by the Engineer. The ends of all pipes shall be neatly built in and finishes flush with cement mortar (1:3).

Walls of manholes and access shafts shall be constructed of (i) insitu concrete of the appropriate Class (ii) building stone in accordance with the Drawings.

Walls where constructed of stone shall be rendered internally for the full height with a cement and sand mortar (1:3) of at least 12mm thickness and finished with a completely smooth surface.

Concrete side walls shall be fair-faced. They shall be brought up vertically to receive a precast slab formed of concrete of the appropriate Class and reinforced all as shown on the Drawings. Cast-iron manhole covers and frames shall be provided and the frames shall be bedded in cement mortar (1:3) and so set that the tops of the covers shall be flush at all points with the surrounding surface of the footway, verge or carriageway, as the case may be. Any slight adjustment of the cover level which may be necessary to accomplish this shall be effected by topping the side walls with concrete integral with the slab.

Where the depth of the invert exceeds 1 metre below the finished surface of the carriageway or the adjacent ground, iron steps shall be built in with alternate steps in line vertically and with such additional hand irons as the Engineer may direct. Step irons must be set into the walls when these are built and not subsequently. Step irons shall comply with the requirements of Clause 22.30

All manholes when completed shall be watertight and to the satisfaction of the Engineer. The prices inserted in the Bills of Quantities shall include for excavation, provision of all materials, construction, refilling and disposal of surplus.

#### **16.21 Precast Concrete Manholes and Inspection Chambers**

Precast concrete manholes and inspection chambers shall be supplied and laid generally in accordance with Clause 22.28 and the Drawings.

#### **16.22 Gully Connections**

Connection from gullies to sewers and surface water drains or ditches shall consist of concrete pipes and fittings jointed with cement mortar (1:3). All pipes, bends and junctions shall be laid to the lines and levels shown in the Drawings or as directed by the Engineer.

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**16.23 Surface Boxes, Covers, etc**

Surface boxes, manholes and other covers lying within the Site of the Works, shall be raised, lowered, altered or removed as directed by the Engineer.

**16.24 Gullies**

Gullies complete with gratings and with rodding eyes where necessary, shall be supplied and laid in accordance with the Drawings. Where directed by the Engineer precast concrete gullies shall be laid on and surrounded with 100 mm of concrete of the appropriate Class, the concrete surround to be brought up to the underside of the frame or flush with the top surface as the case may be. Masonry gullies shall be constructed from 225mm building stone and rendered internally. The rates included in the Bills of Quantities shall include for excavation, provision of all materials, construction, making junctions with connections to main drains, accurate setting of frames to line and level, refilling and disposal of surplus materials. Gullies shall be trapped where leading into foul sewers or into combined foul and surface water sewers. Otherwise, they shall be trapped or untrapped as specified.

**16.25 Completion of Drainage Works**

All sub-soil and surface drains shall be completed in advance of the construction of the verge and carriageway.

**16.26 Temporary Stoppers**

Junction pipes which are laid but not immediately connected to gullies shall be fitted with temporary stoppers or seals, and the position of all such junctions shall be clearly defined by means of stakes or training wires properly marked and labelled.

**16.27 Provision for Future Connection to Manholes**

Inlet pipes of the required diameters shall be built into the walls of manholes and elsewhere for future use and shall be of the diameters shown on the Drawings. The external ends of all such connections shall be sealed off with temporary stoppers, or otherwise sealed off as approved by the Engineer. The pipes shall be laid and jointed as specified in Clause 16.11 and during the placing of the concrete they shall be adequately supported.

**16.28 Granular Bedding to Pipes**

Immediately following excavation of the trench, pipes shall be laid and jointed except when shown otherwise on the Drawings on pipe bedding material. Brick or other hard material shall not be placed under the pipes for temporary support.

After jointing of the pipes the bedding shall be brought up equally on both

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sides of the pipe, first to the level of the centre of the pipeline and then up to a height 225mm above the top of the pipe barrel. The bedding material shall be carefully compacted for the full width of the trench with hand tools.

Pipes shall be laid so that each one is in contact with the bed throughout the length of its barrel, bedding material being scooped away at each socket in the case of socketed pipes so that the socket does not bear on the bed.

#### **16.29 The Surrounding or Haunching of Pipes with Concrete**

Surrounding or haunching of pipes shall be carried out using concrete of the appropriate Class. Before concreting commences pipes will be supported on concrete cradle blocks of design approved by the Engineer. The blocks shall be set by string line and traveller so that when they are firmly bedded they are in correct line and level to receive the pipes. The blocks shall be bedded on 1:3 cement sand mortar. Any additional excavation for the blocks below trench formation shall be done by hand and the cost of the blocks, bedding and additional excavation will be held to have been included in the Contractor's rates for trench excavation.

After pipes have been laid and jointed concrete shall be placed to one side of the pipe and punned and tamped until it forms an even bed below the pipe after which filling will proceed evenly on both sides of the pipe. Concrete shall not be thrown directly onto the pipes. The concrete protection shall be placed in one operation and no horizontal construction joints will be allowed. Care must be exercised to maintain the line and level of the pipe during this operation and any disturbance must be immediately rectified. The upper surface of the concrete shall be struck off with a wooden screed or template and neatly finished off. The rates shall include for any formwork that the Contractor requires to use under this item.

#### **16.30 Invert Block and Stone-pitched Drains**

Precast concrete invert blocks and side slabs shall be formed of concrete of the appropriate Class to the dimensions shown on the Drawings. Each course of side slabs required in the Bills of Quantities shall be interpreted as one complete row of side slabs to one side of the channel concerned. Stone used for channels shall be 225mm x 100mm building stone. Drains should not normally be laid to a radius of curvature less than 5 times the actual width of the drain.

Invert block and stone-pitched drains shall be constructed in the positions and to the levels and dimensions shown on the Drawings and laid to true line and even fall. Where under-filling is required it shall be 75mm maximum thickness layers of compacted murram. The earth sides to such channels shall be neatly finished to a slope of 1 to 1 or such other slope as the Engineer may direct.

Invert blocks and side slabs shall be laid on a 75mm minimum thickness of

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compacted murram and be neatly jointed with cement mortar (1:3) as the work proceeds. The rates included in the Bills of Quantities shall include for excavation, murram bedding, providing, laying and jointing invert blocks or stone, back-filling and disposal of surplus, all as specified, and all insitu connections in concrete of the appropriate Class.

#### **16.31 Intercepting Ditches**

Intercepting ditches shall be excavated to regular falls and unless otherwise directed by the Engineer, when completed shall be 300 mm wide at the bottom with the sides trimmed back at a slope of 2.5 to 2. Where possible intercepting ditches shall be constructed in advance of general earthworks in cuttings and embankments.

#### **16.32 Inspection and Testing of Pipelines**

After pipes have been laid they shall be inspected and checked by the Engineer for grade, direction, line and appearance of inner surface. Any pipes inaccurately laid to grade, direction or line or the interior of which shows open or eccentric joints, ragged edges or protruding material must be made good or relaid as may be ordered by the Engineer, so as to conform with the Specification. After inspection and before haunching, casting or backfilling, the pipes shall be tested by one of the methods described in Clauses 16.33 and 16.34 of this Specification, or as may be directed by the Engineer. All necessary equipment, materials and labour required for the complete and proper testing of the drains shall be provided by the Contractor in accordance with the Conditions of Contract.

#### **16.33 Air Test**

All branches and openings in the length of drain under test shall first be sealed with approved expanding plugs and appropriate lids in the case of access fittings. After sealing, an air pressure of 100mm of water as measured on a manometer tube shall be applied. The drop in pressure after pumping has ceased shall not exceed 25mm of water in five minutes. Should the rate of pressure drop exceed that specified, a smoke test shall be applied for the purpose of locating the fault. Any failure of the drains to withstand these tests and any defect which may be found while they are under test must be made good to the satisfaction of the Engineer and at the contractor's expense, and the test repeated. Upon the successful conclusion of the test, the pipes shall be back-filled in accordance with Clause 16.16 of this Specification.

#### **16.34 Water Test**

All branches and openings in the lengths of drain under test shall first be sealed with approved expanding plugs and appropriate lids in the case of access fittings. The pipes shall be filled with water in such a manner as will give rise to no shock and prevent any accumulation of air in the sewer.

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When all air has been expelled and the pipes are saturated, the pressure in the drains shall be raised by means of a force pump or standpipe so that the length under test is subjected to a hydrostatic pressure of at least 2.2 metres head of water for concrete pipes. For UPVC pipes, testing shall be done under hydrostatic pressure of at least 5 metres head of water. The drop in pressure after pumping has ceased shall not exceed 25mm head of water in ten minutes. Should the rate of pressure drop exceed that specified the Contractor shall thereupon, at his own expense, search for and rectify any weakness or defect in the pipes and fittings under test to the satisfaction of the Engineer. The pipes shall then be subjected to the specified water pressure again and re-tested and repaired until a satisfactory test is obtained. No pipeline or other work shall be covered up until they have been approved by the Engineer.

The Contractor shall allow for supplying all water required for such tests and shall make provision for its disposal after use.

#### **16.35 Testing of Manholes**

Manholes shall be tested by filling to the adjacent ground level with clean water. After allowing a 60 minute period for initial absorption, no measurable subsidence in the water level shall occur during the next 30 minutes. The Contractor shall correct any leaks in the manhole at his own expense.

The Contractor shall, at his own expense, provide the water and everything necessary for the carrying out of the manhole test.

#### **16.36 Infiltration Test**

In the event of a high water table, the Engineer may order an infiltration test to be made on any section of drain. The average rate of infiltration as measured in such manner as the Engineer may direct shall not exceed 2 litres per kilometre of drain per minute or as specified by the Engineer.

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**A PART 17 ROADS - 1**

**CONSTRUCTION OF SUB-BASES, BASES AND VERGES**

**17.1 Drains to be completed**

Before the construction of the carriageways, footways or verges is begun, all drains, sewers cable ducts or other special formation work shall be completed.

**17.2 Compaction of Non-plastic soil immediately below formation level in cuttings**

Where shown on the Drawings or directed by the Engineer, non-plastic soils shall, for a depth of 150mm, be scarified, pulverized and recompact in accordance with the requirements of Clauses 13.7 and 13.10 for non-plastic soils. Work shall be continued in such a manner as to produce a maximum density of 100 percent at the optimum moisture content, or such other percentage as may be approved by the Engineer as a result of compaction trials.

Soft areas which may develop during compaction shall be removed and replaced by approved material.

**17.3 Murram to Carriageway on Rock**

Where the formation is rock, after excavation has been completed and if directed by the Engineer, a murram cushion shall be laid to the proper cross-falls to receive the carriageway base. It is anticipated that the depth of such murram shall not exceed 50mm and the cost of this work shall be included for in the rates for excavation in rock.

**17.4 Preparation of Formation**

The formation of carriageways, footways and verges shall be well cleaned, freed from mud and slurry, and entirely in accordance with the Specification. Where directed by the Engineer, the surface of newly prepared areas of the formation of sub-base shall, before the completion of each day's work, be surfaced dressed in accordance with Clause 18.11 Alternatively, where directed by the Engineer, the formation shall be covered by the sub-base or base within 48 hours after formation level is reached.

Once the formation has been prepared, constructional traffic shall not be allowed to run thereon without the permission of the Engineer, which permission if given shall not relieve the Contractor from total responsibility for any damage caused by such traffic.

**17.5 Granular Sub-base**

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Granular sub-base shall be of the thickness shown on the Drawings or stated in the Bills of Quantities, conform to the other requirements of this Clause and be constructed using one of the permitted aggregates in the following manner:-

Aggregates

These shall comprise approved crushed building stone, crushed concrete, well-graded natural sands, gravels, rock or mixtures thereof.

Grading:

Percentages by

| <u>Sieve Size</u> | <u>Weight Passing</u> |
|-------------------|-----------------------|
| 75mm              | 100                   |
| 38mm              | 85 - 100              |
| 5mm               | 25 - 45               |
| No. 25            | 8 - 22                |
| No. 200           | 0 - 10                |

Wet sieving shall be used to determine the percentage passing the No. 200 sieve. Subject to the approval of the Engineer the proportion of material passing the No. 200 sieve may be increased to 10 percent provided that all the material passing the No. 200 sieve is non-plastic when tested otherwise in accordance with British Standard 1377 : Methods of Testing Soils for Civil Engineering Purposes.

The material shall be laid and compacted at a moisture content not exceeding 5 percent, unless otherwise directed by the Engineer.

General Requirements

The material shall be laid in one or more layers, each not exceeding 150mm compacted thickness, to produce the specified total depth of sub-base to the width and correct line and levels shown on the Drawings as stated in the Bills of Quantities.

The material for each layer shall be deposited either into the hopper of a paver or box spreader or sufficiently evenly on the existing surface for immediate spreading by a motor-grader. Spreading shall be effected by one or other of the above types of machine.

Compaction shall be by means of an 8 - 10 tonne roller or by a vibratory tandem roller having a weight exceeding 3 tonnes until a state or compaction is achieved such that not more than one field dry density achieved during compaction trials with 10 passes of such a roller or vibratory roller.

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The levels of the surface of the course shall be within the limits specified in Clause 17.7 for sub-bases.

#### **17.6 Murram Sub-base**

The murram sub-base shall be in accordance with Clause 22.8 and shall be of the thickness shown on the Drawings or stated in the Bills of Quantities. It shall be laid one layer and spread by a motor-grader or other plant approved by the Engineer. Compaction shall be as earthworks in accordance with Clause 13.10.

#### **17.7 Scarifying Existing Surface and Making Good**

Where a new carriageway abuts on to or include an existing carriageway and the Engineer so directs, the surface of the latter shall be scarified, adjusted and reshaped to conform with existing and new cambers or crossfalls. Materials from the existing road shall be used or disposed of as directed by the Engineer.

#### **17.8 Lean Concrete Base**

##### General

Construction of a lean concrete base, including all preliminary trials, shall be in accordance with the provisions of this Clause. Construction shall be to the specified thickness after compaction. If the Contractor proposes to compact in one layer he shall satisfy the Engineer that with the plant and method of construction used the specified requirements can be achieved throughout the whole depth of the base. Failing such satisfaction the Contractor shall compact the base in two layers each of approximately equal thickness.

Where a base of more than 200mm of lean concrete is required and the specified compaction requirements cannot be met using single each not less than 100mm nor more than 200mm in depth after compacting the top layer laid immediately after compacting the lower layer so that in any vertical section the lean concrete shall be fully compacted throughout the whole depth and finished within two hours from the time of the completion of the mixing of the first batch of lean concrete in that section.

##### Aggregates

The aggregates shall consist of gravel, sand, crushed rock or a mixture of these materials. All aggregates shall comply with the requirements of British Standard 882 : Concrete Aggregates from Natural Sources. Gravel, sand or all-in gravel-sand mixtures shall be washed unless they can be shown to meet the requirement of British Standard 882 : Concrete Aggregates from Natural Resources, as regards freedom from clay, silt and other impurities.

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#### Gradings and Maximum Size

The nominal size of aggregate shall be either 38mm or 20mm as stated in the Bills of Quantities. The aggregate may consist of coarse and fine aggregate batched separately or an all-in aggregate, but, subject to the following proviso, the gradings of the fine aggregate or the material passing the 5mm sieve in all-in material shall be within Zone 2 or Zone 3 of British Standard 882 : Concrete Aggregates from Natural Sources, and the overall grading shall be within the limits shown in the table below.

In the event of the Contractor offering a material in which the fine aggregate or the material passing the 5mm sieve in an all-in material has a grading falling within either Zone 1 or Zone 4 of British Standard 882 : Concrete Aggregates from Natural Sources, the Engineer may approve its use and permit the proportions passing the 5mm sieve to exceed the figures given below by 5 percent for a Zone 1 material or to fall below the figures given below by 5 percent for a Zone 4 material subject to his being satisfied by trial mixes and a trial area laid with the plant to be used on the work, that a mix can be obtained which can be satisfactorily compacted.

BS Test    Percentage by weight passing

| <u>Sieve</u> | 38mm nominal<br>maximum size | 20mm nominal<br>maximum size |
|--------------|------------------------------|------------------------------|
|--------------|------------------------------|------------------------------|

|         |          |          |
|---------|----------|----------|
| 75mm    | 100      |          |
| 38mm    | 95 - 100 | 100      |
| 20mm    | 50 - 80  | 80 - 100 |
| 5mm     | 30 - 40  | 35 - 45  |
| No. 25  | 8 - 30   | 10 - 35  |
| No. 100 | 0 - 6    | 0 - 6    |

#### Mix Proportions

The ration of cement to aggregate by weight (including any absorbed moisture but excluding free water in the aggregate), shall be not less than 1 : 20 and shall be such as to produce average crushing strengths to the requirements of this Clause. The ratio of cement to aggregate by weight shall not, however, be more than 1 : 15 except with the approval of the Engineer.

#### Water Content

The water content of the mixed concrete shall be such as to ensure that the degree of compaction specified below can be achieved under all normal working conditions.

#### Crushing Strength Requirements

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The essential strength requirement for the material is that the average 28 - day strengths of groups of three cubes determined in accordance with the Section 3 of this Specification and shall be such that not more than one such average strength in any consecutive five such averages is less than 0.985 kg/sq. mm. If however the overall average of any consecutive five groups of three cubes (i.e. fifteen cube strengths) falls below 1.125 kg./sq. mm. at 28 days, the Engineer may require the use of different materials, mix proportions, plant or methods, notwithstanding any approval which may have been previously given to such materials, mix proportions, plant or methods.

Further, in order to ensure a high probability at an early stage that the above requirements will be met, the average 7-day strengths of groups of three cubes determined in accordance with Section 3 should not be less than 0.705 Kg./sq. mm and if more than one of the 7 day average strengths of groups of three cubes in any consecutive five such averages falls below 0.705 kg/sq.mm the cement content shall be increased to such a value as may be approved by the Engineer and the making of cubes shall be continued at the same rate as at the start of the work until the results show that a satisfactory material is being produced.

#### Density of Compacted Base

The average density obtained from groups of three determinations carried out in accordance with Section 3 shall be not less than 95 percent of the theoretical density of material as compacted to zero air content calculated from the specific gravities, determined in accordance with British Standard 812 : Methods of Sampling and Testing of Mineral Aggregates, Sands and Fillers, and the nominal proportions of the constituents, including the water.

If more than one average density in any consecutive five such averages fails to meet this requirement, the Engineer may require the removal of the base represented by the low densities and its replacement with further material to the requirements of this Clause.

#### Preliminary Site Trials

In the event of the grading of the fine aggregate or of the material passing the 5mm sieve in an all-in aggregate falling within either Zone 1 or Zone 4 of British Standard 882 : Concrete Aggregates from Natural Sources, the Contractor shall construct, at least ten days before the main work of base construction is started, an area of lean concrete base of 1,000 sq. metres as a preliminary trial at a site to be approved by the Engineer. For this trial the Contractor shall use the materials, mix proportions, mixing, laying and compacting plant and construction procedure that are proposed for the main work. The preliminary trial is to establish the suitability of the materials and mix proportions, and the efficiency of the mixing, spreading and compacting plant in handling and processing the proposed materials.

Testing of the materials, the crushing strength of the lean concrete and the

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density of the base shall be carried out during the trial in accordance with Section 14 of this Specification. The average 7-day crushing strength shall correspond to not more than 5 percent air voids.

Batching, Mixing and Transport of Mixed Material

Proportioning and mixing of the lean concrete shall be carried out in accordance with Section 14 except that, if batch mixers other than tilting or non-tilting drum mixers are used, the mixing time may be reduced to a value which shall in no circumstances be less than 45 seconds after all the materials including the water have entered the pan, trough or other mixing vessel, provided that the Engineer is satisfied as a result of preliminary trials that adequate mixing is achieved with the reduced mixing time. Sufficient mixers shall be employed to ensure that a rate of not less than 20 metres per hour measured longitudinally of completed base can be maintained in order to permit satisfactory compaction of the material. Care shall be taken during tipping from the mixer, transit and spreading to prevent segregation.

In particular when continuous mixers are used with a receiving hopper below, the mixed materials shall not be allowed to fall direct from mixer to transport vehicle with the bottom door of the receiving hopper open. The mixed material shall, where required by the Engineer, be covered during transit and while awaiting tipping to prevent wetting by rain or evaporation or moisture.

Spreading of Mixed Material

The lean concrete shall be spread by means of an approved box-hopper spreader or by bituminous pavers. If the latter are used and the width of the carriageway is greater than the width which can be laid by one pass of a single paver, the work shall be arranged using, if necessary, two or more pavers in echelon so that a free edge of spread material is not exposed for more than one hour.

Compaction

Compacting shall be carried out by means of a vibratory roller which applies a dead load of not less than 0.5 tonne through the vibratory roll or by a vibratory compactor approved by the Engineer. The vibrating roller shall, where required by the Engineer, be operated both longitudinally and transversely. This shall be followed by rolling with an 8 - 10 tonne tandem or other approved type of roller. Where directed by the Engineer the rolls shall be lightly wetted. Compacting shall be continued until visible movement of the surface of the layer beneath the roller ceases and until the surface is closed. The maximum period of time between mixing of the materials and completion of compaction of any given material shall be two hours or such shorter maximum period as may be necessary in dry weather.

The compaction shall be such that the density of the compacted base meets the requirements for density in the Clause.

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### Joints

At the end of each day's work the lean concrete shall be compacted against a securely fixed vertical temporary stop end and if compaction is being done with a vibratory roller this shall be used transversely close to the stop end. In addition, the material in the corners adjacent to the stop end shall be compacted by means of a small power-operated compactor. When the stop end is removed any poorly compacted material adjacent to it shall be removed and a 1:1 cement : sand grout shall be applied to the exposed face of a thickness of 6mm - 12mm before proceeding with the laying of further adjoining lean concrete. Such fresh lean concrete shall be thoroughly compacted against the joint and where a vibratory roller is employed this shall be used transversely close to the joint again using the small power-operated compactor in the corners of the new work. None of the compacting equipment shall be allowed to bear directly on the hardened or partially-hardened lean concrete previously laid.

### Curing and Surface Finish

The surface shall be formed to the lines and levels shown on the Drawings and its levels shall be within the limits specified for bases in Clause 17.17.

Except where the Engineer approves an alternative form of curing, the surface of the lean concrete shall, within one hour of being finished and compacted to the satisfaction of the Engineer, be sprayed with an approved quick-breaking 55 percent bitumen emulsion at a rate not lighter than 0.9 litre/sq. metre and blinded with medium sand.

Vehicular traffic shall be kept off the lean concrete base for 7 days after laying and thereafter the admission of traffic shall be at the discretion of the Engineer.

### **17.9 Waterbound Macadam Base**

The base shall consist of crushed building stone mechanically laid in one or more separate layers, so as to give a total compacted thickness as shown on the Drawings, or stated in the Bills of Quantities. The first layer shall be laid to produce a thickness of 75mm to 150mm after compaction as specified. Where a greater thickness than 150mm of base is specified the material shall be laid in separate layers, each not less than 75mm or more than 150mm in thickness after compaction.

The stone shall have the following gradings:-

| <u>BS Sieve Size</u> | <u>Percentages by Weight Passing</u> |
|----------------------|--------------------------------------|
| 125mm ring           | 100                                  |
| 75mm                 | 25 - 80                              |
| 38mm                 | 10 - 20                              |

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20mm                      0 - 5

Alternatively a stone base may be placed by hand. In this case the first stones in each layer, which shall be of a cubical nature, shall be placed to the approximate height of the layer. When an area has been covered in this way a second placing of stones of smaller size shall be positioned by eye in the spaces between those first placed, and wedged home by hammering. A third placing of stones shall follow the second and so on until in the opinion of the Engineer the voids are sufficiently filled to permit compaction.

Thorough watering shall be carried out at all stages of compaction. Initial compaction shall be with a light roller. The surface shall then be blinded with quarry dust so as to fill the interstices completely and again rolled, this time using a heavy roller. The base shall then be well watered and brushed and permitted to dry. Further rolling with heavy roller, blinding with quarry dust, watering and brushing shall be carried on until the whole presents a homogenous surface and no movement is visible under the action of a heavy roller.

The levels of the surface of the course shall be within the limits specified in Clause 17.17 for bases.

#### **17.10 Pre-mixed Waterbound Macadam Base**

The base shall consist of crushed building stone mechanically laid in one or more separate layers, so as to give a total compacted thickness as shown on the Drawings, or stated in the Bills of Quantities. The first layer shall be laid to produce a thickness of 75mm - 150mm after compaction as specified. Where a greater thickness than 150mm of base is specified the material shall be laid in separate layers each not less than 75mm or more than 150mm in thickness after compaction.

The stone shall have the following gradings:

| <u>Sieve Size</u> | <u>Percentages by<br/>Weight Passing</u> |
|-------------------|--|
| 50mm              | 100                                      |
| 38mm              | 95 - 100                                 |
| 20mm              | 60 - 80                                  |
| 10mm              | 40 - 60                                  |
| 5mm               | 25 - 40                                  |
| No. 7             | 15 - 30                                  |
| No. 25            | 8 - 22                                   |
| No. 200           | 0 - 2                                    |

Wet-sieving shall be used to determine the percentage passing the No. 200 B.S. Sieve.

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The graded aggregate shall be mixed with a percentage of water as directed by the Engineer depending on the type of aggregate specified within the range of 2 - 5 percent, in a mixer of a type approved by him.

The mixed material shall be protected from the weather during transit from the mixer to the site so as to prevent evaporation of moisture or further weeding of the material. It shall be laid by an approved paver or other approved plant.

Compacting shall be carried out immediately following the finisher by means of an 8 - 10 tonne roller or a vibratory tandem roller having a weight exceeding 3 tonnes. The surface of the base shall be uniformly rolled by not less than 10 passes of the roller to achieve a state of compaction such that not more than one dry density determination in 10 corresponds to an air content greater than 5 percent.

The final layer of stone shall, in addition, be compacted so as to provide a smooth and even surface free from irregularities or loose material and true to cross-section, line and level. The levels of the surface of the course shall be within the limits specified in Clause 17.17 for bases.

#### **17.11 Drybound Macadam Base**

The base shall consist of crushed building stone in one or more layers each not less than 75mm or more than 125mm in thickness after compaction so as to give the total compacted thickness shown on the Drawings or stated in the Bills of Quantities.

The aggregate shall consist of dry single sized crushed stone of 50mm or 38mm nominal size and shall be laid by spreader box or other means approved by the Engineer to an even depth which, after compaction, will produce the specified thickness of layer. After preliminary shaping with two passes of a 2.5 tonne roller or by other approved means, each layer shall be covered with a 25mm thick layer of dry crushed stone well graded from 5mm down to dust and approved by the Engineer. This fine material shall then be vibrated into the interstices of the single sized aggregate by means of an approved vibrating plate compactor or other approved vibratory plant.

Should hungry patches develop during compaction additional fine material as above shall be applied and compaction of the whole surface continued until no more can be taken in. Once this stage of compaction is reached the layer shall be rolled with an 8 - 10 tonne roller until movement of the surface ceases.

All excess fine material shall be removed on completion of compacting and before the next layer of material is placed. The final layer of stone shall in addition be compacted so as to provide a smooth and even surface free from irregularities or loose material and true to cross-section, line and level.

The levels of the surface of the course shall be within the limits specified in Clause 17.17 for bases.

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**17.12 Rock Filling Below Formation**

Rock used as filling below formation level should be generally hard rock or building stone but may contain up to 50% of soft weathered rock in pieces not exceeding 200mm minimum dimension.

**17.13 Bitumen Bound Base**

Bitumen bound base shall be constructed to the required thickness after compaction shown on the Drawings or stated in the Bills of Quantities in layers, each of approximately equal thickness, and between 50mm and 75mm compacted thickness.

Aggregates

The aggregate shall consist of hard clean durable crushed rock complying with the requirements of British Standard 1621 : Bitumen Macadam with Crushed Rock or Slag Aggregate, and subject to the approval of the Engineer.

Filler

If additional material passing the No. 200 sieve is required in the base material for compliance with the grading limits it shall consist of crushed rock, Portland cement, hydrated lime, or other material approved by the Engineer, and at least 75 percent of it shall pass a No. 200 sieve.

Binder

The binder shall be petroleum bitumen in accordance with Clause 22.33.

Composition of the Mixed Material

On analysis of the freshly mixed material its composition shall comply with Table 17.1

Table 17.1Bitumen Bound Base

| <u>BS Sieve Size</u> | <u>Percentages by Weight Passing</u> |
|----------------------|--------------------------------------|
| 50mm                 | 100                                  |
| 38mm                 | 95 - 100                             |
| 25mm                 | 75 - 90                              |
| 12mm                 | 60 - 75                              |
| 2mm                  | 30 - 45                              |
| No. 200              | 3 - 6                                |

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Binder content (as percentage by weight of total mixture) for 85 - 100 pen. to be 3.0 - 4.0.

Temperature of Mixed Material

The aggregate shall be surface dry, and shall be mixed within the range 110 degrees - 150 degrees centigrade so that the temperature as delivered to site and as rolled complies with Table 17.2

Table 17.2

| Binder                   | Delivery<br>Temp °c | Min. Rolling<br>Temp. °c |
|--------------------------|---------------------|--------------------------|
| 85 - 100<br>pen. bitumen | 100°-135°           | 85°                      |

Mixing

The materials, including any added filler, shall be weighed or measured into a mechanical mixer, and thoroughly mixed in such manner that all particles of the aggregate are completely and uniformly coated.

Transport

The mixed material shall be transported from the manufacturing plant to the Site in clean vehicles, protected against adverse weather. The use of dust, coated dust, oil or water on the interior of the vehicle to facilitate discharge of the mixed material is permissible, but the amount shall be kept to a minimum, and any excess shall be removed by tipping and brushing.

Laying

The mixed material shall be laid in accordance with Clause 18.15

Compaction and Surface Finish

As soon as rolling can be effected without causing undue displacement of the material and while it has at least the appropriate minimum temperature stated in Table 17.2, it shall be uniformly compacted by an 8 - 10 tonnes roller having a width of roll not less than 450mm in accordance with Clause 17.16.

**17.14 Rolled Asphalt Base**

Rolled asphalt base shall be constructed in base course material complying with British Standard 594 : Rolled Asphalt (Hot Process), in layers of between 50mm and 75mm compacted thickness, each of approximately equal thickness, so as to give the required total thickness of base.

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The levels of the surface of the course shall be within the limits specified in Clause 17.17 for bases.

#### **17.15 Surface of Base**

On completion of the base, and before any surfacing is laid, the finished surface shall be maintained free from potholes, ruts and undulations, irregularities, depressions, loose material or other defects, and shall comply with the requirements of Clause 17.17 for bases.

#### **17.16 Cement Stabilised Materials for Bases and Sub-bases.**

Materials to be stabilised may be naturally occurring soil, washed or processed granular material, crushed rock, an industrial waste product or

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### **A PART 18 ROADS - 2**

#### **CONSTRUCTION OF SURFACINGS**

#### **18.1 Concrete and Block Carriageways Construction**

##### Concrete, General

Two-lane concrete carriageways shall be constructed to their full width in one operation. Three-lane concrete carriageways of six lane roads shall be constructed in two widths, one slab comprising the nearside and centre lanes and the other the overtaking lane.

Where a concrete carriageway is constructed more than one slab wide, the first slab shall be constructed between two forms or a bankette and a single form as shown on the Drawings. The adjacent slab shall be constructed by replacing the flanged wheels on one side of the machine with flangeless wheels, which can travel on the surface of the concrete already completed, or on flat bottom section rails weighing at least 15 kg per metre, laid firmly on the completed concrete to support the flanged wheels. Concrete slabs or bankettes shall be at least 10 days old before they are subjected to the weight of the finishing machine and the transverse joints shall be temporarily sealed at the points where the wheels cross. The wheels shall not run nearer to the edge of the slab than 150mm. In suitable weather the Owner may permit a shorter period provided that adequate provision is made for protecting the surface of the slab on which the wheels of the finishing machine run..

Where flangeless wheels are used, the surface of the concrete slab over which they are to pass shall be thoroughly cleaned off and brushed immediately in front of the train to remove all mud and grit.

##### Thickness of Slabs

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The thickness at any point shall not vary more from that shown on the Drawings than is permissible by reason of the requirements of Clause 17.17 for rigid pavements.

#### Concrete Spreader

All concrete to be compacted by finishing machines shall be distributed with a hopper type spreader which shall have bottom gates to control the discharge of the concrete and which shall be approved by the Owner. Spreaders shall be capable of striking off concrete at the correct levels for the placing of reinforcement and for producing uniform surface.

The design of the spreader shall be sufficiently robust to ensure that the level at which the concrete is struck off is the same for both directions of travel of the hopper. Provision shall also be made for spreading to a differential surcharge across the width of the carriageway and for rapid adjustment of this differential.

Where hand-guided vibrating beams instead of finishing machines are used for compaction, the arrangements for placing and spreading concrete to a uniform surcharge shall be to the approval of the Owner.

To minimise pre-compaction, hand spreading will be permitted only where the concrete is deposited in heaps each not exceeding  $\frac{3}{4}$ cu. metre in size, and from a height not exceeding 750mm.

#### Waterproof Underlay

Waterproof underlay shall be used where shown on the Drawings. Where an overlap is necessary this shall be at least 150mm and water shall not be allowed to stand on the underlay which shall not be torn or damaged when the concrete is laid.

#### Setting, Checking and Striking of Side Forms

All side forms shall:

- a) Be so supported that they remain right at all times. They shall at any point be set in position at least 30 hours before concrete is placed between them. Forms shall be cleaned and oiled each time before they are used.
- a) Be bedded directly on a strip of concrete or mortar of thickness within the range 25-50mm as shown on the Drawings and of the width of the forms base so as to ensure the necessary complete rigidity and stability. The base, or where none is specified, the formation on the line of the forms shall be thoroughly compacted before the forms are set.

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a) Be as specified set to line and secured by using not less than three pins for each 3 metre section, one being placed at each side of every joint or as otherwise approved by the Owner. Form section shall be tightly jointed together by a locked joint free from play or movement in any direction.

For concrete to be compacted by vibrating screeds the setting of the forms shall be such as to provide the accuracy of finish specified in Clause 17.17 for concrete pavements.

If corrections are necessary as a result of checking for conformity with the alignments and levels shown on the Drawings such correction shall be made at least 20 hours before any concrete is placed between them - Where any form has been disturbed it shall be reset and checked. Side forms shall be removed not less than 12 hours after completion of the construction of the concrete road slabs or after such longer time as the Owner may require to avoid damage to arise. Care shall be taken that the concrete and any projecting time rods are not damaged in any way during the removal of the forms. Any concrete or mortar bed projecting above the level of the bottom of the slabs shall be removed at the same time and the sub-grade and base made good to the satisfaction of the Owner.

#### Quantity and Distribution of Steel Reinforcement

The quantity and distribution of reinforcement shall be as shown on the Drawings, with such modifications as may be necessary and approved by the Owner to suit manholes and surface boxes, junctions or slabs of different width or length. No loose rods or small pieces of fabric other than as provided for in the Specification shall be permitted in any portion of the work.

All reinforcement for carriageways and structural work shall when placed in position be free from loose rust, mill scale or other substances which might prevent proper adhesion to the concrete.

#### Placing Of Steel Reinforcement

Steel fabric reinforcement for carriageways shall be as specified. The reinforcement shall be so placed that after compaction of the concrete it is in the position shown on the Drawings and shall terminate 38mm from the edges of all joints in the concrete unless otherwise specified.

#### Treatment At Manholes

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Manholes shall be housed in separate small slabs, which shall be the size of the exterior of the shaft and shall be formed by casting the main slab against boxes of this size, made from framework and accurately placed vertically above the exterior of the shaft. This formwork shall be removed at the same time as the remainder of the formwork for the slab. Expansion joint filler 10mm wide shall be placed against the exposed edges of the slab, and reinforcing bars as specified in Clause 14.3 and if shown on the Drawings shall be placed accurately in position so as to give the required final cover, concrete being placed by hand in the space intervening between the slab and the manhole frame. The concrete shall then be compacted to the same density as that of the adjoining slab.

A groove shall be formed at the top of the joints with the surrounding slab and sealed, in accordance with the requirements of this Specification, the top edges of both slabs being rounded to radius of 6mm.

#### Joints In Concrete Carriageways, General Requirements

All joints shall be constructed by methods approved by the Owner, and with vertical faces. Grooves in the surface of the concrete over joints shall be sawn except that alternative methods of forming the grooves may be submitted and may be considered by the Owners in lieu of a sawn groove provided that the Contractor demonstrates to the Owners satisfaction that the surface finish so obtainable is within the appropriate tolerance permitted in Clause 17.17.

#### Transverse Joints

Expansion joints shall comprise preformed joint filler, dowel bars and supporting cradles. The joint filler shall be soft-wood, free from knots, or other approved material complying with the requirements of the relevant Clause and of sufficient rigidity to enable it to be satisfactorily installed in the joint and resist deformation during the passage of the concreting train. The joint filler together with the sawn groove, shall provide complete separation of adjacent slabs. The dowel-bars shall be provided at mid-depth of the slab, parallel to the finished surface and to the centre line of the road within a tolerance of  $\pm 5\text{mm}$  in 1 metre.

The supporting wire cradles shall be made from welded wire fabric having a 150mm square mesh and wires not smaller than 5.5mm diameter. The joint filler, dowel-bars and supporting cradles shall be wired together so as to form a rigid assembly which will not become distorted during handling on the Site or during concreting operations.

Dowel-bars shall be provided at one end with closely fitting sleeve 100mm long consisting of waterproof cardboard or other approved material. A loose plug equal in thickness to the width of the expansion joint, and consisting of cotton waste or a disc of expansion joint filler, shall be inserted within the sleeve at the end of the dowel-bar. The free half of each dowel shall be greased or painted with joint priming compound. The method of

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assembling and securing joints shall be approved by the Owner.

Where contraction joints are required these shall be formed by a groove sawn in the surface of the hardened concrete and an approved filler cast into the bottom of the slab, all as shown on the Drawings. The sawn groove shall be located vertically above the filler to within a tolerance of  $\pm 12\text{mm}$ . Dowel-bars shall be provided as for expansion joints except that a sleeve at one end is not required. The dowel-bars and timber fillet shall be supported by a wire cradle which shall be similar to that specified for expansion joints in respect of both materials and method of assembly. The tolerance on the alignment of dowel-bars in contraction joints shall be similar to that specified for expansion joints.

Construction joints shall be installed only under the conditions specified herein. They shall be formed by means of a drilled and split cross-form which shall allow the specified tie bars to be inserted and which shall permit the reinforcement to project through the joint for a distance of at least 375mm. On recommencing work the cross-form shall be removed and the vertical face of the concrete roughened. The next reinforcing mat shall completely overlap the projecting reinforcement.

Joints shall be formed in a straight line at right angles to the longitudinal axis of the carriageway except where this cannot be achieved as at road junctions and roundabouts and corresponding joints on either side of a longitudinal joint shall be in line with each other.

#### Sealing Of Joints

Any dust, grit, or temporary protective material shall first be removed from the grooves which shall, if necessary, be dried immediately prior to permanent sealing.

Unless otherwise directed by the Owner, the dried joints shall then be sealed with a compounding complying with this specification. Hot poured sealing compound shall be heated in an indirectly heated melter-pourer to a temperature within the recommended pouring range stated by the manufacturer and shall not be heated at this temperature for a period longer than the safe heating time stated by the manufacturer. The melter pourer shall be cleaned out at the end of each days work and material which has been once heated and allowed to cool shall not be re-heated or mixed with fresh material. Joints shall be filled so that the sealing compound is flush with the carriageway.

Where specified two-component cold-applied compound complying with US Federal Specification SS-S-170 shall be used in accordance with the recommendations of the manufacturer.

#### Compressive Strength Of Concrete

During the whole progress of concreting, test cubes shall be made in the

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manner described in Clause 14.6 Not more than 1 percent of cubes tested shall show a strength of less than 2.8 kg/sqmm at 28 days.

If rapid-hardening cement is used, reference in this Clause to 28 days, which is the period for ordinary Portland cement, shall be the period between concreting and opening to traffic.

Cubes shall be made each day in pairs at intervals, each pair being from a different batch of concrete. At the start of the work, and until such times as the Owner may order a reduction in the number of cubes required, six pairs shall be made each day, one of each pair for testing at 28 days for determination of the maximum permissible crushing strength and the other for testing at an early stage for the information of the Owner as to the quality of the stage for the information of the Owner as to the quality of the mix. When the first thirty results are available and for so long as the Owner is satisfied with the quality of the mix, he may reduce the number of cubes required to two pairs each day.

After it has been established that the specified crushing strength is being regularly obtained or exceeded and provided that the source of the quality of the materials remain constant, the Owner may waive the making of cubes for testing at an early stage. One cube from each of two batches of concrete shall be made each day for testing at 28 days.

If the minimum crushing strength of 2.8 kg/sq mm is not so attained the Contractor may without expense to the Employer, cut cores from locations selected by the Owner. Where this is done the strength of cores when tested in accordance with British Standard 1881: Methods of Testing Concrete, will be accepted as taking precedence over the cube strengths if not less than 2.1 kg/sq. mm at 28 days will be accepted for a core having a height/diameter ratio of 2.

The method which shall be adopted for correcting the strength of curves and cores for age is given in Appendix III. In order to check the depth of concrete laid, the state of compaction and the position of the reinforcement, the Owner may order cores to be cut.

The unit prices to be inserted by the Contractor in the Bills of Quantities shall include for preparing, cutting packing and transporting and testing cubes and cores required by the Owner. In addition, for cores the price shall include for all costs incurred in connection with drilling and making good to the satisfaction of the Owner.

#### Grading Of Aggregates

The grading of the aggregates shall be within the limits of British Standard 882: Concrete Aggregate from Natural Sources. Once the appropriate grading, including the grading zone of the fine aggregate, has been determined and approved, it shall not be varied without the permission of the Owner.

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#### Consistency Of The Mix

The cement and the coarse and fin aggregate shall be as specified in Section 14 of this specification. The maximum size of aggregate shall be either 20mm or 38mm as stated in the Bills of Quantities. The aggregate cement ratio shall not exceed 7:1 by weight. Rapid hardening Portland cement shall be used only with the approval of or on the direction of the Owner.

Concrete used in the construction of carriageways shall be of the strength specified below

#### Water Cement Ratio Of Concrete

The ratio of free water to cement for saturated surface-dry aggregate shall not exceed 0.55 by weight for all concrete in carriageways.

#### Limit Of Workability

The concrete shall be of suitable workability for full compaction to be obtained with the equipment used and without undue flow.

When the optimum value of the compacting factor has been determined and approved by the Owner for the mix and plant being used, that value shall be maintained within a tolerance of  $\pm 0.03$ .

#### Proportioning The Mix

Unless an integral number of bags of cement is used the cement shall be weighed. The proportions of sand and aggregate shall also be gauged by weight, allowance being made for the weight of moisture in the aggregate. Each size of fine and coarse aggregate shall be batched by weight, allowance being made for the weight of moisture aggregate. The weight of cement, the total weight of fine aggregate and the total weight of coarse aggregate shall each be within a tolerance of  $\pm 2$  percent of the weight specified.

#### Placing Concrete

When concreting of a slab has commenced no cessation of the work will be allowed until concreting of the slab is completed. In the event of mechanical breakdown or adverse weather, however, the Owner may permit the use of a construction joint.

The placing, compacting and finishing of the concrete shall be carried out as rapidly as possible and operations shall be so arranged that in any

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transverse vertical section the concrete shall be fully compacted throughout the whole depth and finished within 1.5 hours from the time for the completion of the mixing of the first batch of concrete in that section. The period shall be 1 hour whenever cement entering the mixer exceeds 66°C. in temperature.

Spreading And Compaction With A Vibrating Screed Of Reinforced Concrete Road Slabs

A layer of concrete shall be spread, struck off at the appropriate surcharge and compacted to a level that will ensure a top cover to the reinforcement of 65mm. the layer of reinforcement shall then be placed in position by hand, or by mechanical means approved by the Owner, and shall be covered with concrete, which shall be struck off at the appropriate surcharge and compacted true to line and level by means of a vibrating steel or hardwood screed. The compaction and surface finish shall be to the satisfaction of the Owner.

Spreading And Compaction With A Finishing Machine Or Vibrating Screed Of Concrete Slabs Or Haunches Used As Road Bases

In exceptional circumstances where reinforced concrete slab or haunches are used as road bases, the concrete shall be spread, struck off at the appropriate surcharge and compacted in a single layer by machine or by vibratory steel or hardwood screed and finished true to line and level to the required thickness. the compaction and surface finish shall be to the satisfaction of the Owner.

Curing Concrete

Immediately after the concrete surface has been finished the concrete shall be cured by treating with an approved resinous curing compound. It shall be mechanically sprayed on to the surface at the rate of 0.22 to 0.27 litre/sq metre using a fine spray. Care shall be taken to apply the compound uniformly. Any groove over a joint shall be protected from the entry of liquid curing compound. The concrete shall then be protected against the effects of sunshine and rain during setting by tents consisting of frames running on the rails and covered with an approved opaque and waterproof material of white colour on the outside and arranged so that it will shed any water clear of the fresh concrete. The concrete shall be covered by the tents for such period as the Owner shall direct which will be not less than 2

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hours.

Where white concrete road markings are used in the surface, these shall be cured by an approved curing compound which does not discolour the white concrete.

#### Traffic Over Finished Work

No vehicular traffic shall be allowed on the finished surface within 20 days of its completion where ordinary Portland cement is used or 10 days where rapid-hardening cement is used and until the joints have been permanently sealed unless otherwise authorised by the Owner.

Such authorisation will be given only when all joint grooves have been protected temporarily by a method approved by the Owner to prevent the ingress of foreign material.

#### Concrete Block Paving

Where required, areas to be paved with concrete blocks shall be in 210mm x 105mm x 80mm thick natural grey, coloured concrete paving blocks from approved manufacturers.

The paving blocks shall be laid as specified by the manufacturers. Generally the specification is as follows:-

- Provide a compacted murram sub-base with thickness shown in the drawing
- Spread a 50mm thick layer of well graded sand with not more than 10% sand retained on 5mm mesh sieve over the compacted murram base
- Lay the concrete paving blocks over bed of sand in a Herring-borne pattern and joint with mortar. The paving slabs shall be vibrated to their finished bedding level using three passes of a plate vibrator. The plate of the vibrator shall have a centrifugal force of 10N or 12N and plate area of 0.3M<sup>2</sup>.
- Brush sand over the surface of the paving blocks after the initial vibration
- Precast concrete kerbs and channels blocks shall be provided as shown in the drawing.

#### **18.2 Rolled Asphalt (Hot Process) Wearing Course**

Rolled Asphalt wearing course shall be made and laid (subject to the

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requirements of Clause 17.17 in respect of levels and tolerance of irregularity for wearing course) in accordance with British Standard 594 : Rolled Asphalt (Hot Process). Composition of the mixed material shall comply with Table 18.1, Mix Ref E. Temperature requirements shall be as detailed in Table 18.2, Mix Ref. E. The thickness after compaction shall be as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable, the rolled asphalt shall be laid using an approved paver.

Where a basecourse has been used as part of the surfacing, the wearing course shall be laid thereon as soon as practicable, care being taken that the latter is thoroughly clean. In any case the wearing course should be laid within 3 days of the laying of the base-course, unless the Owner allows otherwise, and no construction or other traffic shall be allowed on the base-course.

### **18.3 Dense Bitumen Macadam Wearing Course**

Dense bitumen macadam course shall be made and laid (subject to the requirements of Clause 17.17) in accordance with British Standard 1621 : Bitumen Macadam with Crushed Rock or Slag Aggregate. Composition of the mixed material shall comply with Table 18.1, mix Ref. A or C, all as shown on the Drawings or stated in the Bills of Quantities. Temperature requirements for the respective mixes shall be as detailed in Table 18.2, Mix Ref. A or C. The thickness after compaction shall be as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable, the bitumen macadam shall be laid using an approved paver. Coated chippings shall be applied if required.

The provisions of Clause 18.2 in respect of elapsed time between the laying of the base and wearing courses, and traffic, shall apply to this Clause.

The maximum mixing temperature for straight run bitumen of penetration 85 - 100 is 160°C. For other penetration bitumens it shall be as determined by the Owner.

### **18.4 Bitumen Macadam Wearing Course**

Bitumen macadam wearing course shall be made and laid (subject to the requirements of Clause 17.17) in accordance with British Standard 1621 : bitumen Macadam and Crushed Rock Slag Aggregate, using the appropriate Table and Section(s) thereof, other than those for Dense Bitumen Macadam, and nominal size of aggregate all as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable the bitumen macadam shall be laid using an approved paver. The maximum mixing temperature for straight run bitumen of penetration 85 - 100 is 155°C. For other penetration bitumens it shall be as determined by the Owner.

### **18.5 Cold Asphalt**

Cold asphalt wearing course shall be made and laid (subject to the

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requirements of Clause 17.17) in accordance with British Standard 1690 : Cold Asphalt. Composition of the mixed material shall comply with Table 18.1, Mix Ref. D. Temperature requirements shall be as detailed in Table 18.2, Mix Ref. D. It shall be laid in a single course ranging in thickness from 12mm to 25mm after compaction as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable asphalt shall be laid using an approved paver. Coated chippings shall be applied if required.

#### **18.6 Open Textured Bitumen Macadam Base-Course**

Open textured bitumen macadam base-course shall be made and laid (subject to the requirements of Clause 17.17) in accordance with British Standard 1621 : Bitumen Macadam with Crushed Rock or Slag Aggregate, using the appropriate Table and Section(s) thereof and nominal size of aggregate all as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable the bitumen macadam shall be laid using an approved paver.

The maximum mixing temperature for straight run bitumen of penetration 85 - 100 is 150°C. For other penetration bitumens it shall be as determined by the Owner.

#### **18.7 Dense Bitumen Macadam Base-Course**

Dense bitumen macadam base-course shall be made and laid (subject to the requirements of Clause 17.17) in accordance with British Standard 1621 : Bitumen Macadam with Crushed Rock or Slag Aggregate. Composition of the mixed material shall comply with Table 18.1, Mix Ref. A or B. Temperature requirements shall be as detailed in Table 18.2, Ref. A or B. The thickness after compaction shall be as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable the bitumen macadam shall be laid using an approved paver.

#### Compaction and Surface Finish

As soon as rolling can be effected without causing undue displacement of the material, and while the material is above the minimum temperatures stated in Table 18.2, it shall be uniformly compacted by an 8 - 10 tonne roller having a width of roll not less than 450mm in accordance with Clause 18.18.

#### **18.8 Blinding of Open Textured Bitumen Macadam Surfacing**

Where any course of bitumen macadam (other than dense bitumen macadam wearing course) is to be used as a permanent or temporary running surface it shall be blinded and/or surface dressed in accordance with Clause 18.13.

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The blinding shall be carried out as directed by the Owner, using approved bitumen coated grit not exceeding 3mm nominal size, or fine cold asphalt in accordance with British Standard 1690 : Cold Asphalt. The rate of coverage of either material shall be as directed by the Owner.

(Table 18.1 and Table 18.2 - next page)

#### **18.9 Rolled Asphalt Base-Course**

Rolled asphalt base-course shall be made and laid (subject to the requirements of Clause 18.15) in accordance with British Standard 594 : Rolled asphalt (Hot Process), and the thickness after compaction shall be as shown on the Drawings or stated in the Bills of Quantities. Except where impracticable, the rolled asphalt shall be laid using an approved paver.

#### **18.10 Marshall Asphalt (Asphaltic Concrete) Design Mix**

Asphaltic concrete shall be made and laid (subject to the requirements of Clause 17.17 in respect of levels and tolerance of irregularity for wearing course and base course) in accordance with British Standard 594. Temperature requirements shall be as detailed

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### **A PART 19 PAINTING**

#### **19.1 GENERAL**

The Contractor shall supply all paints, primers, varnishes, distemper, oil, etc. ready mixed in original sealed containers bearing the brand maker's name identifying the contents and giving directions for its proper use.

Painting materials shall be of the best quality products of recognised manufacturers, and shall be subject to the approval of the Architect. The quality of the finishing colours shall be capable of giving three years' minimum satisfactory performance under tropical conditions with high temperatures and humidity, and capable of withstanding temperatures of up to 60 Deg. C for long periods without colour change. Paints shall also be resistant to oils, acids and alkalis.

All surfaces to be painted shall be adequately cleaned and prepared to the satisfaction of the Engineer's Representative and shall be dry and free from any oils, greases, stains or other marks prior to being painted. The paint shall be well and evenly applied. Where sprays are used, markings of the edges of the painted area shall be carried out to provide a definite edge. Brushes and sprays shall be the correct size and type for the work being executed.

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For painting applied in several coats each coat shall be of a different shade or colour from the others. Each coat shall be allowed to dry thoroughly and sufficiently harden before the next coat is applied.

All colours shall be selected and approved by the Architect.

All hardware and furniture for doors and windows, together with any exposed electrical installation in walls shall be removed before painting commences. Upon completion of all paintwork all such hardware and furniture etc. shall be re-installed and left in good working order.

Floors shall be covered as protection against staining by paint.

### **19.2 BLOCKWORK**

Surfaces of concrete and rendering to be painted shall first be washed down and then allowed to dry. Any efflorescence present shall be thoroughly removed, and the areas so affected shall be given a coat of porous alkali-resistant primer. After any traces of grease have been removed the surfaces shall be painted with two coats of emulsion paint of the copolymer acrylic type. Any cracks in walls shall be cleaned, filled and puttied up then left to dry before application of paint.

Plastered surfaces shall be left as long as possible to dry out before being painted and after any efflorescence has ceased to form and has been removed, they shall be painted with two coats of an approved porous emulsion paint. When a gloss paint finish is called for, this coat or coats should only be applied over the emulsion paint after an interval of at least six months.

### **19.3 WOODWORK**

Woodwork to be painted shall be reasonably dry and its surfaces shall be cleaned and made smooth by the use of fine sand paper obliquely across the grain. The surfaces shall then be dusted off with a dusting brush.

Knots shall be sealed with knotting putty to BS 1336, unless very resinous, when they shall be cut out and the depressions filled after priming. The work shall then be thoroughly primed by brush with a priming paint to BS 5082 and 5358, end grain being given two coats. Cracks, holes and open joints shall be stopped with a mixture of equal parts of hard stopping and linseed oil putty.

Two coats of undercoating of approved manufacture shall be applied, the surfaces being rubbed down between coats. The surfaces on being dry shall then be painted with a final coat of gloss paint leaving no brush traces or irregularities.

Hardwood surfaces shall not be painted but shall instead be treated with

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two coats of linseed oil, of the clear boiled type. The linseed oil shall be well rubbed in, until the surface of the wood is clearly capable of not absorbing any further linseed oil. The second coat shall be applied between 8 and 12 days after the application of the first coat.

#### **19.4 METALWORK**

Galvanised metal surfaces shall first be treated with one coat of mordant solution which shall in due time be carefully washed off. The surface shall then be primed with a calcium plumbate primer. When this has dried thoroughly, the surfaces shall be given one coat of undercoat and one of a gloss finishing paint.

All metalwork shall be cleaned free from all rust, scales, grease, oils and any other surface stains, and shall be given one coat of an approved primer compatible with the metal to be painted, two applications of undercoat and one application of a gloss finishing coat.

The Contractor shall seek specific instructions to paint any non-ferrous metal surface.

All metalwork which has been supplied with bituminous protection or painting prior to despatch from the place of manufacture, such as pipes, tubes, valves, manhole covers, etcetera, shall have all exposed surfaces painted after erection.

The manufacturer's primer or coating shall be made good to the same standard and specification as supplied, and shall then be given two coats of paint as follows:-

- (a) Pipes, valves, manhole covers, and fittings, etc. exposed to view shall be painted with two coats of an approved "bitumastic aluminium paint" or similar approved paint.
- (b) Pipes, valves and fittings, etcetera in manholes, or chambers shall be painted with two coats of bitumastic paint or other approved paint.

#### **19.5 STRUCTURAL STEELWORK**

All surfaces to be painted shall be dried and cleansed free of all oil, grease, dirt or other extraneous matter by the use of white spirit, water or other appropriate cleaning material. Where surfaces have been damaged in transit they shall be made good to the same standard to which they were originally protected. Where as a result of such damage the metal has been bared, the paint immediately adjacent to the affected area shall be trimmed down, the affected area cleaned by wire brushing and the protective paint system restored, to provide a coat by coat lapping at the junction of the new and old paint systems. Where welding has been carried out on site, the welds shall be deslagged and wire brushed, and a protective paint system

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applied similar to that of the surrounding steel surfaces.

Where surfaces have been left unpainted and are to be connected by High strength friction grip bolts they shall be cleaned as specified in Specifications Section 20 and the contact surfaces brought together without further treatment. After bolting up, those surfaces which, being exposed are not protected, shall be wire brushed, primed and painted to the requirements of Specifications Section 20 to give a coat by coat lapping with adjoining painted surfaces.

Where surfaces have been left unpainted and are to be completely embedded in concrete they shall be cleaned of all oil, grease millscale or other extraneous matter immediately prior to concreting but shall otherwise be left untreated. Where steelwork is to be partially embedded in concrete the paint system shall be continued into the concrete for a distance equal to the least lateral dimension of the concrete forming the surround.

Unless otherwise specified the final coat of finishing paint Specifications Section 20 shall be applied to the immediate area of all steelwork connections after completion of erection. The main body of the steelwork, however, may be painted on site before erection, in which case any damage sustained during the course of erection shall be made good to the satisfaction of the Engineer. Painting will not be permitted when the temperature is below 3 C or when Relative Humidity is in excess of 85% or during wet weather.

#### **19.6 GALVANISING**

Galvanising shall be hot dip galvanising conforming to the requirements of BS 729. Galvanising shall be applied at the rate of 610 g/m<sup>2</sup> of surface area in a uniform covering of 100 microns thickness.

#### **19.7 FINISHING OFF**

All surfaces including window panes shall be left clean and doors and window hinges lubricated.

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**A 20.0 STRUCTURAL STEELWORK**

**20.1 General requirements**

Unless otherwise specified on the drawings or described in the specifications all steelwork shall comply with the requirements of BS 5950: 1990 The Use of Structural Steel in Buildings including the current addenda and BS 2853: 1957 The Design and Testing of Steel Overhead Runway Beams.

**20.2 Drawings**

Two copies of all shop drawings by the Contractor shall be submitted to the Engineer for his approval, but this approval shall in no way relieve the Contractor of his responsibility for the work under the Contract and the Contractor shall be fully responsible for ensuring that the details and workmanship result in correct assembly of the work. These drawings shall be submitted to the Engineer in sufficient time for any amendments to be incorporated in the works.

No variations or alterations from the approved shop drawings and this specification shall be permitted without the consent of the Engineer.

**20.3 Substitution of materials.**

No substitution of materials or section sizes shall be permitted without the express written permission of the Engineer. Notification of any substitutions offered by the Contractor shall be made within 28 days after the Contract.

**20.4 Testing laboratory**

Testing of materials is to be carried out at the Contractors expenses at a testing laboratory as approved by the Engineer.

**20.5 Inspection**

The Contractor shall give the Engineer ample notice of the beginning of the work so that inspection may be provided at the works where steelwork is being fabricated and at all places where materials for the work are being manufactured or from which they are being supplied. No material shall be manufactured or work done in the shop before the Engineer has been notified.

The Contractor shall supply the Engineer with copies of the ordering list of all materials which are obtained from rolling mills and shall also supply test sheets for such materials. List of materials to be obtained from stock with the name of the manufacturers shall be supplied. If test sheets for these materials are not available the Contractor may be required to dispatch sample pieces as directed to an approved laboratory. In this case the Contractor will be required to provide the sample pieces free of charge and

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pay the carriage to the testing works. The decision of the Engineers as to the acceptance or rejection of the materials in view of reports obtained from the testing works shall be final. The Contractor shall bear the costs of all tests materials and workmanship.

#### **20.6 Structural steel**

Unless otherwise stated structural mild steel shall comply in all respects with the requirements of BS 4360 Grade 43A or the equivalent grade in BS 7668-1994.

Hot rolled Hollow Sections shall comply with the requirements of BS 7668, 43C.

The dimensions of all structural rolled shapes except angles, the form, weight, tolerance etc., shall conform to the requirements of BS 4 Structural Steel Sections, part 1 Hot rolled Sections, including current addenda. Angles shall comply with BS EN 10056 Specification for Structural Steel Equal and Unequal Angles

Rectangular hollow sections shall conform to the requirements of BS EN 10210 Hot finished Structural Hollow Sections of non-alloy and fine grain Structural Steels.

Cold formed Zed purlins shall have a minimum yield stress of 200 N/mm<sup>2</sup>.

#### **20.7 Bolts, nuts and washers**

Mild steel black bolts and nuts shall conform to the requirements of BS 4190 Black Bolts and Nuts. Washers shall comply with the requirements of BS 4320 Black Washers.

#### **20.8 Electrodes**

Electrodes shall conform with the requirements of BS EN 499 Covered Electrodes for Manual Metal Arc Welding of Non-Alloy and Fine Grain Steels.

#### **20.9 Painting**

Primer: All members will be shop painted with one coat of Red Oxide Zinc Chromate primer; applied by brush employing a criss-cross technique of semi-matt finish and suitable to provide a key for subsequent paint coating.

Thinning, if required, shall be done with mineral turpentine up to 5 %.

Method of application, surface preparation, drying time as well as any other requirements shall be done in accordance with the manufacturers specification.

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Shop painting shall be done after fabrication and within the specified time after the metal surfaces have been cleaned. Any damage to the surface from weather or other exposures should be avoided. Shop contact surfaces shall not be painted unless specified. Unless otherwise specified, surfaces to be in contact only after erection shall be painted except where the paint may interfere with assembly.

Surfaces not to be in contact but which will be inaccessible after assembly shall receive three shop coats of the specified primer before assembly.

The areas of steel surfaces to be in contact with concrete shall not be painted.

Application of the primer shall be by brush employing a criss-cross technique. Paint shall be worked into all crevices and corners and all runs or sags shall be brushed out. There will be a minimum of brush marks left in the applied paints.

#### **FABRICATION**

##### **20.10 General**

Structural material, either plain or fabricated, shall be stored at the fabrication shop above the ground on platforms, skids or other supports. It shall be kept free from dirt, grease or other foreign matters and shall be protected as far as is practicable from corrosion.

Structural sections before being worked must be straight. If straightening is necessary, it shall be done by methods that will not injure the metal and sharp kinks and bends shall be cause of rejection of the material.

Finished members shall be true to line and free from twists, bends and open joints.

The ends of lacing bars shall be neatly rounded unless another form is required.

The bearings shall be accurately machined square with the axis so that the parts connected shall butt over the entire surface of contact.

Slab bases and base plates shall be in one solid piece accurately machined over bearing surfaces and shall be in effective contact over the whole areas. Unless otherwise instructed, a bearing face which is to be otherwise grouted directly to a concrete foundation need not be machined if the bearing surface is true and parallel to the machined upper face.

##### **20.11 Holes and bolted connections**

All holes drilled or punched shall be drilled (punched) so that before any

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reaming is done, a cylindrical pin 3mm in diameter than the nominal size may be entered normal to the surface of the member, without drifting, in at least 75% of the contiguous holes in the same plane. If requirement is not fulfilled, the badly drilled (punched) pieces will be rejected. If any hole will not pass a pin 5mm smaller in diameter than the nominal size of the hole, the steel member having such a hole will be rejected.

When all holes are reamed or drilled, 85% of the holes in any contiguous group shall, after reaming or drilling, show no offset greater than 1mm between adjacent thicknesses of metal.

The drilling done during assembling shall be only such as to bring the parts into position and not sufficient to enlarge the holes or distort the metal. If any hole must be enlarged to admit the metal, it must be reamed.

Holes shall be truly cylindrical. The size of holes shall be 2mm greater than the nominal diameter of the bolts, unless otherwise specified, and shall be made a driving fit with the bolts. Holes shall be at right angles to the surface of the metal so that both head and nut will bear squarely against the metal. Bolts shall be driven accurately into the holes without damaging the thread.

The heads and nuts shall be drawn tight against the work with a suitable wrench. Bolts heads shall be tapped with a hammer while nuts are being tightened. All bolts shall have threads neatly and accurately finished. If for any reason the bolts twist before drawing tight the hole shall be carefully reamed and the bolts replaced with a new bolt of diameter to fit properly in the hole.

Nuts shall closely fit the bolts so that they can only just be turned by hand. Bolts shall show two clear threads through the nuts and shall have one washer under the nuts unless otherwise specified. The threaded portions of the bolts shall not bear upon the thickness of the metals connected.

#### **20.12 Flame cutting**

The flame cutting procedure shall be carried-out to the satisfaction of the Engineer. The edges resulting from manual flame cutting shall be smoothed with special care. All re-entrant corners shall be filleted to a radius of at least 20mm. The cut lines shall not extend beyond the fillet and all cuttings shall follow closely the lines prescribed. No site flame cutting shall be done without the permission of the Engineer.

#### **20.13 Fitted Stiffeners**

Stiffening angles or plates to brackets, flanges, etc., shall be accurately ground to fit the profile of the stiffened member.

#### **20.14 Welding**

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Welding and welded work shall conform to the requirements of BS 5135: 1974 - Specification for Metal Arc Welding of Carbon and Carbon Manganese Steels, unless otherwise specified.

Surfaces to be welded shall be smooth, uniform and free from fins, tears and other defects which would adversely affect the quality of the weld. Surfaces to be welded shall also be free from loose scale, slag, rust, grease or other material that will prevent proper welding. Mill scale that withstands vigorous wire brushing may remain.

Welds shall not be in excess of those specified by design requirements and shop drawings nor shall their location be changed without approval of the Engineer.

The Contractor shall, before commencement of the fabrication, submit to the Engineer for his approval a list of qualified welders who shall carry out welding operations and shall certify that such welders have been doing satisfactory welding or similar structural work for at least 6 months immediately prior to the subject work. When required by the Engineer, the tests as laid down in the BS 4871 Specification shall be carried out. The test specimens shall be supplied and forwarded free of charge and all testing shall be paid for by the Contractor.

If, in the opinion of the Engineer, the microscopic inspection is not sufficient to establish the quality of the fully penetrated butt-welds, the Contractor shall provide for such welds to be inspected by X-ray, ultrasonic or any other method as directed by the Engineer. Any such inspections shall be paid for by the Contractor.

Any weld or member showing defective and sub-standard workmanship shall be rejected.

The parts to be joined by fillet welds shall be brought into as close contact as practicable and in no event shall be separated more than 2mm. If the separation is greater than 2mm the leg of the fillet weld shall be increased by the amount of separation.

The fit of joints which are not sealed by welds throughout their lengths shall be sufficiently close to exclude water after painting.

Abutting parts to be joined by butt welds shall be carefully aligned. Measurement of offset shall be based upon centre line of parts unless otherwise shown on the drawings. Unless otherwise described, all butt welds shall be fully penetrated butt welds made between fusion faces.

The general welding programme for shop and site welding including particulars of the preparation of fusions faces, the methods of making the welds and the types of electrodes shall be submitted to the Engineer for his approval before commencement of the Work.

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Members to be welded shall be brought into correct alignment and held firmly in position by bolts, clamps, struts or by tack-welds until welding has been completed. The use of jigs is preferable and adequate allowances shall be made for warpage and shrinkage. Tack-welds that are to be incorporated in the final welds shall be subject to the same quality requirements as the final welds. Such tack-welds shall be as small as practicable and shall be cleaned and fused thoroughly with the final weld.

Defective, cracked and broken tack-welds shall be removed before final welding.

Welding shall be carried out only under the direction and supervision of an experienced, competent and qualified supervisor. Unless otherwise agreed by the Engineer, a record shall be kept to enable major welds to be identified with the welders responsible for the work.

Before welding over previously deposited metal the slag shall be removed and the weld and adjacent base metal shall be brushed clean. This requirement shall apply not only to successive layers but also to successive beads and to the crater area when welding is resumed after any interruption.

All butt-welds, except when produced with the aid of backing-plates, shall have the root of the initial weld gouged, chipped or otherwise removed to sound metal before welding is started from the other side. Butt-welds made with the use of backing-plates of the same materials as the base metal shall have the weld metal thoroughly fused with the backing.

Butt-welds shall be extended beyond the edges of the parts to be joined by means of extensions providing a similar joint preparation and having a width not less than 30mm.

Each weld pass shall be terminated at least 20mm from the edge of the parts to be joined. Extensions shall be removed upon completion and cooling of the welds at the ends of the weld shall be made smooth and flush with the edges of the abutting parts.

Neither the depth of fusion nor the total width of fusion at any point in a single weld or weld pass shall exceed the width of the face of the weld or pass.

The welding current, the arc voltage, the speed of travel shall be such that each pass shall have complete fusion to adjacent base metal and weld metal and that there will be no overlap of undue undercutting.

When the welding current, arc, voltage, speed of travel and type of electrode to be used are established by a test, they shall be kept within the following limits of:

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- Welding current + or - 10%
- Arc Voltage + or - 7%
- Speed of travel + or - 10%

#### **20.15 Correction in Welding**

In lieu of the rejection of an entire piece of member containing welding which is unsatisfactory or indicates inferior workmanship, the Engineer may permit the Contractor to apply the corrective measures, and such approval shall be entirely at the Engineers discretion.

#### **20.16 Cambering**

Each truss shall be cambered as specified on the drawings. A camber diagram shall be submitted to the Engineer showing the camber at each panel point for each truss taken from actual measurement while the truss is assembled.

#### **20.17 Preparation of surfaces to receive paint**

Surfaces of metal to be painted shall be thoroughly cleaned by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances. Any of the following methods may be employed:

- Solvent cleaning (Method A)
- Power tool cleaning (Method B)
- Blast Cleaning to BS 7079 (Method C)
- Hand tool cleaning (Method D)

The blast cleaned surfaces shall be examined for any traces of oil, grease or smudges deposited in the cleaning operation. If present, they shall be removed with white spirit or other solvent.

Cleaned metal surfaces shall be protected within the following periods:

- Method A and D - 6 hours
- Method B and C - 4 hours

A sample of steel panel measuring not less than 150 x 150 x 6mm, cleaned using any of the specified cleaning methods approved by the Engineer, shall be adequately protected by sealed clean polythene wrapping and submitted to the Engineer for his approval before any work is put in hand. The approved sample shall then be retained by the Engineers Inspectors for comparison with the prepared steelwork.

Paint shall not be applied in fog, mist or rain, or when the relative humidity exceeds 75%. Paint shall not be applied to wet or damp surfaces.

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No thinner shall be added to the paint unless necessary for proper application.

The type of thinner shall comply with the paint specifications.

When the use of thinner is permissible, thinner shall be added to the paint during the mixing process. Painter shall not add thinner to paint after it has been thinned to the correct consistency.

All thinning shall only be done by the painting supervisor who shall be well acquainted with the paint specification and with the paint application.

Painted steel shall not be handled until the paint has dried-out except for necessary handling in turning for painting or stacking for drying. Paint which is damaged in handling, storing, loading and off-loading, transport and erection shall be scarpd off to bare metal with sand paper and touched up with the same kind of paint as was previously applied to the steel, by at least 50mm all round the affected parts.

#### **20.18 Assembly and erection**

Prior to erection, the Contractor shall check all levels, alignments and positions of the concrete bases and anchoring holes and bolts. Prior to the despatch of any steelwork to site, advice notes shall be sent to the Engineer.

The Contractor shall provide the falsework and all tools, machinery and appliances necessary for the expeditious handling of the work and shall do all work necessary to complete the structure as required by the Contract and in accordance with the drawings, specification and time schedule.

Anchor bolts, plates, etc. to be built into the foundation shall be fabricated and delivered to site sufficiently in advance of the other steelwork to enable the Contractor to build these items into the works in accordance with the schedule of the works.

Materials to be stored at site shall be placed on skids above the ground and shall be kept clean. Long members shall be supported on skids placed near enough together top prevent injury from deflection.

The parts shall be carefully and accurately assembled as shown on drawings and any match-marks shall be followed. The materials shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Hammering which will injure or distort the members shall not be done. Bearing surfaces and surfaces to be in permanent contact shall be cleaned before the members are assembled.

The straightening of plates and angles or other shapes shall be done by methods not likely to produce fracture or other injury. The metal shall not

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be heated unless permitted by the Engineer, in which case the heating shall not be to a higher temperature than that producing a dark cherry red colour. After heating, the metal shall be cooled as slowly as possible and the surface of the metal shall be carefully inspected for evidence of fracture.

Before starting the work of erection, the Contractor shall inform the Engineer fully as to the method of erection he proposes to use which shall all be subject to the approval of the Engineer. Such approval shall not be considered as relieving the Contractor of the responsibility for the works in full in accordance with the drawings, specification and time schedule.

The contractor shall agree with the Engineer the sequence of assembly and erection of the steelwork in order that this may conform with the programme of other structural operations. No work shall be done until such approval by the Engineer has been obtained.

Bolted site joints shall not be finally tightened until the structure is properly plumbed, levelled and aligned. No straining into position, after bolts have been finally tightened shall be allowed.

Immediately after final tightening of all bolted connections, all anchor holes and column bases shall be grouted to the satisfaction of the Engineer.

No bolts used shall be less than 12mm diameter and no weld less than 40mm in length. At least two bolts shall be used in connections transmitting loads unless otherwise indicated by the Engineer.

Field connections shall be as detailed i.e. bolted with high tensile or black bolts in drilled holes. Black bolts on punched holes will only be permitted for connections carrying a designed load or for connection to timber members. Trusses shall be carefully set out to the dimensions shown on the drawings. Where it is required that the trusses be cambered, such camber shall be provided by bending the bottom chord to the arc of a circle.

Notwithstanding any dimensions spacing of purlin cleats, the sub-contractor shall ensure that the purlin cleat spacing is satisfactory for the available stock lengths of roof sheeting. However, the Engineers approval must be obtained before alteration is made in purlin spacing or sheeting sizes.

Splices in portals and other frames shall be made where shown on the details.

#### **20.19 Zed purlins and Zed Rails**

Where any row of zed purlins are provided with diagonal tie bars, the purlins between which the tie bars are located together with the sag rods shall be erected first, ensuring that good level line is achieved. Remaining purlins and sag bars shall then be erected, and adjusted to the correct alignment from the previously aligned purlins.

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Where any row of zed purlins are provided with diagonal tie bars, the rails incorporating the tie bar and rail support angle(s) shall be erected first, ensuring that a good level line is achieved. Remaining rails and rail supports shall then be erected and adjusted to the correct alignment from the previously aligned rails.

Pressed or cold rolled steel purlins and girts shall be to the sizes indicated on the drawings and shall be formed from approved steel strip with a minimum yield strength of 185N/mm<sup>2</sup>. The sections shall be manufactured straight and free from twist, the tolerance away from straightness shall not be greater than 2mm for every 1.50m in length along any folded edge.

#### **20.20 Holding down bolts**

Holding down bolts shall be set in sleeves of steel tubes or similar approved and provided with steel washer plate cast in the concrete and standard nut and washer.

#### **20.21 Special prime painting**

All steelwork where indicated on the drawings shall be shop primed with one coat Epoxy Coal Tar Paint which dries by chemical curing. The paint shall be applied in accordance with the manufacturers instructions.

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**A PART 21 MASONRY AND BLOCKWORK**

**21.1 General**

All masonry work shall be constructed from building stone as specified in Part 4 or approved concrete blockwork as specified in Part 4.

For culvert headwalls and other small works, the stone shall, unless otherwise specified, be rough dressed. For walls, facing and other exposed works the stone shall, unless otherwise specified, be medium chisel-dressed.

**21.2 Workmanship**

All masonry work is to be constructed in compliance with BS 5.

The Contractor shall provide and use proper setting-out rods for all work.

Stones and blocks shall be well soaked before use and the tops of walls shall be kept wet as the work proceeds. The stones and blocks shall be properly bonded so that no vertical joint in a course is within 115mm of a joint in the previous course. Alternate courses of walling at angles and intersections shall be carried through the full thickness of the adjoining walls. All perpend, reveals and other angles of the walling shall be built strictly true and square.

The stones and blocks shall be bedded, jointed and pointed in mortar (1:3) in accordance with Part 4, with beds and joints 9mm thick flushed up and grouted solid as the work proceeds.

All work shall be cured in accordance with the relevant requirements of Part 4.

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**PART 22 MATERIALS****22.1 Standard Specification**

In cases where no particular Specification or Standard is given for any article or material to be used in the Contract the relevant Specification of the British Standards Institution or other relevant Standard shall apply unless otherwise stated.

The latest version of the standards referred to under this Section shall be used where applicable.

**22.2 Submission of Samples**

As soon as possible after the Contract has been awarded, the Contractor shall submit to the Engineer a list of the suppliers from whom he proposes to purchase the materials necessary for the execution of the Works. Each supplier must be willing to admit the Engineer, or his representative, to his premises during ordinary working hours for the purpose of obtaining samples of the materials in question. Alternatively, if desired by the Engineer, the Contractor shall deliver the samples of the materials to the Engineer's office, without charge. Samples of materials to be used as aggregates shall be taken and tested in accordance with the provisions of British Standard 812 : Sampling and Testing of Mineral Aggregates, Sands and Fillers. Subsequent supplies shall conform, within the specified tolerances, to the quality of approved samples.

The information regarding the names of the suppliers may be submitted at different times, as may be convenient, but not source of supply shall be changed without the Engineer's prior approval.

Samples of materials approved will be retained at the Engineer's office until the completion of the Contract. Samples may be tested to destruction.

All materials delivered to Site must be at least equal in all respects to approved samples.

**22.3 Cement**

Ordinary Portland Cement and rapid-hardening Portland cement shall comply with the relevant section of the Concrete Specification or other standards as given in Concrete Specification.

Sulphate resisting cement shall comply with the physical requirements of British Standard 12 : Portland Cement (Ordinary and Rapid-hardening)

High alumina cement shall comply with the requirements of British Standard 915 : High Alumina Cement.

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White or coloured cement shall be of approved quality and chemical composition, and shall comply with the physical requirements of British Standard 12 : Portland Cement (Ordinary and Rapid-hardening).

Cement shall be delivered in broken bags, barrels or by an approved bulk delivery vehicle.

Cement shall be stored in a dry weatherproof shed with a raised wooden floor, or in a silo, and shall be delivered in quantities sufficient to ensure that there is no suspension or interruption of the work of concreting at any time and if in sheds, each consignment shall be kept separate and distinct. Any cement which shall have become injuriously affected by damp or other causes shall at once be removed from the Site. Cement should be used in rotation.

The Contractor shall furnish as directed by the Engineer test certificates relating to the cement to be used on the work. Each certificate shall indicate that the sample has been tested and analysed by an approved laboratory and that it complies in all respects with the requirements of the appropriate Specification for the particular type of cement.

#### **22.4 Aggregates for Concrete**

Aggregates for concrete shall consist of naturally occurring material complying with the requirements of British Standard 882 : Concrete Aggregates from Natural Resources.

A certificate as to compliance with the British Standard shall be provided by the supplier to the aggregate. Tests for the determination of impurities in the sand shall be made once daily, until the Engineer is satisfied that the specified compressive strength is being regularly obtained, when, with his approval, such tests shall be made once weekly and at other times as directed by the Engineer.

The coarse aggregate, unless otherwise authorised by the Engineer, shall be delivered to the Site in separate sizes (two sizes when the maximum size is 20mm and three sizes when the maximum size is 38mm or more).

The Flakiness Index when determined by the sieve method described in British Standard 812 shall not exceed 20 for 65mm and 38mm aggregates nor shall it exceed 35 for 20mm and 10mm aggregates.

All aggregates brought upon the Site shall be kept free from contact with deleterious matter and in the case of aggregates passing a 5mm sieve they shall have been deposited in the site of mixing for not less than 16 hours before further use; aggregates of different sizes shall be stored in different hoppers, or different stacks on a clean hard surface and shall be separated from each other as approved by the Engineer.

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**22.5 Sand for Mortar**

- a) Sand for mortar shall be natural or crushed stone sand and shall be in accordance with BS 1198-1200 where applicable to sands for general purpose mortars.
- b) The source of the sand is to be approved by the Engineer.
- c) At the Works the sand is to be stored on a clean, hard surface.

All building stone shall be capable of withstanding when wet a crushing stress of 10N/mm<sup>2</sup>. The source of stone shall be approved by the Engineer and stone supplied therefrom shall be free from Magadi, overburden, mudstone, cracks, sandholes, veins, laminations or other imperfections. The stone shall be chisel-dressed into true rectangular blocks, with each surface even and at right angles to all adjoining surfaces, to the size specified. For exposed stonework the maximum permissible variation of any of the specified dimensions shall be 6mm provided that cut stone, supplied as 'rock face' stone may be hammer dressed on one face only, or on one face and one end, if in other respects it conforms with this Specification. Stones shorter than 375mm will not be accepted.

Unless the Engineer allows otherwise the Contractor shall at his own expense provide and dress four 100mm cubes of stone for testing.

The stone shall be sound when tested in accordance with BS 1438 : Media for Biological Percolating Filters, Appendix B, (Sodium Sulphate Soundless test) except that:

- i) The treatment shall be repeated for 10 cycles only; and
- ii) The second criterion of failure shall be amended to allow for a loss weight of not more than 20% of its original weight.

**22.7 Stone Dust**

Stone dust for blinding shall be blacktrap screened to the following grading:

Passing 10mm sieve 100%

Passing No. 4 sieve 85% - 100%

Passing No. 100 Sieve 5% - 25%

**22.8 Murram**

Murram shall be from an approved source quarried so as to exclude vegetable matter, loam, topsoil or clay. The California Bearing Ratio of the murram, as determined for a sample compacted to maximum density (as defined under BS 1377) and allowed to soak in water for four days, shall not be

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less than 30. This CBR is a guide to quality only and the compaction in the work will be judged by density.

#### **22.9 Water for Cement Treated Materials**

If water for the Works is not available from the Public Mains the Engineer's approval must be obtained regarding the source of supply and manner of its use. Water to be used with cement or lime shall be free from salt, oil, alkali, organic matter and other deleterious substances. If the water is required to be tested, this shall be done in accordance with the requirements of British Standard 3148 : Tests for Water for Making Concrete.

#### **22.10 Cement Mortar**

Cement mortar shall consist of proportions by volume as specified of Portland cement and natural sand or crushed natural stone or a combination of both as specified in British Standard 1198-1200 : Building Sands from Natural Sources. The constituent materials shall be accurately gauged and mixed in an approved manner.

Cement mortar shall be made in small quantities only as and when required, and any mortar which has begun to set or which has been mixed for a period of more than one hour shall be rejected.

#### **22.11 Hydrated Lime**

Hydrated Lime shall comply with British Standard 890 : Building Lime, and shall be Class B of the semi-hydrated type.

#### **22.12 Calcium Chloride**

Calcium Chloride shall be of a good industrial grade, and shall be obtained from an approved source.

#### **22.13 Lime Mortar**

Lime mortar shall consist of proportions by volume as specified of hydrated lime and natural sand or crushed natural stone or a combination of both as specified for cement mortar in clause 14.10. The constituent materials shall be accurately gauged and mixed in an approved manner.

#### **22.14 Cement-Lime Mortar**

Cement-lime mortar shall consist of Portland cement, hydrated lime and natural sand or crushed natural stone or a combination of both, as specified for cement mortar in Section 3 of this Specification. The constituent materials shall be accurately gauged and mixed by volume in an approved manner in the proportions specified.

Cement-lime mortar shall be made only in small quantities as and when

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required and any mortar which has begun to set or which has been mixed for a period of more than two hours shall be rejected.

#### **22.15 Cement Grout**

Cement grout shall consist of Portland cement and water mixed in the proportion of one part by volume of cement and one-and-a-half parts by volume of water. The grout shall be used within one hour of mixing.

#### **22.16 Concrete Building Blocks**

Precast concrete building blocks shall be in accordance with BS 2028 for Type A blocks from an approved source.

The faces of the blocks shall be smooth, true to shape with sharp arrises and be free from pitting and other surface defects.

#### **22.17 Building Stone**

Stone used for building shall be the best quality hard local stone obtained from approved quarries and shall be sound throughout so as to ring when struck and shall be free from all defects. Stones shall be dressed into true rectangular blocks with each surface even and at right angles to all adjoining surfaces and equal to samples submitted to and approved by the Engineer.

#### **22.18 Steel Reinforcement**

Mild steel and hot-rolled high tensile steel rod reinforcement for concrete shall be as specified in British Standards 4449, 4482 : Rolled Steel Bars and Hard Drawn Wire for Concrete Reinforcements. Cold-twisted high tensile bars shall be as specified in British Standard 4461 Metric Units : Cold-twisted Steel Bars for Concrete Reinforcement. Steel fabric reinforcement shall be as specified in British Standard 4483 : Steel Fabric for Concrete Reinforcement, and shall be delivered to the Site in mats, unless the Engineer allows otherwise, and free from any permanent set tending to make it curl under vibration.

The Contractor shall furnish the Engineer with copies of the manufacturer's certificates of test for the steel reinforcement to be supplied. The Engineer, may however, order independent tests to be made and any steel which does not comply in all respects with the appropriate foregoing Specifications will be rejected.

#### **22.19 Granular Material for Pipe Beddings**

Granular material for pipe beddings shall consist of well and evenly graded material such as gravel or broken stone, having a grading of 19mm to 5mm, free from fines, readily compactible and free draining.

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The grading of supplies will be frequently checked.

#### **22.20 Concrete Pipes and Specials**

Concrete pipes and specials shall comply with the requirements of British Standards 5591 . They shall carry the British Standards Institution registration certificate trade mark, or test certificates shall be furnished by the manufacturers.

#### **22.21 Concrete Porous Pipes**

Concrete porous pipes shall comply with the requirements of British Standard 5911: Concrete porous Pipes for Under-drainage.

#### **22.22 Concrete Drain Invert Blocks**

Precast concrete invert blocks shall be 150 mm dia. Half round manufactured to the detail Drawings supplied from concrete of the appropriate Class specified in Section 3 of this Specification using maximum 12mm size aggregate. If required, cube test certificates shall be supplied by the manufacturer.

#### **22.23 Concrete Slabs for Open Drains**

Precast concrete slabs for lining open drains shall be manufactured to the detail Drawings supplied from concrete of the appropriate Class as specified in Tables 14.2, 14.3 and 14.4 using maximum 12mm size aggregate. If required, cube test certificates shall be supplied by the manufacturers.

#### **22.24 Drainage Ditch Warning Posts**

Precast concrete drainage ditch warning posts shall be manufactured to the detail drawings from concrete of the appropriate Class specified in Section 3 of this Specification. If required, cube test certificates shall be supplied by the manufacturers.

#### **22.25 Agricultural Tiles and Pipes**

Agricultural tiles and pipes shall be best well burnt earthenware, true and circular in bore and with an externally flat bottom and plain ends suitable for laying with open or butt joints.

#### **22.26 Manhole Covers and Frames**

Manhole covers and frames shall be basically in accordance with the requirements of BS EN 124: Cast Manhole Covers, Road Gully Gratings and Frames for Drainage Purposes, except that manhole covers shall be constructed of mild steel, concrete filled, and set in grease/bitumen for water tightness in accordance with the Local Authoritys standard detail

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drawings.

Foulwater sewer manholes shall have triangular Grade 'A' heavy duty covers and frames. Circular manhole covers and frames shall be used on surface water sewer manholes, and also heavy duty covers where indicated on the drawings.

#### **22.27 Gully Gratings and Frames**

Gully gratings and frames shall be basically in accordance with the requirements of BS EN 124 497, nominal size 500mm x 350mm, except that the gully gratings shall be constructed of mild steel, concrete filled in accordance with the Local Authoritys standard detail Drawings.

#### **22.28 Precast Concrete Manholes and Inspection Chambers**

Precast concrete manholes and inspection chambers shall comply with the requirements of British Standard 5911: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies, and they carry the British Standard Institution registered certification trade mark, or test certificates shall be furnished by the manufacturers.

#### **22.29 Precast Concrete Gullies**

Precast concrete gullies shall be unreinforced and shall comply with the requirements of British Standard 5911: Concrete Cylindrical Pipes and Fittings including Manholes, Inspection Chambers and Street Gullies.

#### **22.30 Manhole Step-irons**

Step-irons of general-purpose type shall comply in all respects with BS 1247: Malleable Step Irons.

#### **22.31 Timber**

Timber shall be sound, well seasoned and entirely free from worm, beetle, warps, shakes, splits, and all forms of rot and deadwood. Where required, all timber shall be treated with creosote, as specified in British Standard 144: Coal Tar Creosote for the Preservation of Timber, or an alternative approved timber preservative.

#### **22.32 PVC Pipes**

uPVC pipes for potable water supply shall comply with BS 3505 and shall be of the type and class as specified in the Drawings or the Bills of Quantities. Where uPVC pipes are to be used for gravity sewerage, they shall be to BS 5481 for sizes DN200 and above and to BS 4660 for under sizes. Laying, jointing and testing shall be to BS 5955. The joint shall employ a flexible rubber ring which shall meet the requirements of BS 2494. Laying, jointing

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and testing shall generally be carried out according to the relevant Clauses of this Specification and all as per the manufacturer's instructions.

**22.33 Bitumen**

Bitumen shall unless otherwise stated be commercial straight run of penetration 85 - 100 as specified in Table IV - I of the Asphalt Handbook of the Asphalt Institute (USA).

**22.34 Cut-Back Bitumen**

Cut-back bitumen shall be of the specified grade stated in Tables IV - 2 to IV - 4 of the Asphalt Handbook of the Asphalt Institute (USA).

**22.35 Bitumen Emulsion**

Bitumen emulsion shall conform to the requirements of British Standard 434: Bitumen Road Emulsion.

**22.36 Aggregates for Surface Dressing**

Aggregates for surface dressing shall consist of hard, rough, clean crushed rock (blacktrap) as approved by the Engineer. It shall be of approved nominal size and quality and otherwise in conformity with the requirements of British Standard 63: Single Sized Road Stone and Chippings.

**22.37 Dry Rubble Backing**

Dry rubble backing shall consist of broken stone of approved quality, graded from 100mm to 50mm.

**22.38 Precast Concrete Kerbs, Channels, Edgings and Quadrants**

Unless otherwise stated in the Bills of Quantities precast concrete kerbs, channels and edgings shall comply with the requirements of British Standard 7263: Precast Concrete Kerbs, Channels, Edgings and Quadrants. The date of manufacture shall be marked on each unit. If required, test certificates shall be furnished by the manufacturers.

**22.39 Precast Concrete Flags**

Precast concrete flags/paving slabs shall comply with British Standard 7263: Precast concrete paving slabs shall be 600 x 600 x 50 mm thick, laid on a 50 mm thick sand bed. If required, test certificates shall be furnished by the manufacturers.

**22.40 Paint**

All priming, undercoating and finishing paints shall be in accordance with

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| A | <p>British Standard 2521/4: Ready Mixed Oil-based Priming Paints, or British Standard 2525/32 : Ready Mixed Oil-based Undercoating and Finishing Paints (Exterior Quality), as appropriate.</p> <p><b>PART 23 TESTING OF MATERIALS AND WORKMANSHIP</b></p> <p><b>23.1 Apparatus Required for Testing on Site</b></p> <p>Apparatus for Testing shall be provided by the Contractor, delivered to the Engineer on Site of the Works, kept in good repair throughout the Contract, and regarded as constructional plant. The following may be required: -</p> <p>a) A set of sieves complying with British Standard 410: Test Sieves, of the following nominal sizes:</p> <p>Fine mesh wire cloth 200, 100, 72, 52, 36, 25, 18, 14, 10, 7.</p> <p>Medium mesh wire cloth 3mm</p> <p>Perforated plate 5mm, 6mm 9mm, 12mm, 20mm, 38mm, 50mm, 65mm, 75mm.</p> <p>b) A suitable balance, a pycnometer and a stone or other approved apparatus for determining the moisture content of the aggregate. The methods of test shall be as described in Part Four of British Standard 812 : Sampling and Testing of Mineral Aggregates, Sands and Fillers.</p> <p>c) A 200ml. graduated cylinder in accordance with British Standard 604 : Graduated Measuring Cylinders, for use in the field settling test for clay and fine silt in aggregates.</p> <p>d) Two 0.34kg. graduated clear glass medicine bottles for use in the test for organic impurities in sand.</p> <p>e) Apparatus required for testing soils in accordance with British Standard 1377: Methods of Test for Soil Classification and Compaction, and British Standard 1924: Methods of Test for Stabilised Soils.</p> <p>f) Apparatus for testing concrete in accordance with British Standard 1881: Methods of Testing Concrete, Parts 1 to 7.</p> <p>g) A straight edge 3 metres long and measuring wedge or other approved apparatus for testing the accuracy of surfaces in accordance with Clause 23.4.</p> <p>h) Additional testing equipment as stated in the Bills of</p> <p style="text-align: right;"><b>Carried to Collection</b></p> <p>Section No. 2<br/>SECTION 2 - SPECIFICATIONS<br/>Bill No. 1<br/>SPECIFICATIONS<br/><b>177 - M&amp;A</b></p> | Item |  |  |
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Quantities.

### **23.2 Testing of soil**

During the progress of earthworks the Contractor shall provide facilities for, and all assistance required by, the Engineer in carrying out tests, taking samples of the soil and packing these into containers. When required the Contractor shall then send them to an approved laboratory for testing.

### **23.3 The Slump test**

This test is to be used during the progress of the work in order to give an indication of the consistency of the concrete. The consistency shall be recorded in terms of inches of subsidence of the specimen during the test, which shall be known as the slump. The respective slumps to be used for various portions of the structure shall be regulated in accordance with the instructions of the Engineer.

The test specimen shall be formed in a mould in the form of the frustum of a cone having the following internal dimensions: bottom diameter 200mm, top diameter 100mm, and height 300mm. The mould shall be constructed of metal of at least 1.5mm thickness and the top and bottom shall be open and at right angles to the axis of the cone. The mould shall have a smooth internal surface and shall be provided with suitable foot pieces and handles; and tamping rod shall be of steel 15mm diameter and 600mm long and rounded at one end.

The internal surface of the mould shall be thoroughly clean free from superfluous moisture and any set concrete before commencing the test. The mould shall be placed on a smooth, horizontal, rigid and non-absorbent surface, such as carefully levelled metal plate, the mould being firmly held in place while it is being filled.

The mould shall be filled in four layers, each approximately one quarter of the height of the mould. Each layer shall be tamped with 25 strokes of the rounded end of the tamping rod. The strikes shall be distributed in a uniform manner over the cross-section of the mould and for the second and subsequent layer shall penetrate into the underlying layer. The bottom layer shall be tamped through its depth. After the top layer has been rodded, the concrete shall be struck off level with a trowel or the tamping rod, so that the mould is exactly filled. Any mortar which may have leaked out between the mould and the base-plate shall be cleaned away. The mould shall be removed from the concrete immediately by raising it slowly and carefully in a vertical direction. This will allow the concrete to subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of the specimen being tested. The above operations shall be carried out at a place free from vibration or shock and within a period of two minutes after sampling. The slump measured shall be recorded to the nearest 6

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millimetres.

Any slump specimen which collapses or shears off laterally will give an incorrect result and if this occurs the test shall be repeated with another sample. If, in the repeat test, the specimen should shear the slump shall be measured and the fact that the specimen sheared shall be recorded.

#### **23.4 Measurement of Surface Irregularity**

The measurement of longitudinal surface irregularity shall be undertaken using a device comprising a straight edge 3 metres long, and a wedge marked to indicate the limiting tolerances. The device shall operate on a principle indicated in Fig 15.1. No objection would be raised to other designs embodying the same principle of measurement.

Irregularity shall be measured with the wedge indicated in Fig. 23.1 moved transversely at various points until it touches both the straight edge and the surface.

The permitted tolerances are summarised in Table 14.5 of clause 14.5.

#### **23.5 The Cube Test**

The method described applies to compression tests of concrete sampled during the progress of the Works. The standard size of specimens shall be 150mm cubes.

The moulds shall be of metal with inner faces accurately machined in order that the opposite sides of the specimen shall be plane and parallel. The mould shall be so constructed in such a manner as to facilitate the removal of the moulded specimen without damage. Each mould shall be provided with a metal base plate having a plane surface. The base plate shall be of such dimensions as to support the mould during the filling without leakage and it should be attached to the mould by springs or screws. The interior surface of the mould and the base-plate shall be thinly coated with mould oil before the concrete is placed in the mould.

The tamping bar shall be a steel bar weighing 1.8 kg. and 375mm long and shall have a ramming face 25mm square.

The sample of freshly mixed concrete shall be obtained by the method specified.

Cubes shall be clearly and indelibly marked for identification and records shall be kept of date of casting, mix, portion of structure and all other relevant details as required by the Engineer, and shall be delivered to the testing laboratory damp, well protected and in good condition.

The cubes shall be crushed by a Testing Laboratory approved by the

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Engineer and in accordance with BS 881. Provided that care is taken to ensure that no water is lost the material used for the slump tests may be re-mixed with the remainder of the mix before making the test cubes.

The concrete shall be filled into the mould in layers approximately 50mm deep and each layer shall be compacted with the tamping bar. For mixes of 38mm slump or less 35 strokes of the bar shall be given for each layer; for mixes of wetter consistency the number may be reduced to 25 strokes per layer. The cubes shall not be compacted by means of vibration

The cubes shall be stored on the Site in a place free from vibrations at a temperature between 5°C and 25°C, and under damp or wet conditions until required for testing.

### **23.6 Correction for Age of the Strengths of Concrete Cubes or Cores**

Correction for the age of cubes and cores made with normal Portland cement shall be made by taking the appropriate figure given in Table 1 to give the corresponding strength at 28 days.

Table 23.1

The table gives correction for cubes in kg./sq.mm to be deducted from the strength as determined by the test to give corresponding strength at 28 days. Correction for cores shall be three quarters of the tabulated figure.

#### Correction of the Strength of Cubes or Cores for Ages Greater than 28 Days

| <u>Age in Weeks</u> | <u>Correction to be Deducted</u> |
|---------------------|----------------------------------|
| 5                   | 0.11                             |
| 6                   | 0.21                             |
| 7                   | 0.32                             |
| 8                   | 0.42                             |
| 9                   | 0.53                             |
| 10                  | 0.60                             |
| 11                  | 0.67                             |
| 12                  | 0.74                             |
| 13                  | 0.81                             |
| 15                  | 0.91                             |
| 20                  | 1.05                             |
| 30                  | 1.27                             |
| 40 and over         | 1.41                             |

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**A PART 24 GENERAL SPECIFICATION  
FOR PLUMBING AND DRAINAGE SERVICES**

**24.1 MATERIALS AND WORKMANSHIP**

**GENERAL**

All materials shall be new and in accordance with the types and manufacture described herein and shown on the Contract Drawings. The Contractor shall not vary the materials stated without written approval of the Engineer.

The installations shall comply with all relevant statutory instruments and regulations current at the date of tender (unless stated otherwise in this specification or on any drawing) and in particular with the following:-

1. The Institution of Electrical Engineers (IEE) Regulations for the Electrical Equipment of Buildings.
2. Requirements as stated by the Chartered Institute of Building Services Engineers.
3. British Standards 5572: 1978 Sanitary Pipework, and BS 6700: 1987 Design, installation, testing and maintenance of services supplying water for domestic use within building and their curtilages.
4. The Water Supply Byelaws 1989 (2nd edition).
5. Local Safety Regulations.
6. Any special requirements of the local Authorities.
7. Republic of Kenya Building Code, including latest Amendments.

The equipment and installations shall comply with all other relevant British Standards and Codes of Practice. In the event of a discrepancy between this specification and any BS or BS 8301:1985 the Contractor shall notify the Engineer and wait for his ruling.

**STORAGE OF EQUIPMENT**

All stored items shall be maintained under a weatherproof and shady cover until ready for incorporating in the works. All equipment and materials shall be protected against corrosion and damage. Any equipment damaged, whether before, during or after installation shall be replaced with new equipment at the Contractor's cost.

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Tubes shall be delivered, stored and maintained in storage with any open ends efficiently plugged capped or sealed.

All fittings valves and sundry items shall be stored in clean bins or bagged and stowed in suitable racks.

Care must be taken to protect all P.V.C., MDPE or plastic type pipework and fittings from continuous sun rays. Pipe should be supported in suitable racks as indicated by the manufacturers to prevent distortion and over loading.

#### **NEW COMPONENTS**

All components shall be new and the Contractor may be required to produce certified invoices to verify this.

#### **PAINTING AND PROTECTION**

All materials and equipment shall be adequately protected against corrosion and damage in transit before leaving the manufacturers works.

#### **WORKMANSHIP**

All work shall be carried out in keeping with good engineering practice. The Contractor shall ensure that the work is carried out by competent employees who are skilled and experienced in the class of works involved.

#### **24.2. PIPEWORK**

##### **PIPEWORK GENERALLY**

All pipework shall be cut square made free from burrs and shall be thoroughly cleaned before erection. Open ends left during the erection of the pipework shall be sealed with proper plugs or caps. Rags and paper plugs will not be allowed.

The pipework shall follow the lines of walls and a gap of at least 30mm shall be maintained between pipes (or their lagging) and the wall. Particular care shall be taken that all pipework is erected and secured truly parallel with vertical surfaces and any adjacent services and that all vertical drops are plumb. To allow venting and draining down of the pipework, where possible horizontal pipes shall be fixed to a fall.

Joints will not be permitted within the thickness of any wall, floor or ceiling. Where pipes penetrate walls, floors or ceilings, they shall be accommodated in suitable pipe sleeves of the same material for the full thickness of the wall, floor and wall plates shall be used where visible. Where the pipework is insulated, the sleeve shall be of sufficient size to accommodate the full thickness of insulation.

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Connections between differing materials shall be detailed and submitted for approval, before work is commenced.

All pipework passing through floors and firewalls shall be caulked with an Intumescent caulking compound except where approved proprietary fire sleeves are used.

#### **Access**

Access to stacks and services should readily be available in particular where access points to stacks and service valves occur.

All pipes, water services and overflows shall be banded or labelled indicating the type of service in accordance with BS 1710. In addition flow direction arrows shall be provided.

#### **SOIL AND WASTE PIPEWORK**

Pipework in this section of the specification shall comply with BS 5255 for plastic wastepipes and fittings, and BS 4514 for uPVC soil and ventilation pipes and fittings, and BS 3868 for galvanised mild steel tube.

Jointing of mild steel soil and waste pipework shall be executed with either the cealfit joint to BS 2494 or mechanical joint to BS 3868.

Jointing of uPVC soil and waste pipework shall be executed incorporating either solvent cement jointing techniques or ringseal methods. The solvent cement jointing technique is the preferred method of jointing, but either system will be acceptable. The manufacturer's pipe jointing recommendations shall be fully complied with. Small diameter (>54mm dia) waste pipework shall not be solvent weld jointed.

The above ground soil and waste system of pipework shall be adequately supported in accordance with the manufacturers instructions. Additional support shall be provided at bends and junctions. Vertical pipework shall be fixed straight and plumb.

Discharge pipes shall be laid to falls as recommended in BS 5572, adequate provision for expansion shall be made.

Access fittings shall be provided in the locations indicated to ensure that all lengths of discharge pipework are accessible for maintenance purposes.

Every care shall be taken to protect the work and to prevent the entry of foreign matter into any part of the system during construction. Openings shall be sealed with purpose made plugs of metal, plastic or wood.

Special care shall be taken with pipe systems having flexible joints to prevent deflection of the joint after the pipework is assembled. Pipework shall not be allowed to carry any external load either during or after

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construction.

All access covers and cleaning eyes shall be fitted at the time of installation and be finally fixed and sealed after testing.

#### **HOT & COLD WATER PIPEWORK**

Hot and cold water pipework shall be installed as called for in the particular specification.

#### **Copper Pipework**

- (i) Pipework, straight runs and or lengths incorporating bends or sets shall be in copper to BS 2871, Part 1, Table x.
- (ii) All fittings shall be of DZR bronze or copper to BS 864, Part 2. Joints to Capillary fittings shall only be made with lead free solder.
- (iii) Copper pipework and fittings shall be as manufactured by IMF Yorkshire Ltd., P.O. Box 166, Leeds LSI IRD, England.

#### **Jointing of Pipework and Fittings**

Jointing of pipework and fittings shall be as follows:

- (i) Necessary connections or couplings that are used for joining pipework or fittings of differing materials shall be gunmetal to retard any electrolytic action.
- (ii) Any threads of fittings for male/female connections, etc., shall be made watertight with non-toxic PTFE tape or jointing compounds suitable for potable water.
- (iii) Flux used for soldering copper pipework with fittings shall be of the non-toxic water soluble type for potable water.
- (iv) All jointing materials shall be approved by the Local Authority.
- (v) Pipe joints shall be made with soldered capillary fittings and connections to equipment shall be with compression fittings manufactured in accordance with B.S. 864.
- (vi) Short copper connecting tubes between galvanised pipework and sanitary fittings shall not be used because of the risk of galvanic action.
- (vii) If, as may occur in certain circumstances, it is not possible to make the connections in any other way than by the use of copper tubing, then a p.v.c. connector shall be positioned between the galvanised pipe and the copper tube in order to prevent direct contact.

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### **Galvanised Pipework**

(i) Galvanised steel pipework shall be manufactured to comply in all respects with the standards described for mild steel in accordance with BS 1387.

Galvanising shall be carried out in accordance with the requirements of BS 1398 and BS 143 respectively.

### **Jointing of Pipework**

Jointing of galvanised pipe shall be by means of threaded joints sealed with PTFE tape or hemp and jointing compound such as "Boss White". All jointing materials should be of the non toxic type suitable for potable water systems.

All threads shall be cut full depth and all burrs removed before assembly. Threads shall be fully seated into the fitting.

Unions shall be fitted as necessary to allow dismantling of the pipework. At least one union shall be provided in each run of pipework. Unions must be fitted each side of all fixed equipment to allow removal of the equipment if necessary.

All damage to galvanising due to use of pipe wrenches shall be made good by applying one coat of zinc rich paint such as "Galvafroid" to the damaged area.

### **PVC Pipework**

(i) PVC pipework and fittings shall be manufactured to BS 3505 1968 Imperial sizes or ISO 727 Metric Sizes.

All threads shall be to BS 21 or ISO 7. Pressure rating shall be Class D or PN10 unless otherwise stated in the particular specification or on the drawings.

(ii) Jointing

Jointing shall be carried out using Solvent Cement conforming to BS 4346 Part 3 and in accordance with the pipe manufacturers recommendations.

All pipe end shall be cleaned using the manufacturers recommended cleaning agent before applying solvent cement.

All screw joints shall be made using PTFE tape.

(iii) Expansion loops shall be allowed for in all long runs in accordance with the manufacturers recommendations.

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### **PIPEWORK SUPPORTS (ALL SERVICES)**

Pipe hangers shall be generally as described in this specification but the Sub-Contractor shall prepare and submit for approval details of all hangers, supports and accessories before installation, as requested by the Engineer. The Sub-Contractor may use as a substitute for the following described hangers and supports, a proprietary system of pipe supports and brackets provided that full details and drawings are submitted to the Engineer prior to the installation being carried out.

Generally, all supports, brackets, anchors and fixing accessories shall be provided by the Sub-Contractor. For items which are required to be attached to the surface of the building fabric, the Sub-Contractor shall provide competent labour and suitable equipment for drilling and securing the support or fixing accessory.

Acceptance of such work shall be given by the Engineer prior to its commencement. Where individual fixings require the cutting of and building into the building structure, the Sub-Contractor shall arrange and shall provide all other labour required to ensure that such fixings are located and set to his requirements.

Copper tubing shall be carried exclusively from support members constructed from copper or copper alloy. uPVC piping shall be carried from steel, copper or copper alloy supporting members having plastic liners. Mild steel piping shall have steel supporting members actually in contact with the pipe.

Pipes shall be supported on either side of changes of direction and pipeline mounted equipment, at centres not exceeding the following:-

#### **Copper Pipes (Table X)**

| Pipe Diameter<br>(OD) (mm) | Horizontal<br>(mm) | Vertical<br>(mm) |
|----------------------------|--------------------|------------------|
| 15                         | 1200               | 1200             |
| 22                         | 1500               | 2400             |
| 28                         | 1800               | 2400             |
| 35                         | 2100               | 3000             |
| 42                         | 2400               | 3000             |
| 54                         | 2700               | 3000             |
| 67                         | 3000               | 3600             |

#### **Mild Steel (Medium and Heavy Weight) Including Galvanised**

| Pipe Diameter | Horizontal | Vertical |
|---------------|------------|----------|
|---------------|------------|----------|

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| (OD) (mm) | (mm) | (mm) |
|-----------|------|------|
|-----------|------|------|

|     |      |      |
|-----|------|------|
| 15  | 1800 | 2400 |
| 20  | 2100 | 2400 |
| 25  | 2400 | 3000 |
| 32  | 3000 | 3600 |
| 40  | 3000 | 3600 |
| 50  | 3300 | 4500 |
| 65  | 3300 | 4500 |
| 30  | 3300 | 4500 |
| 100 | 3600 | 4500 |

**P.V.C. Pipes**

| Pipe Diameter | Horizontal | Vertical |
|---------------|------------|----------|
| (OD) (mm)     | (m)        | (m)      |

|     |     |     |
|-----|-----|-----|
| 20  | 0.9 | 1.0 |
| 25  | 1.0 | 1.5 |
| 32  | 1.1 | 1.5 |
| 40  | 1.2 | 1.5 |
| 50  | 1.3 | 2.0 |
| 63  | 1.5 | 2.0 |
| 80  | 1.6 | 2.5 |
| 100 | 1.9 | 2.5 |
| 150 | 2.3 | 3.0 |

Multiple pipe supports of differing sizes shall be placed at intervals required for the smallest pipe concerned.

Exposed pipes of 50mm bore or less running through occupied areas of the building shall be supported in malleable iron or copper alloy Munsen ring pattern brackets screw fixed to the supporting wall with flanges screwed sockets and threaded steel or brass rods.

The type of pipe hanger, clip or hoop used shall be selected according to the application, special provision being made in instances where the piping or tubing is subject to axial movement due to thermal expansion and/or contraction.

Where the Sub-Contractor proposes to support pipes on cantilever runs of fabricated mild steel section, either bolted or welded, he shall submit full details of his proposals to the Engineer for acceptance.

In vertical riser ducts pipework shall be fixed to load bearing brackets attached to the slab at each floor level. Load bearing brackets shall be formed from 50 x 50 mm mild steel angle iron. Intermediate pipe supports shall be fixed to the supporting walls at intervals previously described.

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All steel shall be painted with one coat of red oxide paint prior to erection and shall be free from any rust. Following erection and installation of the piping, the brackets shall be cleaned of rust and painted with a further coat of red oxide paint, prior to the application of the final finished paintwork, by the Sub-Contractor.

#### **PIPEWORK SLEEVES**

Where pipework for hot and cold services pass through walls and floors they shall be sleeved as follows:-

- (i) All sleeves shall be a minimum of two diameters larger than the service pipe. Sleeves shall be of the same material as the service pipework they are installed for.
- (ii) Where sleeves are installed in walls they shall be of such length as required for the total wall thickness and finishes. Where exposed the sleeves shall be covered with a chrome plated face plate.

Where sleeves pass through floors they shall be 50mm greater than the total depth of the floor. The 50mm shall project above the floor for water proofing and finishes.

#### **VALVES AND METERS**

- (a) Draw-off Taps and Stop Valves (up to 50mm nominal Bore)

Draw-off taps and stop valves up to 50 mm nominal bore, unless otherwise stated or specified for attachment or connection to sanitary fittings shall be manufactured in accordance with the requirements of BS 1010.

- (b) Gate Valves

All gate valves 80mm nominal bore and above, other than those required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of BS 5163. All gate valves required for fitting to buried water mains shall be of cast iron construction in accordance with the requirements of BS 1218.

All gate valves up to and including 65mm nominal bore shall be of bronze construction DZR PN16 in accordance with the requirements of BS 5154. The pressure classification of all gate valves shall depend upon the pressure conditions pertaining to the Site of Works.

- (c) Check or Non-Return Valves

All check or non-return valves up to and including 65mm nominal bore shall be of the swing check type of bronze construction in accordance with BS

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All check or non-return valves 80mm nominal bore and above shall be of the swing check type of cast iron construction in accordance with the requirements of BS 5153.

The pressure classification of all check non-return valves shall depend on the pressure conditions pertaining to Site of the Works.

(d) Ball Valves

All ball valves for use in connection with hot and cold water services shall be of the "Underhay" pattern equilibrium type with copper ball complying to BS 1212, constructed from bronze or other corrosion resistant materials. These valves fall into three pressure classifications as follows:-

i) Low Pressure - 3.588 b maximum

ii) Medium Pressure - 7.725 b maximum

iii) High Pressure - 12.620 b maximum

The pressure classification required for each ball valve will be designated in the description of its associated equipment contained in the particular specification.

(e) Manually Operated Mixing Valves

Mixing valves for shower fittings and other appliances being provided under the Sub-Contract works shall be manufactured in accordance with the requirements of BS 1415 from bronze or other corrosion resistant materials.

(f) Potable water meters shall be to BS 5728.

**EXPANSION JOINTS AND ANCHORS**

Where practicable, cold pipework systems shall be arranged with sufficient bends and changes of direction to absorb pipe expansion providing that the pipe stresses are contained within the working limits prescribed in the relevant B.S. Specifications.

The Sub-Contractor shall pay particular care when supporting cast iron and asbestos cement pipes in order to ensure that settlement and building movement do not break the pipe joints.

Where piping anchors are supplied, they shall be fixed to the main structure only. Details of all anchor design proposals shall be submitted to the Architect or Engineer for approval before erection commences.

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The Sub-Contractor when arranging his piping shall ensure that no expansion movements are transmitted directly to connections and flanges on pumps or other items of plant.

The Sub-Contractor shall supply flexible joints to prevent vibrations and other movements being transmitted from pumps to the piping systems or vice versa.

## **INSTALLATION**

### **GENERAL**

Installation of all pipework, valves, fittings and equipment shall be carried out under adequate supervision from skilled staff to the relevant codes and standards as specified herein. The Sub-Contractor shall be responsible to the Contractor for ensuring that all builder's work associated with his piping installation is carried out in a satisfactory manner to the approval of the Services Engineer.

### **ABOVE GROUND INSTALLATION**

#### **(a) Water Services**

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 which shall be required are achieved without springing the pipe.

Where falls are not shown on the Contract Drawings or stated elsewhere in the Specification, pipework shall be installed parallel to the lines of the buildings and as close to the walls, ceilings, columns, etc., as it practicable.

All water systems shall be provided with sufficient drain points and automatic air vents to enable them to function correctly. Valves and other user equipment shall be installed with adequate access for operation and maintenance. Where valves and other operational equipment are unavoidably installed beyond normal reach or in such a position as to be difficult to reach from a short step ladder, extension spindles with floor or wall pedestals shall be provided.

Screwed piping, shall be installed with a sufficient number of unions to facilitate easy removal of valves and fittings, and to enable alterations of pipework to be carried out without the need to cut the pipe.

Full allowance shall be made for the expansion and contraction of pipework, precautions being taken to ensure that any forces produced by pipe movements not transmitted to valves, equipment or plant.

All screw joints to piping and fittings shall be made with P.T.F.E Tape.

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All hot water pipework shall be insulated with preformed fibre glass lagging to a thickness of 25mm where the pipe runs above a false ceiling or in areas where the ambient temperature is higher than normal with the result that pipe "sweating" due to condensation will cause nuisance.

All lagged pipes which run in a visible position after erections shall be given a canvas cover and prepared for painting as follows:-

- (i) Apply a coating of a suitable filler until the canvas weave disappears and allow to dry.
- (ii) Apply two undercoats of an approved paint and finish in suitable gloss enamel to colours approved by the Architect.

All lagging for cold and hot water pipes erected in crawlways, ducts and above false ceilings which, after erection are not visible from the corridors or rooms, shall be covered with a reinforced aluminium foil finish and banded in colours to be approved by the Architect Services Engineer.

In all respects, unless otherwise stated, the hot and cold water installation shall be carried out in accordance with the best standards of modern practice as described in C.P. 342 and C.P. 310 respectively, to the approval of the Engineer.

(b) Sanitary Services

Soil, waste, and vent pipe systems shall be installed in accordance with the best standards of modern practice as described in BS 5572 to the approval of the Services Engineer.

The Sub-Contractor shall be responsible for ensuring that all ground floor waste fittings are discharged to a gulley trap before passing to the sewer via a manhole.

The Sub-Contractor shall provide all necessary rodding and inspection facilities within the draining system in positions where easy accessibility is available.

Where a branch requires, rodding facilities in a position to which normal access is unobtainable, then that branch shall be extended so as to provide a suitable purpose made rodding eye in the nearest adjacent wall or floor to which easy access is available.

The vent stacks shall terminate above roof level and where stack passes through roof, a weather skirt shall be provided. The Sub-Contractor shall be responsible for sealing the roof after installation of the stacks.

The open end of each stack shall be fitted with a plastic coated, or galvanised steel, wire guard.

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Access for rodding and testing shall be provided at the foot of each stack.

(c) Sanitary Appliances

All sanitary appliances associated with the Sub-Contract Works shall be installed in accordance with the best standard of modern practice as described in BS 6465: Part 1:1984 to the approval of the Architect or Engineer.

**UNDERGROUND INSTALLATION**

(a) General

All underground water and drainage service installation shall be carried out in accordance with the best standard of modern practice as described in BS 6700:1987 301 and BS 8301:1985 310 respectively and the following clauses:

(b) Sequence of Operation for Underground Service Installation

(1) Setting Out

As described in BS Code of Practice 301 Clause 4.6.

(2) Excavation and Timbering

As described in BS Codes of Practice 301 Clause 4.7 and the following:

Excavation shall be made to such depths AND dimensions as may be required by the Services 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 Services Engineer.

Should the Sub-Contractor in error or without the instructions of the Services Engineer make any excavation below the required level of the pipe or bed, as the case may be, then he shall be required to refill such excavation to the correct levels with concrete 1:4:8 to 38 mm maximum aggregate size.

The Sub-Contractor's prices shall have included for excavating in all materials met with, for trimming bottoms to the necessary falls and for any extra excavation required for planking and strutting and working space.

The Sub-Contractor shall keep the whole of the trenches or other excavations free from water and shall execute such works and install such pumps as may be necessary to keep the excavations dry at all times.

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3) Laying of Concrete Beds or Other Supports for Pipes (if required)

As described in BS Code of Practice 301 Clause 4.8 and the following:

All drains below buildings and roads shall be encased in concrete 150 mm thick.

Concrete beds and supports shall be concrete 1:3:6 to 25mm maximum aggregate size.

4) Pipe Laying and Joints

Drain pipes shall be laid and jointed as described under BS Code of Practice 301 Clause 4.9.

Pitch fibre drain pipes shall be laid, jointed and cut in accordance with the requirements or the Note contained under Appendix C of BS 2760.

Water pipes shall be laid and jointed as described under BS Code of Practice 310, Clause 401, 402, 402 and 404.

5) Testing of Pipelines

After pipelines are connected up and joints have been sealed, the pipeline shall be tested before pipes are, if required haunched or surrounded in concrete.

Methods of testing and inspection shall be in accordance with Clause 16 of the Specification.

6) Concrete Bedding, Haunching and Surround

Concrete bedding, haunching and surround shall be provided as necessary or where called for by the Services Engineer in accordance with the requirements laid down in BS Code of Practice 301, Clause 4.8.

7) Backfilling

Backfilling of trenches, headings and around manholes shall be carried out in accordance with the methods described in BS Code of Practice 301, Clause 4.16.

8) Reinstatement of Surfaces

Following the final backfilling of all trenches, headings and manhole surrounds, the surface of the excavated areas shall be fully reinstated to the approval of the Architect.

Where excavations have been carried out in public highways or other areas

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not forming part of the Site, the Sub-Contractor shall be deemed to have allowed in his price for all charges associated with the temporary and final reinstatement requirements of the Local Highway Authority, whether this is carried out by the Sub-Contractor or by the Authority concerned.

No claims for extras in this respect will be accepted.

**EXTERNAL PIPE WORKS, PIPE LAYING, BACKFILLING AND ASSOCIATED ITEMS**

(i) Where pipes are laid below ground, the main contractor shall carry out all excavation, back-filling, removal of spoil, and making good as specified and as necessary to complete the installation to the satisfaction of the Engineer and Architect.

The Sub-Contractor shall include for providing all information and marking out as necessary in good time, so that the main Contractor can provide the necessary attendance.

All pipework shall be installed in a neat and workmanlike manner and properly aligned throughout.

Depth of crown of pipe shall not be less than 0.7m, land pipes shall be installed with due regard to clearances from other services installed in the area.

Pipes shall be so arranged as to avoid air pockets, and shall be graded such that the system will vent normally through the installation, or by other approved means.

Trenches shall be of ample dimensions to permit laying and jointing, and pipes shall be bedded in not less than 75mm of sand or other approved material. Filling of the same material shall be hand packed around the pipe a further 75mm above the crown of the pipe, and the whole shall be well rammed before completion of backfilling, consolidating and making good.

(ii) All drainage pipes shall be laid to continuous and even fall and in accordance with the manufacturers recommendations. The

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SECTION 2 - SPECIFICATIONS

Bill No. 1

SPECIFICATIONS

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**MODERN OFFICE BLOCK  
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Section No. 2

SECTION 2 - SPECIFICATIONS

Bill No. 1

SPECIFICATIONS

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KSHS

Section No. 2

SECTION 2 - SPECIFICATIONS

Bill No. 1

SPECIFICATIONS

**177 - M&A**

**SECTION NO. 3**

**BUILDING WORKS**

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**MODERN OFFICE BLOCK  
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|         | <b>BILL NO 2</b>   |          |       |        |
|         | <b>SUBSTRUCTURES (PROVISIONAL)</b>   |          |       |        |
|         | <b>Anti-termite treatment</b>  |          |       |        |
| A       | Chemical anti-termite treatment to subsoil or fillings : Dragnet 30% EC or equal and approved : provide ten year guarantee                             | m2       | 762   |        |
|         | <b>Excavations</b>   |          |       |        |
| B       | Excavate to reduce levels : in compacted murram/hardcore : not exceeding 1.5 metres deep   | m3       | 1,024 |        |
| C       | Ditto : exceeding 1.5 but not exceeding 3.0 m deep   | m3       | 341   |        |
| D       | Ditto : pits for column bases  | m3       | 113   |        |
|         | <b>Disposal of excavated materials</b>   |          |       |        |
| E       | Backfill and compact in layers : selected excavated material around foundations : placed in 200mm thick layers : well watered and compacted to 95% MDD | m3       | 786   |        |
| F       | Surplus excavated material : load and cart away from site  | m3       | 1,478 |        |
|         | <b>Disposal of water</b>   |          |       |        |
| G       | Keep excavations free from all water by baling, pumping or otherwise   | Item     |       |        |
|         | <b>Planking and strutting</b>  |          |       |        |
| H       | Planking and strutting to sides of all excavations : keep excavations free from all fallen materials   | Item     |       |        |
|         | <b>Hardcore filling</b>  |          |       |        |
| J       | Approved quality hardcore filling : levelled and compacted in 150 mm layers : to receive blinding : laid to falls and crossfalls                       | m3       | 692   |        |
|         | <b>Carried to Collection</b>   |          | KSHS  |        |
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|   |   |    |        |      |  |
|---|---|----|--------|------|--|
|   | <b>Quarry dust</b>  |    |        |      |  |
| A | 50mm Quarry blinding to surface of hardcore   | m2 | 768    |      |  |
|   | <b>Insitu concrete : mix 1:4:8 40mm aggregate</b>   |    |        |      |  |
| B | 50mm Blinding layer : under ramp foundations  | m2 | 673    |      |  |
| C | Ditto : under column bases  | m2 | 95     |      |  |
|   | <b>Insitu concrete : class C25 : vibrated : reinforced : ready mix</b>                            |    |        |      |  |
| D | Ramp foundation   | m3 | 808    |      |  |
| E | Column bases  | m3 | 69     |      |  |
| F | Columns   | m3 | 35     |      |  |
| G | 200 mm lift wall  | m2 | 23     |      |  |
| H | 150mm Thick floor bed   | m2 | 673    |      |  |
|   | <b>Mesh fabric reinforcement to BS 4483 : 200mm laps</b>  |    |        |      |  |
| J | Fabric mesh reference A142 weighing 2.22kg per square metre : in surface beds and hollow pot slab | m2 | 673    |      |  |
|   | <b>High yield square deformed bar reinforcement to BS 4449 (provisional)</b>                      |    |        |      |  |
| K | Assorted diameter bars  | kg | 80,000 |      |  |
|   | <b>Formwork : to</b>  |    |        |      |  |
| L | Sides : ramp foundation   | m2 | 121    |      |  |
| M | Sides : column bases  | m2 | 49     |      |  |
| N | Sides of columns  | m2 | 134    |      |  |
| P | Sides of lift walls   | m2 | 46     |      |  |
| Q | Vertical edge of bed : over 75 but not exceeding 150 mm wide                                      | m  | 121    |      |  |
|   | <b>Labours and sundries</b>   |    |        |      |  |
| R | One layer 500 gauge polythene sheet damp proof membrane : under beds : 300mm laps : sealed joints | m2 | 673    |      |  |
|   | <b>Carried to Collection</b>  |    |        | KSHS |  |
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**Existing Buildings**

- A Allow for ensuring all existing buildings are structurally stabilised during construction works with upto date technologies; ensure no cracks, subsiding or collapse; make good upon completion : to Engineers Approval.

Item

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SUBSTRUCTURES

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|         | <b>BILL NO 3</b>   |          |         |        |
|         | <b>REINFORCED CONCRETE SUPERSTRUCTURE</b>  |          |         |        |
|         | <b>Insitu concrete : class C25 : vibrated : reinforced : ready mix</b>   |          |         |        |
| A       | Columns  | m3       | 615     |        |
| B       | Beams  | m3       | 566     |        |
| C       | Ring beams   | m3       | 459     |        |
| D       | 200 mm lift wall   | m2       | 359     |        |
| E       | 150mm Thick suspended slab   | m2       | 4,072   |        |
|         | <b>Formwork to:</b>  |          |         |        |
| F       | Sides of columns   | m2       | 1,478   |        |
| G       | Sides and soffits of beams   | m2       | 1,981   |        |
| H       | Ditto Ring Beams   | m2       | 1,157   |        |
| J       | Sides of lift walls  | m2       | 717     |        |
| K       | Horizontal soffits : suspended slabs   | m2       | 4,072   |        |
| L       | Vertical edge of suspended slabs over 75 but not exceeding 150 mm high   | m        | 950     |        |
|         | <b>High yield square deformed bar reinforcement to BS 4449 (provisional)</b>   |          |         |        |
| M       | Assorted diameter bars   | kg       | 185,350 |        |
|         | <b>The following in framed structural steelwork : complete with and including all welded and bolted connections, cleats, plates etc : delivery to site and erection with and including one shop coat red oxide</b> |          |         |        |
| N       | 305 x 165 x 40 kg/m IB   | m        | 20      |        |
| P       | 150 x 150 x 4 mm SHS Columns : 18.12kg/m   | m        | 30      |        |
|         | <b>Carried to Collection</b>   |          | KSHS    |        |
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SECTION 3 - BUILDING WORKS

Bill No. 4

STAIRCASES

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STAIRCASES

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|         | <b>BILL NO 5</b>  |          |       |        |
|         | <b>ROOFING</b>  |          |       |        |
|         | <b>Insitu concrete : class C25 : vibrated : reinforced : ready mix</b>  |          |       |        |
| A       | Beams   | m3       | 54    |        |
| B       | Ring beams  | m3       | 64    |        |
| C       | 200 mm lift wall  | m2       | 17    |        |
| D       | Gutters   | m3       | 9     |        |
| E       | 165 mm Thick suspended slab   | m2       | 50    |        |
|         | <b>Formwork to:</b>   |          |       |        |
| F       | Sides and soffits of beams  | m2       | 73    |        |
| G       | Ditto Ring Beams  | m2       | 188   |        |
| H       | Sides of lift walls   | m2       | 33    |        |
| J       | Ditto gutters   | m2       | 97    |        |
| K       | Horizontal soffits : suspended slabs  | m2       | 50    |        |
| L       | Vertical edge of suspended slabs over 150 but not exceeding 225 mm high   | m        | 44    |        |
|         | <b>High yield square deformed bar reinforcement to BS 4449 (provisional)</b>  |          |       |        |
| M       | Assorted diameter bars  | kg       | 5,065 |        |
|         | <b>The following in framed structural steelwork : complete with and including all welded and bolted connections, cleats, plates etc : all weld 6mm thick; all bolts 16mm dia grade 8.8 : delivery to site and erection with and including one shop coat red oxide : to Engineers Specifications</b> |          |       |        |
| N       | 100 x 50 x 4 mm RHS Top Chord :8.7kg/m  | m        | 280   |        |
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|   |  |   |     |
|---|--|---|-----|
| A | 100 x 50 x 4 mm SHS Bottom Chord : :8.7kg/m                      | m | 166 |
| B | 100 x 50 x 4 mm SHS Rafters : :8.7kg/m                           | m | 31  |
| C | 60 x 40 x 4 mm RHS internals: 5.56kg/m                           | m | 322 |
| D | 65 x 65 x 6 mm bracings : 6.02kg/m                               | m | 127 |
| E | 152 x 50 x 19 x 2 mm Zed Purlins : 4.44kg/m : at 1000 mm centres | m | 654 |
| F | 150 x 150 x 4 mm SHS Beam : 18.12kg/m                            | m | 43  |

**Roof Covering**

**0.7 mm Thick pre painted IT5 metal roofing sheet: manufactured by Mabati Rolling Mills or other approved : fixed with and including J. bolts : at 250 mm centres: on purlins (ms) : fixed approximately : to Engineers detail**

|   |  |    |     |
|---|--|----|-----|
| G | Roofing coverings : to slopes not exceeding 45.0 degrees from horizontal | m2 | 590 |
| H | Hip capping to match, jointed as necessary                               | m  | 20  |

**Alucushion insulation foil or super sisalation foil type 420 or equal and approved : laid in accordance with manufacturer's printed instructions : including straining wires laid under roofing sheets : to**

|   |       |    |     |
|---|-------|----|-----|
| J | Roofs | m2 | 590 |
|---|-------|----|-----|

**Alucobond composite panels as supplied and installed by "Rosewood Special Products" or equal and approved : allow a PC rate of KShs 12,000 per m2 for purchasing as selected by the Architect : take delivery, transport to site, store and fix : on and including powder coated aluminium and mild steel framework : deflection controlled : colour to Architects approval : specialist framework profiles for precision accomodation of cladding panels, special joint cleats, provision for expansion/contraction in the system : with and including integrated pressed aluminium powder coated cills and lining around windows : allow end trims, backing cement and sand render to all surfaces as necessary : to Architects approval : (Add fixing costs to material purchase PC rate to make up rate) :**

|   |       |    |     |
|---|-------|----|-----|
| K | Roof. | m2 | 169 |
|---|-------|----|-----|

**Water proofing**

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ROOFING

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SECTION 3 - BUILDING WORKS

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ROOFING

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|         | <b>BILL NO 6</b>  |          |       |        |
|         | <b>WALLING &amp; CLADDING</b>   |          |       |        |
|         | <b>WALLING</b>  |          |       |        |
|         | <b>Selected and approved quality local stone or concrete blocks : load bearing (7N/mm<sup>2</sup>) block walling : bedded, jointed and pointed : in cement and sand (1:4) mortar</b>  |          |       |        |
| A       | 200 mm thick walling : Parapet  | m2       | 233   |        |
| B       | 200 mm thick walling : external   | m2       | 1,344 |        |
| C       | 200 mm Thick walling - internal   | m2       | 1,477 |        |
| D       | 150 mm Thick walling - internal   | m2       | 1,261 |        |
| E       | 100 mm Thick walling - internal   | m2       | 110   |        |
|         | <b>Precast concrete class 20/10 mm : fair faced as exposed surfaces</b>   |          |       |        |
| F       | 300 x 40 mm Thick coping, bedded, jointed and painted in cement mortar (1:4)  | m        | 34    |        |
|         | <b>CLADDING</b>   |          |       |        |
|         | <b>Alucobond composite panels as supplied and installed by "Rosewood Special Products" or equal and approved : allow a PC rate of KShs 12,000 per m2 for purchasing as selected by the Architect : take delivery, transport to site, store and fix : on and including powder coated aluminium and mild steel framework : deflection controlled : colour to Architects approval : specialist framework profiles for precision accomodation of cladding panels, special joint cleats, provision for expansion/contraction in the system : with and including integrated pressed aluminium powder coated cills and lining around windows : allow end trims, backing cement and sand render to all surfaces as necessary : to Architects approval : (Add fixing costs to material purchase PC rate to make up rate) :</b> |          |       |        |
| G       | Walls   | m2       | 387   |        |
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|         | WALLING & CLADDING  |          |       |        |
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|         | <b>BILL NO 7</b>  |          |       |        |
|         | <b>WINDOWS &amp; CURTAINWALLING</b>   |          |       |        |
|         | <b>Single course precast concrete sill with rounded edge : 10 mm drip : bedded, jointed and pointed in coloured cement mortar (1:4) : to Architect's detail</b>   |          |       |        |
| A       | 25 mm Thick x 250 mm wide : splay cutting stone wall  | m        | 506   |        |
|         | <b>Wrot hardwood : selected and kept clean</b>  |          |       |        |
| B       | 125 x 25 mm Window board : one labour : plugged and pellated  | m        | 506   |        |
| C       | 15 x 15 mm quadrant beading : one labour  | m        | 506   |        |
|         | <b>Natural anodized powder coated aluminium frame windows and curtain walling : 6 mm thick reflective structural glass : permavents : windows with propriety projected out type : friction stays : Supply and fix SAA ironmongery or equal and approved : corner glazing butt jointed with silicon sealant : fixed to block work or concrete : pointed externally in mastc sealer : to Architect's approval</b> |          |       |        |
| D       | Window overall size 900 mm diameter   | No       | 14    |        |
| E       | Window overall size 700 x 3000 mm high  | No       | 23    |        |
| F       | Window overall size 1500 x 1500 mm high   | No       | 55    |        |
| G       | Window overall size 2350 x 1500 mm high   | No       | 2     |        |
| H       | Curtainwalling  | m2       | 1,055 |        |
|         | <b>Prepare and apply three coats polyurethane clear varnish : on woodwork</b>   |          |       |        |
| J       | Window board  | m2       | 152   |        |
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|         | WINDOWS & CURTAINWALLING  |          |       |        |
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|---|---|-------|-------|------|--|
|   | <b>Mahogany Louvre doors : infilled with 50 x 25 mm fixed louvres at 50 mm centres</b>  |       |       |      |  |
| A | Door size 800 x 2400 mm high  | No    | 8     |      |  |
| B | Door size 1200 x 2400 mm high   | No    | 1     |      |  |
| C | Door size 1500 x 2400 mm high   | No    | 7     |      |  |
| D | Door size 2800 x 2400 mm high   | No    | 8     |      |  |
|   | <b>Door Frames</b>  |       |       |      |  |
|   | <b>Wrot Mahogany frames : selected and kept clean</b>   |       |       |      |  |
| E | 150 x 50 mm door frame : three labour : plugged and pellated  | m     | 1,621 |      |  |
| F | 50 x 25 mm Architrave : one labour  | m     | 1,621 |      |  |
| G | 25 x 25 mm Beading : one labour   | m     | 1,621 |      |  |
|   | <b>Supply and fix the following timber doors ironmongery as 'Union Assa Abbloy' or equal and approved : to Architect's approval</b> |       |       |      |  |
| H | 100 x 76 x 2 mm Brass hinges  | Pairs | 298.5 |      |  |
| J | Door Closers  | No    | 20    |      |  |
| K | 5 lever mortice lock  | No    | 189   |      |  |
| L | Indicator bolts   | No    | 42    |      |  |
| M | Ball bearing locks : Duct doors   | No    | 48    |      |  |
| N | Brass Door Handles  | Pairs | 189.0 |      |  |
| P | Coat & Hat hook   | No    | 45    |      |  |
| Q | Brass Quarter Door Stoppers   | No    | 199   |      |  |
| R | Male/Female symbol plates   | No    | 16    |      |  |
|   | <b>Prepare, prime and apply three coats two pack matt polyurethane clear finish : on woodwork</b>                                   |       |       |      |  |
| S | Timber Doors  | m2    | 1,081 |      |  |
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|   | DOORS   |       |       |      |  |
|   | <b>177 - M&amp;A</b>  |       |       |      |  |

**MODERN OFFICE BLOCK  
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A Frames : 75 - 150 mm girth

m

1,621

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DOORS

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|         | <b>BILL NO 9</b>   |          |       |        |
|         | <b>INTERNAL FINISHES</b>   |          |       |        |
|         | <b>FLOOR FINISHES</b>  |          |       |        |
|         | <b>Cement and sand (1:4) screeds : steel trowelled : on concrete</b>   |          |       |        |
| A       | 42 mm Thick screeds to receive Porcelain tiles   | m2       | 706   |        |
| B       | 38 mm Thick screeds to receive ceramic floor tiles   | m2       | 2,674 |        |
|         | <b>Non-slip Porcelain floor tiles as 'RAK' or equal and approved : allow a PC rate of KShs 2500 per m2 for purchasing as selected by the Architect : take delivery, transport to site, store and fix with approved adhesive, jointed and pointed in flexible epoxy grout or equal : to screeds bed (m.s) : (Add fixing costs to material purchase PC rate to make up rate) :</b> |          |       |        |
| C       | Floors   | m2       | 706   |        |
| D       | 150 mm High skirting   | m        | 551   |        |
|         | <b>Non-slip ceramic floor tiles : allow a PC rate of KShs 1,500 per m2 for purchase as selected by the Architect : take delivery, transport to site, store and fix with approved adhesive, jointed and pointed in flexible epoxy grout or equal : to screeds bed (m.s) (Add fixing costs to material purchase PC rate to make up rate) :</b>                                     |          |       |        |
| E       | Floors   | m2       | 2,674 |        |
| F       | 150 mm High skirting   | m        | 2,697 |        |
|         | <b>WALL FINISHES</b>   |          |       |        |
|         | <b>Cement and sand (1:4) plaster : steel trowelled finish on concrete or blockwork to :</b>  |          |       |        |
| G       | Walls  | m2       | 7,140 |        |
|         | <b>Carried to Collection</b>   |          | KSHS  |        |
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|         | INTERNAL FINISHES  |          |       |        |
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|   |  |    |       |      |  |
|---|--|----|-------|------|--|
| <b>Glazed ceramic wall tiles : allow a PC rate of KShs 1,500 per m2 for purchase as selected by the Architect : take delivery, transport to site, store and fix with approved adhesive, jointed and pointed in flexible epoxy grout or equal : (Add fixing costs to material purchase PC rate to make up rate) :</b>                            |  |    |       |      |  |
| A   | Walls : Washrooms & kitchenettes         | m2 | 924   |      |  |
| B   | 100 mm Wide plastic white corner strip   | m  | 513   |      |  |
| <b>Porcelain wall tiles as 'RAK' or equal and approved : allow a PC rate of KShs 2500 per m2 for purchasing as selected by the Architect : take delivery, transport to site, store and fix with approved adhesive, jointed and pointed in flexible epoxy grout or equal : (Add fixing costs to material purchase PC rate to make up rate) :</b> |  |    |       |      |  |
| C   | Walls : Lifts                            | m2 | 98    |      |  |
| <b>Prepare and apply three coats eggshell plastic emulsion paint as 'Crown' or equal and approved to :</b>  |  |    |       |      |  |
| D   | Walls                                    | m2 | 5,295 |      |  |
| <b>Specialist applied finish as "Wallmaster" or equal, colour and pattern as selected by the Architect applied as per manufacturer's recommendation by a specialist :</b>   |  |    |       |      |  |
| E   | Walls : 6th Floor                        | m2 | 823   |      |  |
| <b>CEILING FINISHES</b>   |  |    |       |      |  |
| <b>12 mm Thick lime plaster : steel trowelled on concrete or blockwork to :</b>   |  |    |       |      |  |
| F   | Concrete soffits                         | m2 | 2,926 |      |  |
| G   | Sides and soffits of beams               | m2 | 2,082 |      |  |
| <b>12 mm Suspended gypsum plasterboard ceiling : taper and fitted joints ; on and including proprietary pressed metal brander system, all bulkheads : cutting and trimming to light fittings</b>  |  |    |       |      |  |
| H   | Ceiling                                  | m2 | 565   |      |  |
| J   | 150 x 50 mm gypsum cornice : two labours | m  | 499   |      |  |
| <b>Carried to Collection</b>  |  |    |       |      |  |
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**Prepare and apply three coats plastic emulsion paint : to**

|   |   |    |       |
|---|---|----|-------|
| A | Soffits of plastered horizontal ceiling | m2 | 2,926 |
| B | Sides and soffits of beams              | m2 | 2,082 |
| C | Soffits of plasterboard ceiling         | m2 | 565   |
| D | Cornice not exceeding 100 mm girth      | m  | 499   |

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EXTERNAL FINISHES

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**Shelves**

**450 mm wide Shelves overall 2400 mm high comprising 5No shelves at 400 mm centres vertically; 25 mm thick MDF top; dividers; allow for chasing in blockwalls or concrete : to Architect's detail**

|   |                     |   |    |
|---|---------------------|---|----|
| A | Cleaner's Store     | m | 8  |
| B | Store Shelves       | m | 23 |
| C | File Room Shelves   | m | 42 |
| D | Typing Pool Shelves | m | 11 |

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BUILT-IN FITTINGS

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|         | <b>BUILDING WORKS</b>   |          |      |        |
|         | <b>BILL NO 12</b>   |          |      |        |
|         | <b>BOUNDARY WALL, GATE &amp; GATE HOUSE</b>   |          |      |        |
|         | <b>BOUNDARY WALLS</b>   |          |      |        |
|         | <b>Demolition</b>   |          |      |        |
| A       | Demolish existing front boundary wall overall 94m long x 2.4 m high : comprising 1200 mm high masonry wall and steel grille respectively, concrete or masonry columns; foundation walling, concrete footings and bases : carefully set aside for Client re-use. | m        | 94   |        |
| B       | Ditto : Gate overall size 5000 x 2400 mm high   | No       | 1    |        |
|         | <b>Excavation</b>   |          |      |        |
| C       | Excavate trenches for strip footing : not exceeding 1.5 m deep  | m3       | 85   |        |
|         | <b>Disposal of excavated materials</b>  |          |      |        |
| D       | Backfill and compact in layers : selected excavated material around foundations : placed in 200mm thick layers : well watered and compacted to 95% MDD  | m3       | 47   |        |
| E       | Surplus excavated material : load and cart away from site   | m3       | 38   |        |
|         | <b>Insitu concrete : class 15</b>   |          |      |        |
| F       | 50mm Blinding layer : under strip foundation footing  | m2       | 56   |        |
|         | <b>Insitu concrete : class C20 : vibrated : reinforced</b>  |          |      |        |
| G       | Strip footing   | m3       | 11   |        |
| H       | Columns - substructure  | m3       | 2    |        |
| J       | Ditto : superstructure  | m3       | 3    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
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|  |   |    |       |      |  |
|--|---|----|-------|------|--|
| <b>High yield square deformed bar reinforcement to BS 4449 (provisional)</b>   |   |    |       |      |  |
| A  | Assorted diameter bars  | kg | 1,200 |      |  |
| <b>Formwork : to</b>   |   |    |       |      |  |
| B  | Sides : strip footing   | m2 | 38    |      |  |
| C  | Sides of columns  | m2 | 93    |      |  |
| <b>Expansion joints : styropore : or equal approved</b>  |   |    |       |      |  |
| D  | 200mm x 20 mm thick expansion joint between columns   | m  | 5     |      |  |
| E  | 20 x 20mm Bituminous mastic or equal approved joint sealant   | m  | 5     |      |  |
| <b>Damp proof course</b>   |   |    |       |      |  |
| F  | 200mm wide Bituminous membrane or equal approved damp proof course  | m  | 94    |      |  |
| <b>Selected and approved stone load bearing (7.0N/mm<sup>2</sup>) walling : bedded, jointed and pointed in cement and sand (1:4) mortar</b>  |   |    |       |      |  |
| G  | 200mm Wall : medium dressed : substructure  | m2 | 106   |      |  |
| H  | 200mm Wall : machine cut : superstructure   | m2 | 106   |      |  |
| J  | 20 mm thick cement and sand 1:3 backing to receive applied finish (measured separately)   | m2 | 211   |      |  |
| <b>Prepare and apply three coats 1st grade exterior quality paint as 'Wallmaster' from an approved supplier : or equal and approved : to</b> |   |    |       |      |  |
| K  | Rendered surfaces   | m2 | 211   |      |  |
| <b>50 mm thick precast concrete coping : including hoisting to position : bedding, jointing and pointing in cement (1:4) mortar</b>          |   |    |       |      |  |
| L  | 300 mm wide on walls : trapezoidal shaped 200 mm high on one vertical edge other edge 75 mm high : twice throated   | m  | 88    |      |  |
| <b>Steel grilles : primed : painted three coats gloss</b>  |   |    |       |      |  |
| M  | 1200 mm High steel fence : 32 mm diameter solid steel upright members with sharp pointed ends at 115 mm centres : on 2 No. 75 x 10 mm solid horizontal rails : welded to steel columns (measured separately) : all joints welded, ground smooth | m  | 88    |      |  |
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| BOUNDARY WALL, GATE & GATE HOUSE   |   |    |       |      |  |
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|         | <b>BUILDING WORKS</b>  |          |      |        |
|         | <b>BILL NO 13</b>  |          |      |        |
|         | <b>PARKING</b>   |          |      |        |
|         | <b>Anti-termite treatment</b>  |          |      |        |
| A       | Chemical anti-termite treatment to subsoil or fillings : Dragnet 30% EC or equal and approved : provide ten year guarantee   | m2       | 400  |        |
|         | <b>Excavation : (Provisional)</b>  |          |      |        |
| B       | Excavate to reduce levels : not exceeding 1.5 metres deep  | m3       | 240  |        |
|         | <b>Disposal of excavated materials : (Provisional)</b>   |          |      |        |
| C       | Surplus excavated material : load and cart away from site  | m3       | 240  |        |
|         | <b>Surface treatment</b>   |          |      |        |
| D       | Grade and compact sub-grade or filling to falls, crossfalls and slopes : compact to 95% MDD (heavy duty compaction)  | m2       | 400  |        |
|         | <b>Imported Hardcore Filling</b>   |          |      |        |
| E       | Approved quality hardcore filling : levelled and compacted in 150 mm layers : to receive blinding : laid to falls and crossfalls   | m3       | 240  |        |
| F       | 50mm Quarry blinding to surface of hardcore  | m2       | 400  |        |
|         | <b>Paving</b>  |          |      |        |
|         | <b>60 mm Medium duty paving blocks 45N/mm<sup>2</sup> : 'Bamburi Blox' from Bamburi concrete Products or equal and approved : laid in herringbone pattern : on and including sand bed : on</b> |          |      |        |
| G       | Parking  | m2       | 400  |        |
|         | <b>Precast concrete units : class 25/20 vibrated : reinforced</b>  |          |      |        |
| H       | 100 mm x 125mm Channels : 225 x 100 mm (class 15) bed : formwork   | m        | 75   |        |
|         | <b>Carried Forward to Summary of Section No. 3</b>   |          | KSHS |        |
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|         | SECTION 3 - BUILDING WORKS   |          |      |        |
|         | Bill No. 13  |          |      |        |
|         | PARKING  |          |      |        |
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**SECTION NO. 4**

**ELECTRICAL INSTALLATIONS**

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|         | <b>SECTION NO 4</b>   |          |      |            |
|         | <b>BILL NO 1</b>  |          |      |            |
|         | <b>GROUND FLOOR LIGHTING &amp; POWER INSTALLATIONS</b>  |          |      |            |
|         | <b>GENERAL ITEMS</b>  |          |      |            |
| A       | Allow for the presentation of all required samples as per specifications and detailed in the Bills of Quantities.   | Item     |      |            |
| B       | Allow for preparation of working drawings - 2No. sets in A-2 size paper   | Item     |      |            |
| C       | Allow for preparation of 'As Installed' drawings in 'A3' size paper, operation and maintenance manuals, etc, all as specified in the attached specifications.   | Item     |      |            |
| D       | Allow for provisional sum to cater for disruption of Electrical services due to demolition of ground and first floors, this amount will be measured as is after demolition and making good of the said floors.  | Item     |      | 150,000 00 |
|         | <b>GROUND FLOOR LIGHTING INSTALLATIONS</b>  |          |      |            |
|         | <b>LIGHTING POINTS</b>  |          |      |            |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |            |
| E       | Lighting points wired in 3 x 1.5sq.mm PVC insulated single core copper wires drawn in 20 mm diameter heavy gauge PVC conduits saddled surface on the ceiling slab and ceiling soffit, one way switched complete with all accessories, but excluding switch and fitting. | No       | 94   |            |
|         | <b>LIGHTING ACCESSORIES</b>   |          |      |            |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |            |
| F       | 10 Amp moulded plate switches flush mounted on wall as MK Logic Plus WHI.   |          |      |            |
|         | i) One gang, One way  | No       | 28   |            |
| G       | ii) Two gang, One way   | No       | 2    |            |
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|  |  |    |    |      |  |
|--|--|----|----|------|--|
| A  | iii) Three gang, One way   | No | 1  |      |  |
| B  | iv)One gang, Two way   | No | 3  |      |  |
| <b>LIGHTING FITTINGS</b>   |  |    |    |      |  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |    |      |  |
| C  | 1x36w 1200mm HPF ceiling mounted fluorescent fitting c/w bright aluminium louvres as Thorn or equal and approved, type '4C'.   | No | 28 |      |  |
| D  | Vandal resistant fluorescent outdoor bulkhead fitting  |    |    |      |  |
|  | i) complete with 2x 28w PL lamp as Fitzgerald or equal and approved , type W2  | No | 12 |      |  |
| E  | (ii) 18w, 2D vandal resistant fitting for lift shaft- Type "TX"  | No | 2  |      |  |
| F  | Circular recessed 140 mm diameter LED downlighter with cast aluminium as MICROMARK-Type Z1 (daylight)  | No | 3  |      |  |
| G  | 75mm, 3W Circular recessed LED spotlight with cast aluminium as Philips c/w 240V driver-Type Z2 (daylight)   | No | 7  |      |  |
| H  | Circular surface mounted fitting with 20W PL lamp, opal glass diffuser, IP65 rated, as Massive manufacture or equal and approved, type "E2"  | No | 34 |      |  |
| J  | 1x36w 1200mm HPF ceiling mounted fluorescent batten fitting as Thorn cat No. PP136, or equal and approved, type '4'.   | m  | 2  |      |  |
| K  | Ceiling mounted self-contained emergency exit sign using LED lamps with white stove enamelled aluminium extrusion body with white polycarbonate end caps, suitable for interior use for maintained emergency applications of 3 hour duration. as OMS EMERGENCY 2811 - Type EXIT. | No | 6  |      |  |
| L  | Allow for re-use of the existing lighting system where applicable:-<br>(i) carefully disconnect the lighting fittings and accessories<br>(ii) Clean them and re-install in the new spaces as directed on site.   |    |    | Item |  |
| M  | 20W, Wall mounted polycarbonate luminaire with vandal proof grille as Thorn or Equivalent, Type E  | No | 9  |      |  |
| N  | 5-Light brass chandelier with 5X40w G9 compact mains halogen lamps Micromark MM75007 or approved equivalent, suspended from the ceiling, type 'C1'.  | No | 2  |      |  |
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**GROUND FLOOR SMALL POWER INSTALLATIONS**

**Supply, install, set to work, test and commission the following as specified and described below :-**

|  |   |    |    |
|--|---|----|----|
| A  | 13 Amp ringmain socket outlet points (raw power)wired in 3 x 2.5sq mm PVC single core copper cables drawn in metal trunking (measured elsewhere) and 25mm H/G PVC conduits concealed in wall and floor slab complete with all accessories but excluding the socket outlet plate | No | 38 |
| B  | 15 Amp non standard switched moulded socket outlet plates with neon indicator, mounted flush on wall for tea and milk urn as MK Logic Plus WHI.   | No | 2  |
| C  | Water fountain circuit, SP wired in 3 x 4.0 sq. mm PVC single core copper cables drawn in trunking and/or 20mm H/V PVC conduits concealed in the walls and floor slab complete with all accessories, but excluding the 20 Amp double pole switch                                | No | 2  |
| D  | Fire/Security Alarm Control Panel circuit wired in 3 x 2.5 sq. mm PVC SC copper cables drawn in trunking and/or 20mm H/V PVC conduits concealed in the walls and floor slab complete with all accessories, but excluding the 20 Amp double pole switch                          | No | 2  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |   |    |    |
| E  | 13Amp standard twin switched moulded socket outlet plates with neon indicator, mounted flush on trunking and wall as MK Logic Plus WHI.   | No | 26 |
| F  | 20 Amp double pole switch with neon indicator for various points as indicated:-   |    |    |
|  | - "Fountain" .  | No | 7  |
| G  | - "F/SACP" .  | No | 1  |
| H  | - "HAND DRIER" .  | No | 2  |
| J  | - TV socket outlet plate.   | No | 2  |
| K  | - Air Conditioner units - "A/C" .   | No | 2  |
| L  | 12-Way TPN distribution board, DB-A and DB-B surface mounted on wall at the passage for raw power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (raw power)  | No | 2  |

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SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

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|   |  |    |     |      |  |
|---|--|----|-----|------|--|
| A   | Miniature circuit breaker (MCBs) for the above distribution board as detailed below:-  |    |     |      |  |
|   | (i) 10A SP MCB   | No | 16  |      |  |
| B   | (ii) 20A SP MCB  | No | 14  |      |  |
| C   | (iii) 30A SP MCB   | No | 8   |      |  |
| D   | (iv) 45A TP MCB  | No | 2   |      |  |
| E   | (v) TP Blanking plates   | No | 8   |      |  |
| F   | 4-Way TPN distribution board, DB-A1 and DB-B1 surface mounted on wall at the passage for UPS power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (UPS power)  | No | 2   |      |  |
| G   | Miniature circuit breaker (MCBs), Type "Curve-D" for the above distribution board as detailed below:-  |    |     |      |  |
|   | (i) 20A SP MCB   | No | 8   |      |  |
| H   | (ii) TP Blanking plates  | No | 6   |      |  |
| J   | Submains comprising 4 core 25.0mm sq. PVC SWA PVC cable tray from existing LV Board, to DB A and DB B as indicated in drawing c/w lugs, ties and all necessary accessories.  | m  | 160 |      |  |
| K   | Submains comprising 4 core 10.0mm sq. PVC SWA PVC cable tray from UPS DB D at the server room to DB A1, DB A2, as shown in the drawings c/w lugs, ties and all necessary accessories.  | m  | 160 |      |  |
| L   | 75mm wide perforated cable tray for laying above cable.  | m  | 140 |      |  |
| M   | Photocell, complete with protective fuse, fixing support and associated wiring to above contactors, mounted on the wall  | No | 1   |      |  |
| N   | 200x50mm off-white powder coated 3-compartment rectangular screw type trunking in 18 SWG steel sheets complete with cover, end-caps, screws, etc. mounted under the desk to approval and as manufactured by Power Technics Ltd, Nairobi. | m  | 120 |      |  |
| P   | 200x50mm off white -powder coated factory made corner bends, for the above trunking.   | No | 6   |      |  |
| Q   | 25mm diameter heavy gauge PVC conduit links concealed in walls and floor slab, complete with couplers, threads, etc.   | m  | 100 |      |  |
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GROUND FLOOR LIGHTING & POWER INSTALLATIONS

**177 - M&A**

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

| Item No |   | Quantity | Rate | Amount |
|---------|---|----------|------|--------|
|         | <b>SECTION NO 4</b>   |          |      |        |
|         | <b>BILL NO 2</b>  |          |      |        |
|         | <b>FIRST FLOOR LIGHTING &amp; POWER INSTALLATIONS</b>   |          |      |        |
|         | <b>FIRST FLOOR LIGHTING INSTALLATIONS</b>   |          |      |        |
|         | <b>LIGHTING POINTS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| A       | Lighting points wired in 3 x 1.5sq.mm PVC insulated single core copper wires drawn in 20 mm diameter heavy gauge PVC conduits saddled surface on the ceiling slab and ceiling soffit ,one way switched complete with all accessories, but excluding switch and fitting. | No       | 86   |        |
|         | <b>LIGHTING ACCESSORIES</b>   |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| B       | 10 Amp moulded plate switches flush mounted on wall as MK Logic Plus WHI.   |          |      |        |
|         | i) One gang, One way  | No       | 26   |        |
| C       | ii) Two gang, One way   | No       | 3    |        |
| D       | iii) Three gang, One way  | No       | 2    |        |
| E       | iv)One gang, Two way  | No       | 3    |        |
|         | <b>LIGHTING FITTINGS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| F       | 1x36w 1200mm HPF ceiling mounted fluorescent fitting c/w bright aluminium louvres as Thorn or equal and approved, type '4C'.  | No       | 33   |        |
| G       | Single arm light pendant with glass lamp shade complete with 8 watts energy saving lamp as EGLO-Type P1   | No       | 2    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
|         | Bill No. 2  |          |      |        |
|         | FIRST FLOOR LIGHTING & POWER INSTALLATIONS  |          |      |        |
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**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

|   |   |    |    |      |  |
|---|---|----|----|------|--|
|   | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |    |    |      |  |
| A   | 13Amp standard twin switched moulded socket outlet plates with neon indicator, mounted flush on trunking and wall as MK Logic Plus WHI.   | No | 36 |      |  |
| B   | 20 Amp double pole switch with neon indicator for various points as indicated:-   |    |    |      |  |
|   | - "F/SACP" .  | No | 1  |      |  |
| C   | - "HAND DRIER" .  | No | 1  |      |  |
| D   | - TV socket outlet plate.   | No | 1  |      |  |
| E   | - Air Conditioner units - "A/C" .   | No | 1  |      |  |
| F   | 12-Way TPN distribution board, DB-A and DB-B surface mounted on wall at the passage for raw power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (raw power)  | No | 2  |      |  |
| G   | <b>Miniature circuit breaker (MCBs) for the above distribution board as detailed below:-</b>  |    |    |      |  |
|   | (i) 10A SP MCB  | No | 16 |      |  |
| H   | (ii) 20A SP MCB   | No | 14 |      |  |
| J   | (iii) 30A SP MCB  | No | 8  |      |  |
| K   | (iv) 45A TP MCB   | No | 2  |      |  |
| L   | (v) TP Blanking plates  | No | 8  |      |  |
| M   | 4-Way TPN distribution board, DB-A1 and DB-B1 surface mounted on wall at the passage for UPS power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (UPS power) | No | 2  |      |  |
| N   | Miniature circuit breaker (MCBs), Type "Curve-D" for the above distribution board as detailed below:-   |    |    |      |  |
|   | (i) 20A SP MCB  | No | 8  |      |  |
| P   | (ii) TP Blanking plates   | No | 6  |      |  |
| <b>Carried to Collection</b>                      |   |    |    | KSHS |  |
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| FIRST FLOOR LIGHTING & POWER INSTALLATIONS        |   |    |    |      |  |
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**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

Section No. 4

SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

Bill No. 2

FIRST FLOOR LIGHTING & POWER INSTALLATIONS

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Section No. 4

SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

Bill No. 2

FIRST FLOOR LIGHTING & POWER INSTALLATIONS

**177 - M&A**

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|         | <b>SECTION NO 4</b>   |          |      |        |
|         | <b>BILL NO 3</b>  |          |      |        |
|         | <b>SECOND FLOOR LIGHTING &amp; POWER INSTALLATIONS</b>  |          |      |        |
|         | <b>SECOND FLOOR LIGHTING INSTALLATIONS</b>  |          |      |        |
|         | <b>LIGHTING POINTS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| A       | Lighting points wired in 3 x 1.5sq.mm PVC insulated single core copper wires drawn in 20 mm diameter heavy gauge PVC conduits saddled surface on the ceiling slab and ceiling soffit ,one way switched complete with all accessories, but excluding switch and fitting. | No       | 86   |        |
|         | <b>LIGHTING ACCESSORIES</b>   |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| B       | 10 Amp moulded plate switches flush mounted on wall as MK Logic Plus WHI.   |          |      |        |
|         | i) One gang, One way  | No       | 26   |        |
| C       | ii) Two gang, One way   | No       | 3    |        |
| D       | iii) Three gang, One way  | No       | 2    |        |
| E       | iv)One gang, Two way  | No       | 3    |        |
|         | <b>LIGHTING FITTINGS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| F       | 1x36w 1200mm HPF ceiling mounted fluorescent fitting c/w bright aluminium louvres as Thorn or equal and approved, type '4C'.  | No       | 2    |        |
| G       | Single arm light pendant with glass lamp shade complete with 8 watts energy saving lamp as EGLO-Type P1   | No       | 2    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
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|         | SECOND FLOOR LIGHTING & POWER INSTALLATIONS   |          |      |        |
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|  |  |    |    |
|--|--|----|----|
| A  | (ii) 18w, 2D vandal resistant fitting for lift shaft- Type "TX"  | No | 2  |
| B  | Circular recessed 140 mm diameter LED downlighter with cast aluminium as MICROMARK-Type Z1 (daylight)  | No | 3  |
| C  | 75mm, 3W Circular recessed LED spotlight with cast aluminium as Philips c/w 240V driver-Type Z2 (daylight)   | No | 26 |
| D  | Circular surface mounted fitting with 20W PL lamp, opal glass diffuser, IP65 rated, as Massive manufacture or equal and approved, type "E2"  | No | 12 |
| E  | 1x36w 1200mm HPF ceiling mounted fluorescent batten fitting as Thorn cat No. PP136, or equal and approved, type '4'.   | m  | 2  |
| F  | 1x18w, 1200mm HPF wall mounted fluorescent batten fitting with diffuser as Thorn, or equal and approved mounted above wash hand basin, type 'SL'.  | m  | 6  |
| G  | Ceiling mounted self-contained emergency exit sign using LED lamps with white stove enamelled aluminium extrusion body with white polycarbonate end caps, suitable for interior use for maintained emergency applications of 3 hour duration. as OMS EMERGENCY 2811 - Type EXIT. | No | 2  |
| H  | 2x58w 1500mm HPF fluorescent fitting complete with heat resistant diffuser as Thorn or equal and approved ceiling mounted at the kitchen area, type 'D4'.  | No | 7  |
| J  | 1-Light ceiling mounted Pendant c/w 30W LED bulb, as Philips or equal and approved, type "P2"  | No | 12 |
| K  | 2-Light ceiling mounted Pendant c/w 30W LED bulb, as Philips or equal and approved, type "P3"  | No | 7  |
| <b>SECOND FLOOR SMALL POWER INSTALLATIONS</b>  |  |    |    |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |    |
| L  | 13 Amp ringmain socket outlet points (raw power)wired in 3 x 2.5sq mm PVC single core copper cables drawn in metal trunking (measured elsewhere) and 25mm H/G PVC conduits concealed in wall and floor slab complete with all accessories but excluding the socket outlet plate  | No | 34 |
| M  | 15 Amp non standard switched moulded socket outlet plates with neon indicator, mounted flush on wall for tea and milk urn as MK Logic Plus WHI.  | No | 2  |
| <b>Carried to Collection</b>   |  |    |    |
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|   |   |    |    |      |  |
|---|---|----|----|------|--|
| A   | Copper cables drawn in trunking and/or 20mm H/V PVC conduits concealed in the walls and floor slab complete with all accessories, but excluding the 20 Amp double pole switch   | No | 4  |      |  |
|   | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |    |    |      |  |
| B   | Kitchen equipment circuit wired in 3 x 6.0sq. mm PVC SC copper cables drawn in 25mm heavy gauge PVC conduits concealed in the walls and floor slab complete with all accessories but excluding the cooker control unit and control unit.    | No | 8  |      |  |
| C   | Coffe maker circuit wired in 3 x 6.0sq. mm PVC single core copper cables drawn in 25mm heavy gauge PVC conduits concealed in the walls and floor slab complete with all accessories but excluding the cooker control unit and control unit. | No | 6  |      |  |
| D   | 32A single phase isolator for kitchen equipments as KATKO   | No | 6  |      |  |
| E   | 15A 3-Pin female wall mounted socket for above as MK  | No | 6  |      |  |
| F   | 13Amp standard twin switched moulded socket outlet plates with neon indicator, mounted flush on trunking and wall as MK Logic Plus WHI.   | No | 26 |      |  |
| G   | 20 Amp double pole switch with neon indicator for various points as indicated:-   |    |    |      |  |
|   | - "F/SACP" .  | No | 4  |      |  |
| H   | - "HAND DRIER" .  | No | 4  |      |  |
| J   | - TV socket outlet plate.   | No | 4  |      |  |
| K   | - Mechanical ventilation  | No | 4  |      |  |
| L   | 12-Way TPN distribution board, DB-A and DB-B surface mounted on wall at the passage for raw power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (raw power)  | No | 2  |      |  |
| M   | <b>Miniature circuit breaker (MCBs) for the above distribution board as detailed below:-</b>  |    |    |      |  |
|   | (i) 10A SP MCB  | No | 16 |      |  |
| N   | (ii) 20A SP MCB   | No | 14 |      |  |
| P   | (iii) 30A SP MCB  | No | 8  |      |  |
| <b>Carried to Collection</b>                      |   |    |    | KSHS |  |
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SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

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SECOND FLOOR LIGHTING & POWER INSTALLATIONS

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SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

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SECOND FLOOR LIGHTING & POWER INSTALLATIONS

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|         | <b>BILL NO 4</b>  |          |      |        |
|         | <b>TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING &amp; POWER INSTALLATIONS</b>   |          |      |        |
|         | <b>TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING INSTALLATIONS</b>   |          |      |        |
|         | <b>LIGHTING POINTS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| A       | Lighting points wired in 3 x 1.5sq.mm PVC insulated single core copper wires drawn in 20 mm diameter heavy gauge PVC conduits saddled surface on the ceiling slab and ceiling soffit ,one way switched complete with all accessories, but excluding switch and fitting. | No       | 204  |        |
|         | <b>LIGHTING ACCESSORIES</b>   |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| B       | 10 Amp moulded plate switches flush mounted on wall as MK Logic Plus WHI.   |          |      |        |
|         | i) One gang, One way  | No       | 78   |        |
| C       | ii) Two gang, One way   | No       | 6    |        |
| D       | iii) Three gang, One way  | No       | 6    |        |
| E       | iv)One gang, Two way  | No       | 6    |        |
|         | <b>LIGHTING FITTINGS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| F       | 1x36w 1200mm HPF ceiling mounted fluorescent fitting c/w bright aluminium louvres as Thorn or equal and approved, type '4C'.  | No       | 72   |        |
| G       | Single arm light pendant with glass lamp shade complete with 8 watts energy saving lamp as EGLO-Type P1   | No       | 6    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
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|         | TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING & POWER INSTALLATIONS  |          |      |        |
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|  |  |    |     |      |  |
|--|--|----|-----|------|--|
| A  | (ii) 18w, 2D vandal resistant fitting for lift shaft- Type "TX"  | No | 6   |      |  |
| B  | Circular recessed 140 mm diameter LED downlighter with cast aluminium as MICROMARK-Type Z1 (daylight)  | No | 9   |      |  |
| C  | 75mm, 3W Circular recessed LED spotlight with cast aluminium as Philips c/w 240V driver-Type Z2 (daylight)   | No | 36  |      |  |
| D  | Circular surface mounted fitting with 20W PL lamp, opal glass diffuser, IP65 rated, as Massive manufacture or equal and approved, type "E2"  | No | 48  |      |  |
| E  | 1x36w 1200mm HPF ceiling mounted fluorescent batten fitting as Thorn cat No. PP136, or equal and approved, type '4'.   | m  | 9   |      |  |
| F  | 1x18w, 1200mm HPF wall mounted fluorescent batten fitting with diffuser as Thorn, or equal and approved mounted above wash hand basin, type 'SL'.  | m  | 12  |      |  |
| G  | Ceiling mounted self-contained emergency exit sign using LED lamps with white stove enamelled aluminium extrusion body with white polycarbonate end caps, suitable for interior use for maintained emergency applications of 3 hour duration. as OMS EMERGENCY 2811 - Type EXIT. | No | 9   |      |  |
| <b>TYPICAL 3RD, 4TH, 5TH FLOOR SMALL POWER INSTALLATIONS</b>   |  |    |     |      |  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |     |      |  |
| H  | 13 Amp ringmain socket outlet points (raw power)wired in 3 x 2.5sq mm PVC single core copper cables drawn in metal trunking (measured elsewhere) and 25mm H/G PVC conduits concealed in wall and floor slab complete with all accessories but excluding the socket outlet plate  | No | 144 |      |  |
| J  | 15 Amp non standard switched moulded socket outlet plates with neon indicator, mounted flush on wall for tea and milk urn as MK Logic Plus WHI.  | No | 18  |      |  |
| K  | Copper cables drawn in trunking and/or 20mm H/V PVC conduits concealed in the walls and floor slab complete with all accessories, but excluding the 20 Amp double pole switch  | No | 126 |      |  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |     |      |  |
| L  | 13Amp standard twin switched moulded socket outlet plates with neon indicator, mounted flush on trunking and wall as MK Logic Plus WHI.  | No | 78  |      |  |
| <b>Carried to Collection</b>   |  |    |     | KSHS |  |
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|  |   |    |     |      |  |
|--|---|----|-----|------|--|
| A  | 20 Amp double pole switch with neon indicator for various points as indicated:-   |    |     |      |  |
|  | - "F/SACP" .  | No | 3   |      |  |
| B  | - "HAND DRIER" .  | No | 3   |      |  |
| C  | - TV socket outlet plate.   | No | 3   |      |  |
| D  | - Mechanical ventilation  | No | 6   |      |  |
| E  | 12-Way TPN distribution board, DB-A and DB-B surface mounted on wall at the passage for raw power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (raw power)  | No | 6   |      |  |
| F  | <b>Miniature circuit breaker (MCBs) for the above distribution board as detailed below:-</b>  |    |     |      |  |
|  | (i) 10A SP MCB  | No | 48  |      |  |
| G  | (ii) 20A SP MCB   | No | 42  |      |  |
| H  | (iii) 30A SP MCB  | No | 24  |      |  |
| J  | (iv) 45A TP MCB   | No | 6   |      |  |
| K  | (v) TP Blanking plates  | No | 24  |      |  |
| L  | 4-Way TPN distribution board, DB-A1 and DB-B1 surface mounted on wall at the passage for UPS power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (UPS power) | No | 6   |      |  |
| M  | Miniature circuit breaker (MCBs), Type "Curve-D" for the above distribution board as detailed below:-   |    |     |      |  |
|  | (i) 20A SP MCB  | No | 24  |      |  |
| N  | (ii) TP Blanking plates   | No | 18  |      |  |
| P  | Submains comprising 4 core 25.0mm sq. PVC SWA PVC cable tray from existing LV Board, to DB A and DB B as indicated in drawing c/w lugs, ties and all necessary accessories.                   | m  | 540 |      |  |
| Q  | Submains comprising 4 core 10.0mm sq. PVC SWA PVC cable tray from UPS DB D at the server room to DB A1, DB A2, as shown in the drawings c/w lugs, ties and all necessary accessories.         | m  | 540 |      |  |
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| SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS          |   |    |     |      |  |
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| TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING & POWER INSTALLATIONS |   |    |     |      |  |
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|   |  |    |     |
|---|--|----|-----|
| A | 75mm wide perforated cable tray for laying above cable.  | m  | 498 |
| B | 200x50mm off-white powder coated 3-compartment rectangular screw type trunking in 18 SWG steel sheets complete with cover, end-caps, screws, etc. mounted under the desk to approval and as manufactured by Power Technics Ltd, Nairobi. | m  | 540 |
| C | 200x50mm off white -powder coated factory made corner bends, for the above trunking.   | No | 138 |
| D | 25mm diameter heavy gauge PVC conduit links concealed in walls and floor slab, complete with couplers, threads, etc.   | m  | 300 |
| E | 32mm diameter heavy gauge PVC conduit links concealed in walls and floor slab, complete with couplers, threads, etc.   | m  | 300 |
| F | Punched dual outlet plates on the trunking for twin socket outlets.  | No | 126 |
| G | Ditto, but for single sockets  | No | 6   |
| H | Punched single outlet plates on the trunking for data/voice outlets.   | No | 126 |

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SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

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TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING & POWER INSTALLATIONS

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TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING & POWER INSTALLATIONS

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TYPICAL 3RD, 4TH, 5TH FLOOR LIGHTING & POWER INSTALLATIONS

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|         | <b>SECTION NO 4</b>   |          |      |        |
|         | <b>BILL NO 5</b>  |          |      |        |
|         | <b>SIXTH FLOOR LIGHTING &amp; POWER INSTALLATIONS</b>   |          |      |        |
|         | <b>SIXTH FLOOR LIGHTING INSTALLATIONS</b>   |          |      |        |
|         | <b>LIGHTING POINTS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| A       | Lighting points wired in 3 x 1.5sq.mm PVC insulated single core copper wires drawn in 20 mm diameter heavy gauge PVC conduits saddled surface on the ceiling slab and ceiling soffit ,one way switched complete with all accessories, but excluding switch and fitting. | No       | 62   |        |
|         | <b>LIGHTING ACCESSORIES</b>   |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| B       | 10 Amp moulded plate switches flush mounted on wall as MK Logic Plus WHI.   |          |      |        |
|         | i) One gang, One way  | No       | 26   |        |
| C       | ii) Two gang, One way   | No       | 2    |        |
| D       | iii) Three gang, One way  | No       | 2    |        |
| E       | iv)One gang, Two way  | No       | 2    |        |
|         | <b>LIGHTING FITTINGS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| F       | 1x36w 1200mm HPF ceiling mounted fluorescent fitting c/w bright aluminium louvres as Thorn or equal and approved, type '4C'.  | No       | 6    |        |
| G       | 30W, suspended head board light fitting c/w energy saving lamp, as Philips, Type "P"  | No       | 8    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
|         | Bill No. 5  |          |      |        |
|         | SIXTH FLOOR LIGHTING & POWER INSTALLATIONS  |          |      |        |
|         | <b>177 - M&amp;A</b>  |          |      |        |

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|  |  |    |    |      |  |
|--|--|----|----|------|--|
| A  | (ii) 18w, 2D vandal resistant fitting for lift shaft- Type "TX"  | No | 2  |      |  |
| B  | Circular recessed 140 mm diameter LED downlighter with cast aluminium as MICROMARK-Type Z1 (daylight)  | No | 22 |      |  |
| C  | 75mm, 3W Circular recessed LED spotlight with cast aluminium as Philips c/w 240V driver-Type Z2 (daylight)   | No | 18 |      |  |
| D  | 3W, 100mm dia. IP65 warm white recessed LED downlighter complete with 240V driver, as Philips, Type "Z3"   | No | 48 |      |  |
| E  | Circular surface mounted fitting with 20W PL lamp, opal glass diffuser, IP65 rated, as Massive manufacture or equal and approved, type "E2"  | No | 3  |      |  |
| F  | 1x36w 1200mm HPF ceiling mounted fluorescent batten fitting as Thorn cat No. PP136, or equal and approved, type '4'.   | m  | 2  |      |  |
| G  | 1x18w, 1200mm HPF wall mounted fluorescent batten fitting with diffuser as Thorn, or equal and approved mounted above wash hand basin, type 'SL'.  | m  | 4  |      |  |
| H  | Ceiling mounted self-contained emergency exit sign using LED lamps with white stove enamelled aluminium extrusion body with white polycarbonate end caps, suitable for interior use for maintained emergency applications of 3 hour duration. as OMS EMERGENCY 2811 - Type EXIT. | No | 2  |      |  |
| <b>SIXTH FLOOR SMALL POWER INSTALLATIONS</b>   |  |    |    |      |  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |    |      |  |
| J  | 13 Amp ringmain socket outlet points (raw power)wired in 3 x 2.5sq mm PVC single core copper cables drawn in metal trunking (measured elsewhere) and 25mm H/G PVC conduits concealed in wall and floor slab complete with all accessories but excluding the socket outlet plate  | No | 36 |      |  |
| K  | 15 Amp non standard switched moulded socket outlet plates with neon indicator, mounted flush on wall for tea and milk urn as MK Logic Plus WHI.  | No | 4  |      |  |
| L  | Copper cables drawn in trunking and/or 20mm H/V PVC conduits concealed in the walls and floor slab complete with all accessories, but excluding the 20 Amp double pole switch  | No | 32 |      |  |
| <b>Carried to Collection</b>   |  |    |    | KSHS |  |
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| SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS  |  |    |    |      |  |
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| SIXTH FLOOR LIGHTING & POWER INSTALLATIONS   |  |    |    |      |  |
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SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS

Bill No. 5

SIXTH FLOOR LIGHTING & POWER INSTALLATIONS

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|         | <b>SECTION NO 4</b>   |          |      |        |
|         | <b>BILL NO 6</b>  |          |      |        |
|         | <b>SEVENTH FLOOR LIGHTING &amp; POWER INSTALLATIONS</b>   |          |      |        |
|         | <b>SEVENTH FLOOR LIGHTING INSTALLATIONS</b>   |          |      |        |
|         | <b>LIGHTING POINTS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| A       | Lighting points wired in 3 x 1.5sq.mm PVC insulated single core copper wires drawn in 20 mm diameter heavy gauge PVC conduits saddled surface on the ceiling slab and ceiling soffit ,one way switched complete with all accessories, but excluding switch and fitting. | No       | 46   |        |
|         | <b>LIGHTING ACCESSORIES</b>   |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| B       | 10 Amp moulded plate switches flush mounted on wall as MK Logic Plus WHI.   |          |      |        |
|         | i) One gang, One way  | No       | 18   |        |
| C       | ii) Two gang, One way   | No       | 2    |        |
| D       | iii) Three gang, One way  | No       | 2    |        |
| E       | iv)One gang, Two way  | No       | 2    |        |
|         | <b>LIGHTING FITTINGS</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
| F       | 30W, suspended head board light fitting c/w energy saving lamp, as Philips, Type "P"  | No       | 10   |        |
| G       | (ii) 18w, 2D vandal resistant fitting for lift shaft- Type "TX"   | No       | 2    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
|         | Bill No. 6  |          |      |        |
|         | SEVENTH FLOOR LIGHTING & POWER INSTALLATIONS  |          |      |        |
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|  |  |    |    |      |  |
|--|--|----|----|------|--|
| A  | 75mm, 3W Circular recessed LED spotlight with cast aluminium as Philips c/w 240V driver-Type Z2 (daylight)   | No | 16 |      |  |
| B  | 3W, 100mm dia. IP65 warm white recessed LED downlighter complete with 240V driver, as Philips, Type "Z3"   | No | 30 |      |  |
| C  | Circular surface mounted fitting with 20W PL lamp, opal glass diffuser, IP65 rated, as Massive manufacture or equal and approved, type "E2"  | No | 3  |      |  |
| D  | 1x36w 1200mm HPF ceiling mounted fluorescent batten fitting as Thorn cat No. PP136, or equal and approved, type '4'.   | m  | 12 |      |  |
| E  | 1x18w, 1200mm HPF wall mounted fluorescent batten fitting with diffuser as Thorn, or equal and approved mounted above wash hand basin, type 'SL'.  | m  | 4  |      |  |
| F  | Ceiling mounted self-contained emergency exit sign using LED lamps with white stove enamelled aluminium extrusion body with white polycarbonate end caps, suitable for interior use for maintained emergency applications of 3 hour duration. as OMS EMERGENCY 2811 - Type EXIT. | No | 2  |      |  |
| <b>SEVENTH FLOOR SMALL POWER INSTALLATIONS</b>   |  |    |    |      |  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |    |      |  |
| G  | 13 Amp ringmain socket outlet points (raw power)wired in 3 x 2.5sq mm PVC single core copper cables drawn in metal trunking (measured elsewhere) and 25mm H/G PVC conduits concealed in wall and floor slab complete with all accessories but excluding the socket outlet plate  | No | 42 |      |  |
| H  | 15 Amp non standard switched moulded socket outlet plates with neon indicator, mounted flush on wall for tea and milk urn as MK Logic Plus WHI.  | No | 2  |      |  |
| J  | Copper cables drawn in trunking and/or 20mm H/V PVC conduits concealed in the walls and floor slab complete with all accessories, but excluding the 20 Amp double pole switch  | No | 12 |      |  |
| <b>Supply, install, set to work, test and commission the following as specified and described below :-</b> |  |    |    |      |  |
| K  | 13Amp standard twin switched moulded socket outlet plates with neon indicator, mounted flush on trunking and wall as MK Logic Plus WHI.  | No | 12 |      |  |
| <b>Carried to Collection</b>   |  |    |    | KSHS |  |
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|   |   |    |     |      |  |
|---|---|----|-----|------|--|
| A   | 20 Amp double pole switch with neon indicator for various points as indicated:-   |    |     |      |  |
|   | - "F/SACP" .  | No | 1   |      |  |
| B   | - "HAND DRIER" .  | No | 2   |      |  |
| C   | - TV socket outlet plate.   | No | 6   |      |  |
| D   | - Mechanical ventilation  | No | 2   |      |  |
| E   | 12-Way TPN distribution board, DB-A and DB-B surface mounted on wall at the passage for raw power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (raw power)  | No | 1   |      |  |
| F   | <b>Miniature circuit breaker (MCBs) for the above distribution board as detailed below:-</b>  |    |     |      |  |
|   | (i) 10A SP MCB  | No | 8   |      |  |
| G   | (ii) 20A SP MCB   | No | 6   |      |  |
| H   | (iii) 30A SP MCB  | No | 8   |      |  |
| J   | (v) TP Blanking plates  | No | 8   |      |  |
| K   | 4-Way TPN distribution board, DB-A1 and DB-B1 surface mounted on wall at the passage for UPS power complete with 125 A TPN integral isolator and lockable cover as Merlin Gerlin. (UPS power) | No | 1   |      |  |
| L   | Miniature circuit breaker (MCBs), Type "Curve-D" for the above distribution board as detailed below:-   |    |     |      |  |
|   | (i) 20A SP MCB  | No | 4   |      |  |
| M   | (ii) TP Blanking plates   | No | 6   |      |  |
| N   | Submains comprising 4 core 25.0mm sq. PVC SWA PVC cable tray from existing LV Board, to DB A and DB B as indicated in drawing c/w lugs, ties and all necessary accessories.                   | m  | 186 |      |  |
| P   | Submains comprising 4 core 10.0mm sq. PVC SWA PVC cable tray from UPS DB D at the server room to DB A1, DB A2, as shown in the drawings c/w lugs, ties and all necessary accessories.         | m  | 186 |      |  |
| Q   | 75mm wide perforated cable tray for laying above cable.   | m  | 120 |      |  |
| <b>Carried to Collection</b>                      |   |    |     | KSHS |  |
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| SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS |   |    |     |      |  |
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|   |  |    |    |
|---|--|----|----|
| A | 200x50mm off-white powder coated 3-compartment rectangular screw type trunking in 18 SWG steel sheets complete with cover, end-caps, screws, etc. mounted under the desk to approval and as manufactured by Power Technics Ltd, Nairobi. | m  | 68 |
| B | 200x50mm off white -powder coated factory made corner bends, for the above trunking.   | No | 46 |
| C | 25mm diameter heavy gauge PVC conduit links concealed in walls and floor slab, complete with couplers, threads, etc.   | m  | 80 |
| D | 32mm diameter heavy gauge PVC conduit links concealed in walls and floor slab, complete with couplers, threads, etc.   | m  | 80 |
| E | Punched dual outlet plates on the trunking for twin socket outlets.  | No | 18 |
| F | Ditto, but for single sockets  | No | 12 |
| G | Punched single outlet plates on the trunking for data/voice outlets.   | No | 18 |

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|         | <b>SECTION NO 4</b>  |          |      |        |
|         | <b>BILL NO 7</b>   |          |      |        |
|         | <b>LIGHTNING PROTECTION INSTALLATIONS</b>  |          |      |        |
|         | Supply,deliver to site,set to work,test and commission and the following lightning points ; price to be inclusive of VAT   |          |      |        |
|         | <b>All points to be FURSE</b>  |          |      |        |
|         | <b>AIR TERMINAL</b>  |          |      |        |
| A       | 15 mm dia multiple point copper air terminal as furse  | No 4     |      |        |
| B       | Copper air terminal base as furse  | No 4     |      |        |
| C       | Copper junction clamps for tape  | No 4     |      |        |
| D       | 25 x 3mm copper tape as furse  | m 160    |      |        |
| E       | Copper ridge saddle as furse   | No 110   |      |        |
| F       | Copper rod for tape coupling   | No 110   |      |        |
|         | <b>DOWN CONDUCTORS</b>   |          |      |        |
| G       | 25x3mm copper tape as furse  | m 240    |      |        |
| H       | D.C tape clip as furse   | No 110   |      |        |
| J       | Oblong testr/junction clamp as furse   | No 4     |      |        |
| K       | 15mm dia,1200mm long solid copper earth rod as furse   | No 4     |      |        |
| L       | Earth rod to tape clamp  | No 4     |      |        |
| M       | Concrete inspection earth pit with 5-hole earth bar as furse   | No 4     |      |        |
| N       | 1500mm x 1500 mm copper earth mat made from 25mmx3mm copper tape at 300mm spacing,baried at permanent moisture level and complete with all clamps,welding joints and 6mm long, 25mmx3mmx3mm insulated tape | No 2     |      |        |
|         | <b>Carried to Collection</b>   |          | KSHS |        |
|         | Section No. 4  |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS  |          |      |        |
|         | Bill No. 7   |          |      |        |
|         | LIGHTNING PROTECTION INSTALLATIONS   |          |      |        |
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A Bonding and clamping to all metal work including water pipes,gas pipes,handrails,airconditioning units>window frames,cladding,metal roof and the main earth for the building

No

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|         | <b>SECTION NO 4</b>   |          |      |        |
|         | <b>BILL NO 8</b>  |          |      |        |
|         | <b>INTRUDER &amp; FIRE DETECTION AND ALARM SYSTEM INSTALLATION</b>  |          |      |        |
|         | <b>Supply, install, set to work, test and commission the following as specified and described below :-</b>  |          |      |        |
|         | <b>Supply, install, test and commission a complete Conventional type Fire Detection and Alarm System to BS 5839:2000.</b>   |          |      |        |
| A       | Magnetic contact, Motion Sensor, Panic button, Remote, Siren and sounder outlet points comprising wiring in 6 Core white PVC to BS 4731 PVC insulated copper cables drawn in 20 mm diameter heavy gauge PVC conduits concealed in floor slabs and walls, complete with all necessary accessories. | No 6     |      |        |
| B       | i) Magnetic door contacts   | No 6     |      |        |
| C       | ii) Passive Infra-red Motion sensors  | No 8     |      |        |
| D       | Intruder Alarm control panel complete with 72-Hr stand-by batteries as Cooper Menvier or equal and approved.  | Item     |      |        |
| E       | Breakglass, detector and sounder outlet points comprising wiring in 2 x 1.5 mm sq. s/c <b>fire retardant copper cables</b> drawn in 20 mm diameter heavy gauge PVC conduits concealed in floor slabs and walls, complete with all necessary accessories.  | No 28    |      |        |
| F       | 2-Zone Fire Alarm control panel complete with 72-Hr stand-by batteries as Cooper Menvier or equal and approved.   | No 1     |      |        |
| G       | Manual Call Point / Breakglass as Cooper Menvier or equivalent  | No 14    |      |        |
| H       | Photoelectric heat detector as Cooper Menvier or equivalent   | No 11    |      |        |
| J       | Electronic sounder with an output of 90dB at 1 meter  | No 16    |      |        |
| K       | Photoelectric Smoke detector as Cooper Menvier or equivalent.   | m 48     |      |        |
| L       | Allow for testing and commissioning by the equipment supplier Specialist and certificatons.   | Item     |      |        |
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|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
|         | Bill No. 8  |          |      |        |
|         | INTRUDER & FIRE DETECTION AND ALARM SYSTEM INSTALLATION   |          |      |        |
|         | <b>177 - M&amp;A</b>  |          |      |        |

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|---------|---|----------|------|--------|
|         | <b>SECTION NO 4</b>   |          |      |        |
|         | <b>BILL NO 10</b>   |          |      |        |
|         | <b>TELEPHONE AND POWER DISTRIBUTION</b>   |          |      |        |
|         | <b>KPLC POWER DISTRIBUTION</b>  |          |      |        |
| A       | 600 x450 x 750mm Power manhole, PMH complete with E.A.F.W heavy duty steel cover engraved POWER- DANGER   | No       | 12   |        |
| B       | 3x150mm diameter H/G. PVC duct with 150 mm thick 1:3:6 concrete surround across road crossings complete with draw wire  | m        | 42   |        |
| C       | 1x150mm diameter H/G PVC duct laid minimum depth of 600mm below ground level complete with draw cable.  | m        | 42   |        |
| D       | Excavate trenches for the above duct average depth 600mm, remove soft earth, lay duct, cover with "DANGER-HATARI" tape, back-fill with soil and compact to natural ground level and to KPLC approved design layout. | m        | 150  |        |
| E       | Allow for attendance and follow up for KP & LC services comprising of application for permanent service line excavation of trenches to approval, service line installation and meter connections                    | Item     |      |        |
|         | <b>TELECOMUNICATION DISTRIBUTION</b>  |          |      |        |
| F       | 450 x450x 750mm Telephone manhole, TMH complete with E.A.F.W heavy duty steel cover engraved TELECOM  | No       | 12   |        |
| G       | 2x100mm diameter H/G PVC duct with 150 mm thick 1:3:6 concrete surround across road crossings complete with draw wire   | m        | 42   |        |
| H       | 1x100mm diameter H/G PVC duct laid minimum depth of 600mm below ground level complete with draw cable.  | m        | 42   |        |
| J       | Excavate trenches for the above duct average depth 600mm, remove soft earth, lay duct, cover with "DANGER-HATARI" tape, backfill with soil and compact to natural ground level.                                     | m        | 150  |        |
|         | <b>Carried Forward to Summary of Section No. 4</b>  |          | KSHS |        |
|         | Section No. 4   |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS   |          |      |        |
|         | Bill No. 10   |          |      |        |
|         | TELEPHONE AND POWER DISTRIBUTION  |          |      |        |
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|         | <b>SECTION NO 4</b>  |          |      |        |
|         | <b>BILL NO 11</b>  |          |      |        |
|         | <b>COMMON SERVICES</b>   |          |      |        |
| A       | Free standing modular Industrial Essential sub-board "MSB" 600V, Icu = 25kA, Form 2B, IP30 as Scheneider Blok set range as manufactured by Power Technics Ltd or Specialized Power Systems, complete with the following and as shown on the schematic diagram:-<br><br>- 500 A TP+ N + E busbars<br>- 500 A TP+ N MCCB motorized Mains Incomer<br>- 500 A TP+ N MCCB motorized Genset Incomer<br>- 8 No. 125 A TP MCCBs outgoing<br>- 2 No. 100 A TP MCCBs outgoing<br>- 4 No. 63 A TP MCCBs outgoing for PFCU<br>- 2 No.spares for 63 A TP MCCBs outgoing<br>- Space for three phase digital KPLC metering and cut-outs<br>- 25kA, 415V three-phase surge diverter as Furse ESP 415<br>- 0-800A , 600V, Ammeter<br>- 0-600V , Volt meter<br>- Current transformers, phase Indicators and selector switches<br>- Earthing terminal | Item     |      |        |
| B       | PME Earthing to KP&LC requirements, complete with earth electrode, earthing manhole as FURSE etc.,for the above Meterboard.  | Item     |      |        |
| C       | 2 x 100 mm diameter heavy gauge pvc ducts laid underground in 150mm concrete surround for incoming KPLC service line.  | m        | 20   |        |
| D       | 150x150x75 mm cable looping box to approval  | No       | 2    |        |
|         | <b>Carried Forward to Summary of Section No. 4</b>   |          | KSHS |        |
|         | Section No. 4  |          |      |        |
|         | SECTION 4 - ELECTRICAL & FIRE ALARM INSTALLATIONS  |          |      |        |
|         | Bill No. 11  |          |      |        |
|         | COMMON SERVICES  |          |      |        |
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## **SECTION NO. 5**

### **STRUCTURED CABLING INSTALLATIONS**

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COUNTY ASSEMBLY OF KITUI**

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|---------|---|----------|--------|--------|
|         | <b>SECTION NO 5</b>   |          |        |        |
|         | <b>BILL NO 1</b>  |          |        |        |
|         | <b>STRUCTURED CABLING INSTALLATIONS</b>   |          |        |        |
|         | <b>GENERAL ITEMS</b>  |          |        |        |
| A       | Allow for mobilisation and setting up stores, tools and all necessary equipment on site   | Item     |        |        |
| B       | Allow for supply and installation of all labels and danger warning notices, in all personal protective equipment (PPEs).                                      | Item     |        |        |
| C       | Allow for all preparation of all working drawings.(3No. Sets of A2 drawings)  | Item     |        |        |
| D       | Allow for the supply and installation of all necessary consumeables e.g cable markers,ties,etc.   | Item     |        |        |
| E       | Allow for preparation of 'As Installed' drawings in 'A3' size paper, operation and maintenance manuals, etc, all as specified in the attached specifications. | Item     |        |        |
|         | <b>Supply, install, test and commission a complete Cat. 6A Performance Structured Cabling solution as Siemons or equivalent as described below: -</b>         |          |        |        |
|         | <b>HORIZONTAL CABLING</b>   |          |        |        |
| F       | Cat.6e 4-pair FTP cable for data/voice outlets as Siemons or approved equivalent  | m        | 13,020 |        |
| G       | Dual RJ45 Cat.6e outlets for voice / data complete with faceplate and labeling as Siemons or approved equivalent  | No       | 209    |        |
| H       | 24-Port Cat.6e Voice and Data modular patch panel for 4-Pair FTP cable termination as Siemons or approved equivalent  | No       | 7      |        |
| J       | 1M Factory terminated Cat.6e 4 pair-FTP RJ45- RJ45 patch cords to be used inside cabinet as Siemons or approved equivalent                                    | No       | 308    |        |
| K       | 3M Factory terminated Cat.6 4 pair-RJ45- RJ45 patch cords for voice/data outlets as Siemons or approved equivalent  | No       | 204    |        |
| L       | 1U Cable managers/organisers as Siemons or approved equivalent  | No       | 15     |        |
|         | <b>Carried to Collection</b>  |          | KSHS   |        |
|         | Section No. 5   |          |        |        |
|         | SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO   |          |        |        |
|         | Bill No. 1  |          |        |        |
|         | STRUCTURED CABLING INSTALLATIONS  |          |        |        |
|         | <b>177 - M&amp;A</b>  |          |        |        |

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

**CABINETS**

|   |  |    |   |
|---|--|----|---|
| A | Wall mounted purpose made Server cabinet with dimensions of 800x1000mm (Type 22U) for the switch/patch-panel complete with 2 extractor fans and 8 No. 3 pin power points on UPS. To have a PDU with neon indicators as APC, HP or approved equivalent. | No | 6 |
|---|--|----|---|

**ACTIVE DEVICES**

|   |   |    |   |
|---|---|----|---|
| B | - 24-port POE Cisco switch as Cisco catalyst 9800 | No | 6 |
| C | - Wireless access as Cisco Aironet 2800           | No | 8 |

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SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO  
Bill No. 1  
STRUCTURED CABLING INSTALLATIONS  
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Section No. 5

SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 1

STRUCTURED CABLING INSTALLATIONS

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SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 1

STRUCTURED CABLING INSTALLATIONS

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| Item No |  | Quantity | Rate | Amount |
|---------|--|----------|------|--------|
|         | <b>SECTION NO 5</b>  |          |      |        |
|         | <b>BILL NO 2</b>   |          |      |        |
|         | <b>AUDIO VISUAL SYSTEM</b>   |          |      |        |
|         | <b>Supply,install,test and commission the following as described below and attach Coloured Brochure for the Tendered System:</b>   |          |      |        |
|         | <b>TELECONFERENCING EQUIPMENT - MAIN BOARDROOM AND CHEMBER</b>   |          |      |        |
| A       | VGA+Audio Table Top (Pop-Up) Units - (comprises of VGA+Audio+Data+Power Outlets) as Kramer T-bus 3 or equal and approved equivalent as per the technical specifications                    | No       | 4    |        |
| B       | Polycom Teleconferencing Sounstation IP7000 or equivalent  | No       | 4    |        |
| C       | Easy Teleconference microphone extender VT-800   | No       | 4    |        |
| D       | 8" Round Ceiling Mount Speakers  | No       | 4    |        |
| E       | Professional Audio Amplifier as per the technical specifications   | No       | 2    |        |
| F       | Kramer VGA Cables to approved make   | m        | 160  |        |
| G       | HDMI Cables to approved make   | m        | 160  |        |
| H       | 1.5 metres Kramer VGA + Audio patch cables to approved make  | No       | 6    |        |
| J       | 1.5 metres HDMI patch cables to approved make  | m        | 6    |        |
| K       | Oxygen-free audio cables to approved make  | m        | 88   |        |
| L       | Connectors, mountings and terminals  | No       | 4    |        |
|         | <b>Supply, install, test, commission and set to work (To the full satisfaction of all the parties to the contract) the following:--(State make and type of all the equipment supplied)</b> |          |      |        |
|         | <b>AUDIO VISUAL BACKBORN TO ALL MEETING ROOMS</b>  |          |      |        |
| M       | VGA+Audio Table Top (Pop-Up) Units - (comprises of VGA+Audio+Data+Power Outlets) as Kramer T-bus 3 or equal and approved equivalent as per the technical specifications                    | No       | 3    |        |
|         | <b>Carried to Collection</b>   |          | KSHS |        |
|         | Section No. 5  |          |      |        |
|         | SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO  |          |      |        |
|         | Bill No. 2   |          |      |        |
|         | AUDIO VISUAL SYSTEM  |          |      |        |
|         | <b>177 - M&amp;A</b>   |          |      |        |

**Any other items necessary to complete the system installation satisfactorily. (List, give quantities and price of the items)**

**(A technical brochure and product catalogues must be enclosed)**

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Section No. 5

SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 2

AUDIO VISUAL SYSTEM

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SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 2

AUDIO VISUAL SYSTEM

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|---------|---|----------|------|--------|
|         | <b>SECTION NO 5</b>   |          |      |        |
|         | <b>BILL NO 4</b>  |          |      |        |
|         | <b>CCTV INSTALLATIONS</b>   |          |      |        |
|         | <b>Hikvision DS-2CD2132F -(W)(S) Camera or equivalent</b>   |          |      |        |
| A       | 3MP 1/3" Progressive scan CMOS<br>Support dual streams Up30 meters IR range<br>S: Two-way audio and Audio/Alarm I/O<br>W: Support Wi-Fi<br>IR cut filter with auto switch<br>DC12V &<br>Built-in Micro SD/SDHC/SDXC card slot, up to 128 GB<br>Ingress Protection level: IP66   | No       | 36   |        |
|         | <b>Hikvision DS-2CD2542FWD-I(W)(S)</b>  |          |      |        |
| B       | Up to 4 megapixel high resolution<br>Full HD1080p video<br>Dual video streams<br>2.8mm/4mm/6mm fixed lens<br>120dB Wide Dynamic Range<br>3D Digital Noise Reduction<br>3-axis adjustment<br>DC12V & PoE<br>Support H.264+<br>Up to 10m IR range<br>IP66 weather-proof protection<br>IK08 vandal-proof protection<br>S: Built-in microphone, Audio Output, Alarm IO<br>W: Built-in Wi-Fi<br>Mobile Monitoring via EZVIZ P2P or iVMS-4500 | No       | 6    |        |
|         | <b>NVR SERVER</b>   |          |      |        |
| C       | NVR Hardware configured with:<br>4 TB HDD<br>with 4 GB RAM,<br>and 55" TFT Monitor - Lenovo   | No       | 1    |        |
|         | <b>VIDEO MANAGEMENT SOFTWARE</b>  |          |      |        |
| D       | Milestone XProtect Express Base License with 18 Camera License  | No       | 1    |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
|         | Section No. 5   |          |      |        |
|         | SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO   |          |      |        |
|         | Bill No. 4  |          |      |        |
|         | CCTV INSTALLATIONS  |          |      |        |
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A Installation of the cameras and Programming Software Set-up on Server including setting of IP for Cameras

Item

B UPS Power backup system

No

1

**Carried to Collection**

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SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 4

CCTV INSTALLATIONS

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Section No. 5

SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 4

CCTV INSTALLATIONS

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SECTION 5 - STRUCTURED CABLING, ACCESS CONTROL, CCTV, AUDIO

Bill No. 4

CCTV INSTALLATIONS

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**SECTION NO. 6**

**PLUMBING & DRAINAGE INSTALLATIONS**

-6/1/1-

**MODERN OFFICE BLOCK  
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Supply, deliver and install the following appliances including their support brackets, screws etc. Where necessary items such as mastic, silicon, grouting etc must be included in the rates.

All connections to water supply, waste/soil drainage and electrical power supply are to be the responsibility of the contractor and must be priced for:-

**NOTE: TRADE NAMES :** Where Trade Names are mentioned below, the tenderer **MUST** provide the same materials. Alternatives will only be accepted if approved in writing by the Architect/Engineer.

**WC Pan**

- |   |  |    |    |
|---|--|----|----|
| A | "Jaguar" Opal Rimless back to wall WC wash-down action of Ref. No. <b>OPS-WHT-15955NUF</b> with horizontal outlet, fixing screws and mastic. WC pan to be complete with seat & cover as follows;<br>Plastic single ring seat and cover with bottom fix stainless steel hinges with UF soft closing mechanism | No | 44 |
|---|--|----|----|

**Flush Valve**

- |   |  |    |    |
|---|--|----|----|
| B | Jaguar Metropole Dual Flow In-wall Flush Valve, 40mm Size for Western Commode with Round Flange and Ref. No. <b>FLV-CHR-1089</b> or approved equivalent. | No | 44 |
|---|--|----|----|

**Arabic Shower**

- |   |  |    |    |
|---|--|----|----|
| C | Arabian WC Hand Spray complete with toilet hand spray with 1/2 inch tap, flexible hose with connector brackets to approved sample. | No | 44 |
|---|--|----|----|

**Wash Hand Basins**

- |   |   |    |    |
|---|---|----|----|
| D | "JAGUAR" Kubix make or approved equivalent countertop white vitreous china wash hand basin, 505 x 435 x 175mm basin with 1 taphole of Ref. No. <b>KUS-WHT-35601</b> | No | 52 |
|---|---|----|----|

**WHB Accessories**

- |   |  |    |    |
|---|--|----|----|
| E | "JAGUAR" Aria make or approved equivalent, Single Lever Basin Mixer with Pop-up Waste & 375 mm Long Braided Hoses                                    | No | 52 |
| F | "Bricon" Ref. No. 316 chrome plated heavy cast 1½" sink grid waste, 70 mm diameter flange, 45 mm long shank, unslotted with plug, chain and backnut. | No | 52 |
| G | "Cobra Watertech" plastic 1¼" bottle trap with 75 mm deep seal and 200 mm long tail pipe, cap-nut and wall flange.                                   | No | 52 |

**Carried to Collection**

Section No. 6  
SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS  
Bill No. 1  
PLUMBING, DRAINAGE, FIRE FIGHTING INSTALLATIONS  
**177 - M&A**

KSHS

**MODERN OFFICE BLOCK  
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|  |   |    |   |  |
|--|---|----|---|--|
| <b>Kitchen Sink</b>  |   |    |   |  |
| A  | FRANKE model double bowl, double drainer kitchen sink size 1500x500mm made out of 18SWG 18/8 stainless steel sheet with 420 x 355x 150 mm deep bowl in bright machine polish finish. The drainer shall be on the left hand side. (Insert type).   | No | 8 |  |
| <b>Undersink Heater</b>                                      |   |    |   |  |
| B  | "ARISTON" or approved equivalent, undersink heater of 10 litres capacity with 2.0Kw heating element and complete with adjustable thermostat (5-60oC), over-temperature cut-out , dry start cut-out, 15mm connections for cold water inlet and hot water outlet at top suitable for connection to pressure vented mixer tap described elsewhere.. Entire installation to be complete with electrical wiring to a local isolator. | No | 1 |  |
| <b>Kitchen Sink Accessories</b>                              |   |    |   |  |
| C  | "Jaguar single lever kitchen sink mono mixer" wall type sink mixer with swivel spout outlet and 375mm long braided hoses of ref. no. ORP-CHR-10173BPM or Equal and approved   | No | 8 |  |
| D  | "MALPINE"chrome plated heavy cast 1½" sink grid waste, 70 mm diameter flange, 45 mm long shank, unslopped with plug, chain and backnut.   | No | 8 |  |
| E  | PVC 1½" bottle trap with 75 mm deep seal and 200 mm long tail pipe, cap-nut and wall flange.  | No | 8 |  |
| <b>Shower Fittings</b>                                       |   |    |   |  |
| F  | "JAGUAR" 3 way single level shower mixer complete with rainshower head, arm, mixer diverter and shower arm. or approved equivalent complete with shower tray.   | No | 2 |  |
| G  | 15mm diameter heavy duty brass bib tap as "Pegler"  | No | 2 |  |
| H  | 15mm diameter heavy duty chrome plated concealed valve as "Cobra"   | No | 2 |  |
| <b>Carried to Collection</b>                                 |   |    |   |  |
| Section No. 6  |   |    |   |  |
| SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS |   |    |   |  |
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|  |   |    |    |      |
|--|---|----|----|------|
| <b>Stainless Steel Slab Urinal</b>                           |   |    |    |      |
| A  | Stainless steel slab urinal as follows<br><b>ullet One piece construction, made of 18 8SWG Stainless Steel, non staining</b><br><b>ullet Automatic Ceramic Cistern - Capacity 2 gallons</b><br><b>ullet Length 1950mm and 1150mm height</b><br><b>ullet Downpipe - Polished stainless steel bored to siphon tail, length to allow cutting for recommended height of cistern supplied with clip.</b><br><b>ullet Flushing pipe - Exposed stainless steel sparge pipes ready fixed to urinal back with CP pipe and CP tee for down pipe</b><br><b>ullet Cistern and downpipe should be exposed on face of back wall.</b><br><b>ullet 50mm diameter chrome plated domed grating outlet</b> | No | 7  |      |
| <b>Urinal Bowl</b>   |   |    |    |      |
| B  | "JAGUAR" white vitreous china Urinal bowl with concealed pipework complete with Pair of bowl supports , Plastics 1½" diameter domed outlet grating of Ref. No. URS-WHT-132530   | No | 1  |      |
| <b>Urinal Bowl accessories</b>                               |   |    |    |      |
| C  | "JAGUAR" pressmatic in wall compact urinal valve chrome plated, push button ¾" concealed urinal flush valve, top entry with integral ball-o-stop valve and wall plate complete with; chrome plated urinal flush with inlet adapter and backmount spray rose/spreader of Ref. No. <b>PRS-CHR-073</b>   | No | 1  |      |
| D  | 1½" diameter plastic bottle P-Trap with plastic extension pipe to wall and wall flange.   | No | 1  |      |
| E  | "JAGUAR" Rectangular/Curve Shaped Urinal Partition with Frosted Glass.<br>Finish: Chrome<br>Glass: 8mm / 10mm of ref. No.   | No | 2  |      |
| <b>Toilet Roll Holder</b>                                    |   |    |    |      |
| F  | Semi-recessed toilet roll holder in vitreous china as Twyford's Bathrooms Ltd Ref. No. VC 9808 WH.  | No | 44 |      |
| <b>Rob Hook</b>  |   |    |    |      |
| G  | Satin Aluminium robe hook complete with screws as Twyford's Bathrooms Ltd Ref. No. PB0204SI.  | No | 44 |      |
| <b>Carried to Collection</b>                                 |   |    |    |      |
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|  |  |    |    |      |
|--|--|----|----|------|
| <b>Towel Rails.</b>  |  |    |    |      |
| A  | Jaguar 20mm diameter x 600mm long chrome plated towel rail Ref. ACN-CHR-1111SM screwed to wall.  | No | 21 |      |
| <b>Mirrors</b>   |  |    |    |      |
| B  | 6mm thick, polished plate glass, silver-backed mirror with beveled edges, plugged and screwed to wall with concealed chromium plated dome-capped screws, and 5mm thick foam back rest ;  |    |    |      |
|  | i) 600 x 800mm   | No | 2  |      |
| C  | ii) 600 x 2000mm   | No | 19 |      |
| <b>Handdrier</b>   |  |    |    |      |
| D  | Mediclinics Automatic Hand Dryer with a Power supply of 1.8 kW 240V 50Hz automatic no-touch infra sensor operated handrier. With delivery of 36 litres per second of warm air at 50°C above ambient temperature at an average air speed of 17 m/s and a relative drying time of 35 seconds.  | No | 21 |      |
| <b>Soap Dispenser</b>  |  |    |    |      |
| E  | "Medclinics" 1.136 litre white Impact resistant, heavy duty, plastic glued/screwed to wall liquid soap dispenser complete with initial charge, key and mounting brackets.  | No | 21 |      |
| <b>Paper Towel Dispenser</b>                                 |  |    |    |      |
| F  | Surface Mounted Roll Paper Towel Dispenser shall hold and dispense one 200 or 230 mm wide up to 244m long standard towel roll up to diameter 220 mm and one stub roll up to diameter 100 mm. Automatic transfer mechanism shall dispense towels from stub roll before starting new roll. Lever operated unit and shall adjust to dispense 64, 102 or 127 mm preset length of towel.<br>Towel dispensing slot shall be smooth and burr-free for snag-free dispensing and user safety. Compact, robust and vandal-proof design. To be as Mediclinics Model DTP025CS or equal and approved. | No | 21 |      |
| <b>Cleaner's sink</b>  |  |    |    |      |
| G  | "DURAVIT D Code" cleaners sink in enamelled fireclay with hardwood pad & stainless steel grating. The sink is to be complete with legs & bearers with sink screwed to wall   | No | 8  |      |
| <b>Carried to Collection</b>                                 |  |    |    |      |
| Section No. 6  |  |    |    | KSHS |
| SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS |  |    |    |      |
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**Supply, deliver and install PPR PN25 Ariete 25 system of pipes and fittings. Polypropylene Type 3PN25 to DIN 8077- 8078 A1 and DVGWE 534 standards with polyfusion welding.**

**Tenderers must allow for all Metal/plastic threaded adaptors where required for the connection of sanitary fixtures, valves, sockets, sliding and fixed joints, support raceways, supporting brackets, isolating sheaths, elastic materials, expansion arms and bends, crossovers, couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system.**

|   |  |    |     |
|---|--|----|-----|
| A   | 25mm diameter PPR pipe                   | m  | 405 |
| B   | 32mm diameter PPR pipe                   | m  | 236 |
| C   | 40mm diameter PPR pipe                   | m  | 202 |
| D   | 50mm diameter PPR pipe                   | m  | 248 |
| <b>Extra Over PPR PN25 Tubing for the following:-</b> |  |    |     |
| E   | 25 mm diameter PP-R elbow, 90°/45°       | No | 136 |
| F   | 32 mm ditto                              | No | 128 |
| G   | 40 mm ditto                              | No | 104 |
| H   | 50 mm ditto                              | No | 104 |
| J   | 50 mm diameter PPR equal tee             | No | 104 |
| K   | 40 mm ditto                              | No | 120 |
| L   | 32 mm ditto                              | No | 112 |
| M   | 25 mm ditto                              | No | 108 |
| N   | 50 x 40 x 50 mm diameter PPR unequal tee | No | 76  |
| P   | 50 x 40 x 40 mm ditto                    | No | 76  |
| Q   | 40 x 25 x 40 mm ditto                    | No | 102 |
| R   | 40 x 20 x 40 mm ditto                    | No | 102 |

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS  
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**177 - M&A**

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|   |   |    |     |      |  |
|---|---|----|-----|------|--|
| A   | 32 x 25 x 25 mm ditto   | No | 102 |      |  |
| B   | 25 x 25 x 20 mm ditto   | No | 126 |      |  |
| C   | 25 x 20 x 20 mm ditto   | No | 126 |      |  |
| D   | 50 x 40 mm diameter PPR reducer   | No | 110 |      |  |
| E   | 40 x 32 mm ditto  | No | 110 |      |  |
| F   | 32 x 25 mm ditto  | No | 110 |      |  |
| G   | 25 x 20 mm ditto  | No | 210 |      |  |
| H   | 25mm x ½" diameter PPR male/female brass adaptors   | No | 210 |      |  |
| J   | 32mm x ¾" ditto   | No | 210 |      |  |
| K   | 40mm x 1" ditto   | No | 198 |      |  |
| L   | 50mm x 1½" ditto  | No | 54  |      |  |
| M   | ½" diameter Angle Regulating Valve as 'Pex' marking neutral; complete with a 300 mm long Flexible Connector as 'Taq' HG 1212 - ½" x ½" diameter with external stainless steel braid . | No | 214 |      |  |
| N   | 32 mm diameter brass high pressure screw-down fullway non-rising stem, solid wedge disc gate valve as "Pegler" and to be complete with matching diameter PPR adaptor and union.       | No | 56  |      |  |
| P   | 32mm x 1" diameter PPR male/female brass end caps   | No | 214 |      |  |
| <b>FOUL DRAINAGE</b>  |   |    |     |      |  |
| <p><b>Supply and fix uPVC soil system to BS 4660 and 4515; and MuPVC waste systems to BS 5255 with screwed and socketed joints to BS 21. Solvent welded joints shall be as per the systems manufacturer's written instructions.</b></p> <p><b>Tenderer must allow in their pipe work prices for all the couplings, connectors, joints etc as required in the running lengths of pipe work and also where necessary, for pipe fixing clips, holder bats plugged and screwed. The installation must comply with BS 5572.</b></p> <p><b>MuPVC waste System conforming to BS 5255</b></p> |   |    |     |      |  |
| Q   | 32 mm diameter waste pipe   | m  | 94  |      |  |
| <b>Carried to Collection</b>  |   |    |     | KSHS |  |
| <p>Section No. 6<br/>SECTION 6 - PLUMBING, DRAINAGE &amp; FIRE FIGHTING INSTALLATIONS<br/>Bill No. 1<br/>PLUMBING, DRAINAGE, FIRE FIGHTING INSTALLATIONS<br/><b>177 - M&amp;A</b></p>   |   |    |     |      |  |

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|  |  |    |     |
|--|--|----|-----|
| A  | 40 mm diameter waste pipe  | m  | 210 |
| B  | 50 mm ditto  | m  | 162 |
| <b>Extra Over MuPVC Waste Pipework for the following:-</b>                           |  |    |     |
| C  | 32 mm diameter 90°/135° Sweep Bend   | No | 92  |
| D  | 40 mm ditto  | No | 92  |
| E  | 50 mm ditto  | No | 136 |
| F  | 32 mm diameter Wye Tee   | No | 100 |
| G  | 32 mm ditto  | No | 100 |
| H  | 50 mm ditto  | No | 100 |
| J  | 40 mm diameter Access Plug   | No | 28  |
| K  | 100 x 50mm Trapped Floor Gully with 3 No. 40 mm diameter inlets and 50 mm diameter outlet  | No | 42  |
| L  | Chrome polished 150 x 150 x 15mm STAINLESS STEEL Floor drain c/w fixed grill and mobile cover as supplied by Tile & Carpet (manufactured from Italy) | No | 42  |
| <b>uPVC Buried Drain System Heavy Gauge Pipework</b>                                 |  |    |     |
| M  | 100 mm diameter Golden Brown Buried Drain Pipe   | m  | 408 |
| <b>Extra Over uPVC Buried Drain System Heavy Gauge Pipework for the following: -</b> |  |    |     |
| N  | 100 mm diameter Golden Brown Sweep Bend  | No | 134 |
| <b>uPVC Soil System Heavy Gauge Class 41 Pipework</b>                                |  |    |     |
| P  | 100 mm diameter Light Grey Soil Pipe   | m  | 252 |
| <b>Extra Over uPVC Soil Pipework for the following: -</b>                            |  |    |     |
| Q  | 100 mm diameter Light Grey 90°/135° Sweep Bend   | No | 36  |
| R  | 100 x 40 mm diameter Light Grey Single Boss Connector  | No | 36  |
| S  | 100 x 50 mm ditto  | No | 36  |

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS  
Bill No. 1  
PLUMBING, DRAINAGE, FIRE FIGHTING INSTALLATIONS  
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|                                    |  |    |    |
|------------------------------------|--|----|----|
| A                                  | 100mm diameter Light Grey Single Branch  | No | 54 |
| B                                  | 100mm diameter Light Grey Wye Tee Branch   | No | 54 |
| C                                  | 100mm diameter Light Grey Access Cap   | No | 54 |
| D                                  | 100mm diameter Light Grey WC manifold  | No | 54 |
| <b>FIRE FIGHTING INSTALLATIONS</b> |  |    |    |
| E                                  | <b>CO2 Fire Extinguishers</b><br>5 kg Carbon Dioxide Steel Stored pressure gas fire extinguishers conforming to BS EN 3 complete with:-<br>- charge and fixing bracket<br>- pictorial instructions<br>- colour coding to BS 7863<br>- discharge horn and hose.<br>- pressure indicator | No | 19 |
| F                                  | <b>Dry Chemical Powder Fire Extinguishers</b><br>9kg Cartridge operated dry powder fire extinguisher manufactured to BS EN 3 complete with:-<br>- initial charge and fixing bracket, discharge nozzle and hose<br>- pictorial instructions<br>- colour coding to BS 7863               | No | 19 |
| G                                  | <b>Foam</b><br>9 litre foaming agent filled cartridge operated fire extinguishers conforming to BS EN 3 complete with:-<br>- charge and fixing bracket<br>- pictorial instructions<br>- colour coding to BS 7863<br>- discharge horn and hose.<br>- pressure indicator                 | No | 19 |
| H                                  | <b>Water Extinguisher</b><br>9 litre water filled CO2 cartridge operated fire extinguishers conforming to BS EN 3 complete with:-<br>- charge and fixing bracket<br>- pictorial instructions<br>- colour coding to BS 7863<br>- discharge horn and hose.<br>- pressure indicator       | No | 19 |

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Section No. 6

SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 1

PLUMBING, DRAINAGE, FIRE FIGHTING INSTALLATIONS

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Section No. 6

SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 1

PLUMBING, DRAINAGE, FIRE FIGHTING INSTALLATIONS

**177 - M&A**

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|         | <b>SECTION NO 6</b>   |          |      |        |
|         | <b>BILL NO 2</b>  |          |      |        |
|         | <b>WATER RETICULATION</b>   |          |      |        |
|         | <b>INCOMING MAINS FROM THE BOREHOLE AND KITUI WATER &amp; SEWERAGE COMPANY (UP TO THE UNDERGROUND TANK)</b>   |          |      |        |
|         | Supply, deliver and install PPR PN25 Ariete 25 system of pipes and fittings. Polypropylene Type 3PN25 to DIN 8077- 8078 A1 and DVGWE 534 standards with polyfusion welding.   |          |      |        |
|         | Tenderers must allow for all Metal/plastic threaded adaptors where required for the connection of sanitary fixtures, valves, sockets, sliding and fixed joints, support raceways, supporting brackets, isolating sheaths, elastic materials, expansion arms and bends, crossovers, couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system. |          |      |        |
| A       | 63mm diameter PPR pipe  | m        | 200  |        |
|         | <b>Extra Over PPR PN25 Tubing for the following:-</b>   |          |      |        |
| B       | 63 mm diameter elbow/bend   | No       | 24   |        |
| C       | 63 mm diameter PN16 Sluice valve made of cast iron body complete with matching 2No. flanges .Valve to be as manufactured by Hattersley or approved equivalent.  | No       | 2    |        |
| D       | Bricon 3" (63mm) diameter high pressure cast brass float valve MOH Pattern with 1¼" shank as complete with Bricon 4½" diameter high pressure polypropylene plastic float.   | No       | 2    |        |
| E       | Allow for masonry meter chamber, size 600 x 600 x 450mm maximum depth with reinforcement concrete cover with mild steel frame conforming to Architects' requirements. The letters GV to be engraved on the concrete cover to approval of the Engineer/Architect   | No       | 2    |        |
| F       | Allow for application on behalf of the Client and be responsible for water connection to the main supply. Contractor to allow for all the necessary fees ,licences, etc including liason with Kisumu Water Supply and Sewerage Company  | Item     |      |        |
|         | <b>Carried to Collection</b>  |          | KSHS |        |
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|   |  |    |     |      |  |
|---|--|----|-----|------|--|
| A   | 100 mm nominal diameter PVC sleeve with 150mm concrete surround; class 15/20   | m  | 200 |      |  |
| B   | Excavate trench for buried plumbing pipes not exceeding 400 mm and average 300 mm deep, part return, fill in, ram and remainder cart away.   | m  | 200 |      |  |
| <b>FROM THE UNDERGROUND TANK TO THE OVERHEAD TANKS</b>  |  |    |     |      |  |
| <b>Supply, deliver and install PPR PN25 Ariete 25 system of pipes and fittings. Polypropylene Type 3PN25 to DIN 8077- 8078 A1 and DVGWE 534 standards with polyfusion welding. Solvent welded joint shall be as per the system manufacturer's written instructions.</b> |  |    |     |      |  |
| C   | 63mm diameter PPR pipe   | m  | 60  |      |  |
| <b>Extra Over PPR PN25 Tubing for the following:-</b>   |  |    |     |      |  |
| D   | 63mm diameter elbow/bend   | No | 4   |      |  |
| E   | 63mm diameter tee  | No | 2   |      |  |
| F   | 63mm x 2" diameter PPR adaptor   | No | 8   |      |  |
| <b>Puddle flanges</b>   |  |    |     |      |  |
| G   | 500mm long puddle flange fabricated from 300mm diameter GI pipe with 300mm diameter mild steel flange with required welding, nuts and bolts and painted with two coats of anti-bitumastic paint. | No | 4   |      |  |
| H   | 200mm diameter ditto   | No | 4   |      |  |
| J   | 150mm diameter ditto   | No | 4   |      |  |
| K   | 100mm diameter ditto   | No | 4   |      |  |
| L   | 50mm diameter ditto  | No | 4   |      |  |
| <b>Gate Valves</b>  |  |    |     |      |  |
| M   | 63mm diameter brass high pressure screw-down fullway non-rising stem, solid wedge disc gate valve as "Pegler" and to be complete with 2No. Brass adapters  | No | 16  |      |  |
| N   | 50 mm ditto  | No | 16  |      |  |
| P   | 40 mm ditto  | No | 16  |      |  |
| <b>Carried to Collection</b>  |  |    |     | KSHS |  |
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|   |                                    |    |     |      |  |
|---|------------------------------------|----|-----|------|--|
| A   | 32 mm ditto                        | No | 16  |      |  |
| B   | 25 mm ditto                        | No | 16  |      |  |
| <b>FROM THE ELEVATED WATER TANKS TO THE USAGE AREAS</b>   |                                    |    |     |      |  |
| <b>INTERNAL WATER RETICULATION</b>  |                                    |    |     |      |  |
| Supply, deliver and install PPR PN25 Ariete 25 system of pipes and fittings. Polypropylene Type 3PN25 to DIN 8077- 8078 A1 and DVGWE 534 standards with polyfusion welding.   |                                    |    |     |      |  |
| Tenderers must allow for all Metal/plastic threaded adaptors where required for the connection of sanitary fixtures, valves, sockets, sliding and fixed joints, support raceways, supporting brackets, isolating sheaths, elastic materials, expansion arms and bends, crossovers, couplings, clippings, connectors, joints etc. as required in the running lengths of pipework and also where necessary, for pipe fixing clips, holder bats plugged and screwed for the proper and satisfactory functioning of the system. |                                    |    |     |      |  |
| C   | 25mm diameter PPR pipe             | m  | 120 |      |  |
| D   | 32mm diameter PPR pipe             | m  | 220 |      |  |
| E   | 40mm diameter PPR pipe             | m  | 160 |      |  |
| F   | 50mm diameter PPR pipe             | m  | 320 |      |  |
| <b>Extra Over PPR PN25 Tubing for the following:-</b>   |                                    |    |     |      |  |
| G   | 25 mm diameter PP-R elbow, 90°/45° | No | 40  |      |  |
| H   | 32 mm ditto                        | No | 36  |      |  |
| J   | 40 mm ditto                        | No | 24  |      |  |
| K   | 50 mm ditto                        | No | 24  |      |  |
| L   | 50 mm diameter PPR equal tee       | No | 24  |      |  |
| M   | 40 mm ditto                        | No | 36  |      |  |
| N   | 32 mm ditto                        | No | 32  |      |  |
| P   | 25 mm ditto                        | No | 32  |      |  |
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Supply , deliver install the pumpset. Where necessary items such as support brackets, screws,etc. must be included in the rates and all other necessary accessories to make the appliances operational. All connections to water supply are to be the responsibility of the contractor and must be priced for:-

- A "WILO Isar MODH1-2CH1-L3-1604/EC" ( Submersible) Water Booster set (2 No. Pumps), on an auto-sequencing operation mode complete with the following :-
- ullet 2 No. automatic electrical motor driven water pumps to with a capacity of 10m<sup>3</sup>/hr against a total static head of 30 m as ILO Isar MODH1-2CH1-L3-1604/EC - 3, 3kW X 3PH
  - ullet Automatic electric control panel for alternate operation of the pumps with duty switching to standby and vice-versa on each cycle. The panel is to be complete with 'run' & 'trip' indicators, phase failure relays, overload relays, automatic changeover for duty/standby operation etc
  - ullet Base frame with anti-vibration mountings.
  - ullet 10mm dial pressure gauge (0 - 25bar)
  - ullet Pressure vessel(1No. 8 litres capacity), to be installed in series with the pumps.
  - ullet Pressure switch (double Pole) arrangement including flow switch and necessary valve and fittings.
  - ullet Inlet & outlet gate valves.
  - ullet Line strainer, check valves, elbows, tees, unions, etc.
  - ullet all pipework interconnecting pumps and pressure vessels to match suction & inlet pipe size in GMS Class B pipes including elbows, tees, unions, etc.
  - ullet All other necessary items for booster set to specification.

Item

Roof Water Storage Tank

**Carried to Collection**

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS  
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|   |  |      |      |  |  |
|---|--|------|------|--|--|
|   | <p><b>Supply and erect Galvanised pressed steel roof water storage tank on site. The contractor to allow for pipe connections to provisions already provided in the water tank as described below:-</b></p> <p><b>The works by the will comprise the design, manufacture, supply, delivery, erection together with testing and commissioning of water storage tank as described below.</b></p> <p><b>The tank shall be erected complete on a 18m high mild steel tower to structural Engineers approval and with all necessary pipes, ladders, towers, etc as listed herein.</b></p>   |      |      |  |  |
| A | <p>Elevated water tank, 5 mm thick galvanised pressed steel plates of capacity <b>48,000 litres</b> and dimensions 5,000 x 5,000 x 3,000mm high ;plates (1.0 x 1.0m. each) on bearing support to structural Engineers detail complete with internal stays, cover and manhole.</p> <p style="text-align: right;">The</p> <p>tanks shall be painted inside with one coat of bituminous non-toxic paint and on the outside with a coat of primer before erection.After erection, the tank shall be painted with two coats of Aluminium paint.The other structures shall be cleaned and painted with one coat of lead oxide or red lead before erection and two coats of aluminium paint after erection. The tank is to be complete with the following ;</p> <ul style="list-style-type: none"> <li>a) Water level indicator</li> <li>b) Internal ladder</li> <li>c) Tank external ladder</li> <li>d) 100mm diameter overflows</li> <li>e) 100mm diameter washouts with gate valve</li> <li>f) 32mm diameter vent with mosquito net</li> <li>g) Outlets as indicated on drawings with gate valve)</li> <li>h) 100mm diameter inlet with high pressure float valve</li> <li>i) Tank connectors for all incoming &amp; outgoing pipes</li> </ul> | No 2 |      |  |  |
| B | Allow for "Air" and "Water" test for entire installation to the approval of the engineer   | Item |      |  |  |
|   | <p style="text-align: right;"><b>Carried to Collection</b></p> <p>Section No. 6<br/>SECTION 6 - PLUMBING, DRAINAGE &amp; FIRE FIGHTING INSTALLATIONS<br/>Bill No. 2<br/>WATER RETICULATION<br/><b>177 - M&amp;A</b></p>  |      | KSHS |  |  |

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 2

WATER RETICULATION

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 2

WATER RETICULATION

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|         | <b>SECTION NO 6</b>  |          |      |        |
|         | <b>BILL NO 3</b>   |          |      |        |
|         | <b>RAIN WATER HARVESTING</b>   |          |      |        |
|         | <b>INTERNAL RAIN WATER INSTALLATION (ABOVE GROUND).</b>  |          |      |        |
|         | Supply, deliver and install the following for rain water drainage disposal from gutters via wall surfaces to ground disposal as shown on drawings:   |          |      |        |
|         | Supply and fix uPVC soil system to BS 4660 and 4515; and MuPVC waste systems to BS 5255 with screwed and socketed joints to BS 21  |          |      |        |
|         | Tenderer must allow in their pipe work prices for all the couplings, connectors, joints etc as required in the running lengths of pipe work and also where necessary, for pipe fixing clips, holder bats plugged and screwed.  |          |      |        |
|         | uPVC Soil System conforming to BS 4514. heavy gauge class 41 pipe work.  |          |      |        |
| A       | 200 mm diameter waste pipe   | m        | 384  |        |
|         | <b>Extra Over u.P.V.C soil pipe work for the following: -</b>  |          |      |        |
| B       | 200 mm diameter 90°/135° Sweep Bend  | No       | 48   |        |
| C       | 200 mm diameter tee  | No       | 48   |        |
| D       | 200 mm diameter galvanized steel fulbora rainwater outlet complete with dome type grating, flange, raising ring, PVC adaptor and other accessories including connection to uPVC downpipe. (Allow for a special removable mesh type grating to tap debris such as leaves) | No       | 12   |        |
|         | <b>Extra Over GMS class 'C' tubing as follows:-</b>  |          |      |        |
| E       | 200mm diameter Bend  | No       | 48   |        |
| F       | 200 mm dia. PVC Puddle Flange  | No       | 12   |        |
| G       | 200 mm dia. PVC 90o bends  | No       | 12   |        |
| H       | Excavate trench from ground level for all pipes, not exceeding 1,000mm wide and 600mm dee, part return, fill in, bailing or otherwise, cart away and make good.  | m        | 100  |        |
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|         | Bill No. 3   |          |      |        |
|         | RAIN WATER HARVESTING  |          |      |        |
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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 3

RAIN WATER HARVESTING

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 3

RAIN WATER HARVESTING

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|         | <b>SECTION NO 6</b>  |          |      |        |
|         | <b>BILL NO 4</b>   |          |      |        |
|         | <b>STACK PIPES AND EXTERNAL DRAINAGE</b>   |          |      |        |
|         | <b>INTERNAL RAIN WATER INSTALLATION (ABOVE GROUND).</b>  |          |      |        |
|         | Supply and fix uPVC soil system to BS 4660 and 4515; and MuPVC waste systems to BS 5255 with screwed and socketed joints to BS 21. Solvent welded joints shall be as per the systems manufacturer's written instructions.  |          |      |        |
|         | Tenderer must allow in their pipe work prices for all the couplings, connectors, joints etc as required in the running lengths of pipe work and also where necessary, for pipe fixing clips, holder bats plugged and screwed. The installation must comply with BS 5572. |          |      |        |
|         | <b>uPVC Soil System Heavy Gauge Class 41 Pipework</b>  |          |      |        |
| A       | 100 mm diameter Light Grey Soil Pipe   | m        | 450  |        |
|         | <b>Extra Over uPVC Soil Pipework for the following: -</b>  |          |      |        |
| B       | 100 mm diameter Light Grey 90°/135° Sweep Bend   | No       | 32   |        |
| C       | 100mm diameter Light Grey Single Branch Tee  | No       | 32   |        |
| D       | 100 mm diameter Light Grey Weathering Slate  | No       | 8    |        |
| E       | 100 mm diameter Light Grey Vent Cowl   | No       | 8    |        |
|         | <b>uPVC Buried Drain System Heavy Gauge Class 41 Pipework</b>  |          |      |        |
| F       | 100 mm diameter Golden Brown Buried Drain Pipe   | m        | 220  |        |
| G       | 150 mm diameter Golden Brown Buried Drain Pipe   | m        | 40   |        |
|         | <b>Extra Over uPVC Buried Drain Pipework for the following:-</b>   |          |      |        |
| H       | 100mm diameter Light Grey Access Cap   | No       | 36   |        |
| J       | 150 mm ditto   | No       | 45   |        |
| K       | 100 mm diameter Golden Brown Sweep Bend  | No       | 36   |        |
|         | <b>Carried to Collection</b>   |          | KSHS |        |
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|         | Bill No. 4   |          |      |        |
|         | STACK PIPES AND EXTERNAL DRAINAGE  |          |      |        |
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Bill No. 4

STACK PIPES AND EXTERNAL DRAINAGE

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SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 4

STACK PIPES AND EXTERNAL DRAINAGE

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|         | <b>SECTION NO 6</b>  |          |      |        |
|         | <b>BILL NO 5</b>   |          |      |        |
|         | <b>FIRE FIGHTING INSTALLATIONS</b>   |          |      |        |
|         | <b>Fire Hosereel Pump Set</b>  |          |      |        |
|         | Supply deliver and install the following pumpset.Where necessary items such as support brackets, screws,etc. must be included in the rates and all other necessary accessories to make the appliances operational. All connections to water supply are to be the responsibility of the contractor and must be priced for:-   |          |      |        |
| A       | <b>FIRE FIGHTING BOOSTER PUMP</b><br>Shall be as "DAVEY " automatic booster pump<br>model:DF6220 or approved equivalent.<br>Capacity: 9m3/hr<br>Head: 40m<br>Power supply: 2.4kw, 3phase 415V, 50Hz.<br>Duty and standby.<br>Complete with: matching pressure vessel, pressure switch, pressure cell, valves, and any other accessories necessary for efficient operation . Pump and accessories to be mounted on a rigid steel framework. | No       | 1    |        |
| B       | <b>PUMP CONTROLS</b><br>Supply, deliver and install a control panel with removable front access cover, motor control gear, internal buttons with automatic change over running and trip neon lights control system, overload, protection, power surge protection, button for change from automatic to manual operation plus any other necessary controls   | No       | 1    |        |
|         | <b>ELECTRICAL POWER SUPPLY</b>   |          |      |        |
| C       | Allow for pumps wiring from the local isolator.  | Item     |      |        |
| D       | Allow for priming and finish painting of installation with 3 No. coats of paint to the Engineers approval.   | Item     |      |        |
|         | <b>Carried to Collection</b>   |          | KSHS |        |
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|         | FIRE FIGHTING INSTALLATIONS  |          |      |        |
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|---|--|----|-----|------|
| <b>Fire hose reel</b>   |  |    |     |      |
| A   | Standard manual swinging fire hose reel comprising of 30m length of non-linking 19mm bore rubber hose wound on a metal reel with a hollow rotating shaft. The shaft shall be permanently connected to the water supply by a special pipe -work. One end of rubber hose shall be connected to a rotating shaft and the other to the shut-off nozzle. the hose shall conform to BS 3169 : 1981.To be complete with a 25mm diameter Gate Valve as <b>Pegler</b> . | No | 8   |      |
| <b>Supply and fix the following including all materials and jointing to supply pipes, supports, etc:-</b> |  |    |     |      |
| B   | 25 mm Nominal diameter GMS class 'C' Pipes.  | m  | 120 |      |
| C   | 50 mm ditto  | m  | 135 |      |
| <b>Extra Over GMS class 'C' tubing as follows:-</b>   |  |    |     |      |
| D   | 25mm diameter Bend   | No | 40  |      |
| E   | 50 mm ditto  | No | 40  |      |
| F   | 50mm diameter G.I Tee  | No | 10  |      |
| G   | 50 x 25 mm diameter G.I Reducer  | No | 10  |      |
| <b>Drain Valve</b>  |  |    |     |      |
| H   | 25 mm diameter high pressure drain valve, complete with matching diameter GMS union.   | No | 2   |      |
| <b>Air- Valve</b>   |  |    |     |      |
| J   | 25mm diameter automatic Air release valve as Glenfield No 1260'Apex' or equal and approved to be connected to the top of dry riser pipe in copper alloy to BS 1400 or BS2872.  | No | 2   |      |
| <b>Non - Return Valve</b>   |  |    |     |      |
| K   | 50 mm diameter non return valve as "Pegler", complete with matching diameter GMS union.  | No | 1   |      |
| <b>Gate Valve</b>   |  |    |     |      |
| L   | 50 mm diameter gate valve as "Pegler", complete with matching diameter GMS union.  | No | 4   |      |
| <b>Carried to Collection</b>  |  |    |     |      |
| Section No. 6   |  |    |     | KSHS |
| SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS  |  |    |     |      |
| Bill No. 5  |  |    |     |      |
| FIRE FIGHTING INSTALLATIONS   |  |    |     |      |
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**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

Section No. 6

SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 5

FIRE FIGHTING INSTALLATIONS

**COLLECTION**

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Section No. 6

SECTION 6 - PLUMBING, DRAINAGE & FIRE FIGHTING INSTALLATIONS

Bill No. 5

FIRE FIGHTING INSTALLATIONS

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**SECTION NO. 7**

**AIRCON & MECH VENT INSTALLATIONS**

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

| Item No |  | Quantity | Rate | Amount |
|---------|--|----------|------|--------|
|         | <b>SECTION NO 7</b>  |          |      |        |
|         | <b>BILL NO 1</b>   |          |      |        |
|         | <b>AIR CONDITIONING &amp; MECHANICAL VENTILATION</b>   |          |      |        |
|         | <b>GENERAL ITEMS</b>   |          |      |        |
| A       | Prepare and submit record (as-installed) drawings ,instruction charts, operation and maintenance manuals, etc. in an easily readable scale, A1 or A2 paper size format as follows;<br>i) general arrangement drawings of all equipment, plant etc.<br>ii) routes - types and sizes and arrangement of all pipework<br>iii) wiring(electrical & control) details<br>iv) any other details as per specifications<br>Drawings are to be submitted in soft copy (AutoCAD 2004 format) & hard copy to the client, the Architect and the Engineer.(3 copies of each) | Item     |      |        |
| B       | Allow for the preparation of working drawings in liason with the other subcontractors and the main contractor to the entire satisfaction of the Mechanical Engineer  | Item     |      |        |
| C       | Allow for testing and commissioning of Air-conditioning installations to the entire satisfaction of Mechanical Engineer.   | Item     |      |        |
|         | <b>AIR CONDITIONING</b>  |          |      |        |
|         | <b>Modular Variable Refrigerant Flow (VRF)</b>   |          |      |        |
|         | Supply, deliver and install the following equipment including their support brackets, screws,anti-vibration mountings etc. and all connections of refrigerant pipework, condensate drainage, and electrical power & control cabling:-  |          |      |        |
|         | Allow for 2 No. servicing of the A/C units within the six months Defects Liability Period. This include, but not limited to cleaning, checking and restoring to good operating/working condition.  |          |      |        |
|         | Replacement parts and materials are to be included.  |          |      |        |
|         | <b>Carried to Collection</b>   |          | KSHS |        |
|         | Section No. 7  |          |      |        |
|         | SECTION 7 - AIRCONDITIONING & MECHANICAL VENTILATION   |          |      |        |
|         | Bill No. 1   |          |      |        |
|         | AIR CONDITIONING & MECHANICAL VENTILATION  |          |      |        |
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**MODERN OFFICE BLOCK  
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|  |  |    |    |      |
|--|--|----|----|------|
| <b>Outdoor Unit</b>                                  |  |    |    |      |
| A  | Modular Variable Refrigerant Flow (VRF) air-cooled integrated Outdoor Condensing Unit of total cooling capacity <b>78.5KW</b> consisting of a 'header' unit and 'follower' units. Compressor to be hermetic scroll type, to serve multiple indoor Units. The preferred and approved model is <b>TOSHIBA or Equal and Approved</b> with the following;<br><br>Charge - R410a<br>& Liquid stop valves<br>piping for oil balancing<br>connections to match piping to indoor units<br>feet with anti-vibration mountings<br>input adequate for running all modules of condensor unit simultaneously.<br>must be able to restart automatically after power failure. | No | 1  |      |
| <b>Indoor Units</b>                                  |  |    |    |      |
| B  | VRF multi split High Static Ducted type ceiling concealed duct high static pressure indoor unit for cooling only with nominal cooling capacity of 14kW C/W LCD display with the following;<br>- easily cleanable air-filter<br>- Maximum sound level of 36 dB(A)<br>- Maximum air flow rate of 1620 m3/hr<br>- Condensate receiver (drain pan assembly) with drain tube & drain pump with 25mm dia. drain pipe. (Drain pump to have minimum lift of 300mm). size 1000 x 800 x 320mm high. 55kg weight<br>- Liquid & Gas (Flare) pipe connections (sizes to manufacturer's instructions).   | No | 1  |      |
| C  | Ditto but unit being 8.0kw cooling load  | No | 3  |      |
| D  | Ditto but unit being 7.1kw cooling load  | No | 3  |      |
| E  | Ditto but unit being 5.6kw cooling load  | No | 1  |      |
| F  | Ditto but unit being 3.6kw cooling load  | No | 3  |      |
| G  | Steel mounting brackets and supports to fix indoor unit to concrete ceiling slab. Steel frames to be RHS (32x32x3mm), galvanised steel (welded joints), finished in red oxide paint (two coats), fixed with rawlbolts and complete with anti-vibration mountings.  | No | 11 |      |
| H  | Construct plenum box at inlet and outlet of indoor unit with connections to flexible ducting. Plenum box to be fabricated to D/W 144 in galvanised steel duct (guage 22) complete with RHS frame (25x25x2mm), to be insulated on the inside of the in suitable polyurethane or equivalent material and painted in bitumen. and mounted suitably on steel frames externally.  | No | 11 |      |
| <b>Carried to Collection</b>                         |  |    |    |      |
| Section No. 7  |  |    |    | KSHS |
| SECTION 7 - AIRCONDITIONING & MECHANICAL VENTILATION |  |    |    |      |
| Bill No. 1   |  |    |    |      |
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|   |  |    |      |      |  |
|---|--|----|------|------|--|
| <b>Refrigerant Pipework</b>   |  |    |      |      |  |
| Hard drawn heavy gauge copper piping diameter complete with 20mm thick Closed Cell Rubber Insulation, necessary bends, reducers, 'Y' joints/branches, distributors, support brackets, etc, for SUCTION(gas) and LIQUID LINE for the following sizes:- |  |    |      |      |  |
| <b>Suction(Gas) Line</b>  |  |    |      |      |  |
| A   | 5/8  | m  | 85   |      |  |
| B   | 7/8  | m  | 85   |      |  |
| C   | 1 1/8  | m  | 45   |      |  |
| D   | 1 3/8  | m  | 45   |      |  |
| E   | 1 5/8  | m  | 85   |      |  |
| <b>Liquid Line</b>  |  |    |      |      |  |
| F   | 3/8  | m  | 85   |      |  |
| G   | 1/2  | m  | 85   |      |  |
| H   | 5/8  | m  | 45   |      |  |
| J   | 3/4  | m  | 45   |      |  |
| K   | 7/8  | m  | 85   |      |  |
| <b>Drainage pipework</b>  |  |    |      |      |  |
| L   | 32mm diameter high pressure condensate drainage pipe work complete with necessary bends, reducers, tees, supports, hangers & fixtures. | m  | 120  |      |  |
| M   | 25 mm diameter ditto   | m  | 120  |      |  |
| <b>Condensing Unit Support</b>  |  |    |      |      |  |
| N   | Allow for Hoisting and Installing the Condensing Units on the Mounting Platform at 7th floor roof level                                |    | Item |      |  |
| <b>Electrical works</b>   |  |    |      |      |  |
| P   | Electrical conduiting & wiring between indoor units and local DP switches.   | No | 11   |      |  |
| <b>Carried to Collection</b>  |  |    |      | KSHS |  |
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| SECTION 7 - AIRCONDITIONING & MECHANICAL VENTILATION  |  |    |      |      |  |
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|  |   |    |     |      |  |
|--|---|----|-----|------|--|
| A  | Electrical wiring & conduiting between outdoor unit and local isolator.   | No | 11  |      |  |
| B  | Control / Network Cables (4-pair shielded) to interconnect the Indoor Units which are on one circuit, and also to Outdoor Units.  | m  | 345 |      |  |
| C  | 400x100mm deep, perforated cable tray complete with horizontal support brackets all manufactured from galvanised steel for carrying refrigerant and condensate pipes, complete with angle iron supports and fixing bolts, and all other necessary accessories.  | m  | 300 |      |  |
| <b>Ductwork, Diffusers and Grilles</b>               |   |    |     |      |  |
| D  | Pre-insulated aluminium duct board constructed using PIRAL HD HYDROTEC coupled with polyester type sandwich panels including necessary Bends, Reducers, Transformation Pieces and jointing using special invisible flanges with unexposed bayonet coupling. The board to have the following attributes ;-external aluminium: thickness of 0,08 mm embossed protected w/polyester lacquer;<br>internal aluminium:thickness of 0,08 mm smooth protected w/polyester lacquer;<br>insulation component: water foamed polyurethane without use of CFC, HCFC or HFC, density of 50-54Kg/m3;<br>thickness: 20,5 mm;<br>Duct board to be as manufactured by P3 or equal and approved equivalent | m2 | 220 |      |  |
| E  | Supply and installation of Swirl supply air grilles with minimum of 6 M throw. External size: 600 x 600 mm complete with volume control damper. Neck size: 400 mm diameter.   | No | 66  |      |  |
| F  | "Waterloo Air Products Plastic" OBSS <b>perforated</b> air louvred ceiling return air double deflection grille (600mm wide by 600mm long) , having adaptable box  | No | 22  |      |  |
| G  | Insulated 500mm long, 500mm diameter flexible ducting reinforced with steel-wire helix. Insulation to be fibre-glass blanket or equal and approved material (minimum 25mm thick) with inner & outer jacket to be polyethylene film.   | No | 66  |      |  |
| H  | Non - insulated 500mm long, 500mm diameter flexible ducting reinforced with steel-wire helix.   | No | 22  |      |  |
| <b>TOILET EXTRACTION</b>                             |   |    |     |      |  |
| <b>Carried to Collection</b>                         |   |    |     |      |  |
| Section No. 7  |   |    |     | KSHS |  |
| SECTION 7 - AIRCONDITIONING & MECHANICAL VENTILATION |   |    |     |      |  |
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Section No. 7

SECTION 7 - AIRCONDITIONING & MECHANICAL VENTILATION

Bill No. 1

AIR CONDITIONING & MECHANICAL VENTILATION

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SECTION 7 - AIRCONDITIONING & MECHANICAL VENTILATION

Bill No. 1

AIR CONDITIONING & MECHANICAL VENTILATION

**177 - M&A**

**SECTION NO. 8**

**LIFT INSTALLATIONS**

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

| Item No   | Quantity | Rate | Amount |
|---|----------|------|--------|
| SECTION NO 8  |          |      |        |
| BILL NO 1   |          |      |        |
| LIFT INSTALLATION   |          |      |        |
| 1. PARTICULAR SPECIFICATION   |          |      |        |
| 1.0 Scope of Works<br>Not limiting Sub-Contractors obligations in terms of this specification.  |          |      |        |
| Name of installation: Proposed Kitui county assembly office block   |          |      |        |
| 1.1 Complete Lift Installation of Two (2) Passenger Lifts   |          |      |        |
| 2.0 DESCRIPTION OF TH LIFT SYSTEM   |          |      |        |
| The building block comprise of six (6) Typical floors, Ground Floor and the roof with One Passenger lift in duplex mode with shafts openings and stops and as detailed below.   |          |      |        |
| 2.1 Passenger Lifts<br>Number of units: Two (2)<br>Type: Passenger /Panoramic<br>Load: 1000 kg (Number of Persons-13)<br>Rated Speed: 2.5 m/s<br>Acceleration/deceleration rate: 0.8 m/s<br>Travel: 24 metres - Bidder to confirm on site<br>Number of Stops: Seven (7/7)<br>Number of Openings: Seven (7)<br>Car Entrance per Lift: One (1) per lift<br>Floor Designation: GF, F1, F2, F3 ... F6 |          |      |        |
| 2.2 Machine<br>Drive: VVVF<br>Machine: Geared MRL<br>Motor Room: Above<br>Roping: 1:1 or 2:1 roping<br>Re-levelling: As specified<br>Compensation: As specified<br>Safeties Car / Cwt: Car only   |          |      |        |
| 2.3 Control Operation<br>Operation: Duplex mode<br>Load Measuring: Over-load, landing call by-pass and anti- nuisance<br>Special Operations: Independent, fire control level 1 and emergency power control.   |          |      |        |
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| SECTION 8 - LIFT INSTALLATION   |          |      |        |
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| LIFT INSTALLATION   |          |      |        |
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Main landing fire control: Ground level (to be confirmed)  
Main landing emergency control: Ground level (to be confirmed)

#### 2.4 Landing Equipment

Landing door: 900 mm clear opening, 2100 mm high, Centre Opening for Passenger lift 1200 mm clear opening, 2100 mm high, Centre Opening for goods/service lift

Door Operator: Medium to Heavy traffic capabilities

Door Control: VVVF motion controlled

Indicators: Digital indicators (All floors) as specified

Waiting Lanterns: All Floors (Electronic illumination) as specified

Gongs: All Floors (adjustable Electronic) as specified

Number of landing risers: One

Call Buttons: Approved micro-push operation as specified

#### 2.5 Car Equipment

Number of C.O.P's: One (1) per lift

Protection Drapes: Yes

Position Indicators: Yes - in the C.O.P. as specified

Direct Arrows: Yes - in the C.O.P. as specified

Communication Equipment: No

Intercom: No

Piped Music: Yes

Call Buttons: Approved micro-push operation

Door Detector: Pana 40 3D or approved equivalent

Signage: Yes as specified

Emergency light unit: Yes as specified

#### 2.6 Power Supply

Power Supply: 415 volt, 3 phase, 50 hertz, with appropriate control switchgear

Feeder design: Lift Sub-Contractor to specify

#### 2.7 Shaft Dimensions

The bidder MUST state their minimum shaft requirements and provide advice on site during construction and the following inside dimensions and clear heights are shown below for guidance only;

Shaft Sizes: 2,000 mm deep x 2,100 mm width Panoramic passenger lift and 2550mm width x 2800mm depth

Headroom: 5,000 mm

Motor Room: No

Working Platform in pit: No

Overhead sheave platform: No

#### 2.8 Car Enclosure

Platform Size Lift 1: Lift Sub-Contractor to specify

Car Clear Internal Height: Ditto

#### 2.9 Finishes (Subject to final design and Client/Architect's approval)

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SECTION 8 - LIFT INSTALLATION

Bill No. 1

LIFT INSTALLATION

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The bidder shall take into account when sizing the drive and counterweight that the car interior shall be of a high standard and the weight of the interior shall be considered.

The bidder to enclose coloured brochures of the proposed car finishes in his submission.

Note that the Service lift to have a heavy duty canvas cover on all the four walls of the car.

Fixture Face-plates: 3.0 mm minimum thick SST with bevelled edges

Car COP faceplate: Full height SST (Satin # 4 finish)

Car Front: SST (Brush finish)

Car Doors: Stainless Steel (Brush Finish)

Landing doors: Stainless Steel (Brush Finish)

Floor: Non-slip rubber flooring

Base: Bidder to propose

Hand-rails: Stainless Steel (Brush Finish on Two sides)

Car Ceiling: White Metallic

Landing frames: Full reveal splayed, SST (Brush finish)

Mirrors: Full Width Mirror on Neat Wall

Car Side walls: SST

Car rear wall: SST

#### 2.10 Special Features

Motor room monitors / test tools: N/A

Remote monitor: N/A

Accelerometer test: N/A

Traffic Study: N/A

Car Load-weighing device: Strain Gauge as specified

Whisper Ride: N/A

Maintenance Manuals: Yes as specified

#### 2.11 Contractual

Contingencies: As per Price Schedule

Sub-Contractor's Project Manager: N/A

Retention: As per the Main Contract

Performance Guarantee: As per the Main Contract

Surety ship: As pr the Main Contract

#### 3.0 SPECIAL NOTES

##### 3.1 Installation Programme

Commence on: As per the Main Contractor's Program or as in offer letter

Final Hand-over: As per the Main Contractor's Program or as in offer letter

##### 3.2 Forward Cover

As an alternative, an amount for the purchase of Forward Cover to fix fluctuation at the Rate of Exchange shall be included and clearly shown in Section 4 of this Specification.

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SECTION 8 - LIFT INSTALLATION

Bill No. 1

LIFT INSTALLATION

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**3.3 Fixed Price**

As an alternative the price to fix escalation shall be included in the Tender and clearly shown in Section 4 of this Specification.

**3.4 Maintenance Agreement Prices**

A detailed breakdown of the maintenance prices applicable to the individual lifts after the twelve (12) months free maintenance period shall be clearly shown in Tender's supplementary documentation.

**3.5 Section 4**

Section 4 of this Specification must be completed in full.

**3.6 Lift Car Interior and Landing Finishes**

As detailed in Section 2 of this Specification.

Tenderers **MUST** attach colour brochures of the proposed finishes.

**4.0 SCHEDULE OF PRICES**

|   |  |      |   |
|---|--|------|---|
| A | Supply and deliver to site TWO (2 No.) 1000Kg, 13 passenger lifts equipment complete as specified with all the necessary accessories. (In a separate sheet, give detailed breakdown of the unit cost, import charges while stating the Exchange Rate and attach product colour brochure. | No   | 2 |
| B | Local Installation Labour, testing and Commissioning   | Item |   |
| C | Production of Working drawings, As-Installed drawings, Operation & Maintenance Manuals (three complete sets of each)   | Item |   |
| D | Miscellaneous: Sub-Contractor to describe any items there under if not priced above.   | Item |   |
| E | Maintenance price during the one (1) year Defects Liability Period.  | Item |   |

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SECTION 8 - LIFT INSTALLATION

Bill No. 1

LIFT INSTALLATION

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Section No. 8

SECTION 8 - LIFT INSTALLATION

Bill No. 1

LIFT INSTALLATION

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SECTION 8 - LIFT INSTALLATION

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**SECTION NO. 9**

**PROVISIONAL SUMS**

**Carried to Collection**

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**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

**Contingency Sum**

|   |   |                              |  |            |    |
|---|---|------------------------------|--|------------|----|
| A   | Provide the Provisional Sum of KShillings Ten Million Only (KShs 10,000,000/-) for Contingency Sum. | Item                         |  | 10,000,000 | 00 |
| Section No. 9<br>SECTION 9 - PROVISIONAL SUMS<br>Bill No. 1<br>PROVISIONAL SUMS<br><b>177 - M&amp;A</b> |   | <b>Carried to Collection</b> |  | KSHS       |    |

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Section No. 9

SECTION 9 - PROVISIONAL SUMS

Bill No. 1

PROVISIONAL SUMS

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Section No. 9

SECTION 9 - PROVISIONAL SUMS

Bill No. 1

PROVISIONAL SUMS

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**SECTION NO. 10**

**DAY WORK RATES**

**MODERN OFFICE BLOCK  
FOR  
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| Item No |   | Quantity | Rate | Amount |
|---------|---|----------|------|--------|
|         | <b>SECTION NO 10</b>  |          |      |        |
|         | <b>BILL NO 1</b>  |          |      |        |
|         | <b>Schedule of Daywork Rates - Labour</b>   |          |      |        |
| A       | 1.....  | Item     |      |        |
| B       | 2.....  | Item     |      |        |
| C       | 3.....  | Item     |      |        |
| D       | 4.....  | Item     |      |        |
| E       | 5.....  | Item     |      |        |
| F       | 6.....  | Item     |      |        |
| G       | 7.....  | Item     |      |        |
| H       | 8.....  | Item     |      |        |
| J       | 9.....  | Item     |      |        |
| K       | 10.....   | Item     |      |        |
| L       | 11.....   | Item     |      |        |
| M       | 12.....   | Item     |      |        |
| N       | 13.....   | Item     |      |        |
| P       | 14.....   | Item     |      |        |
| Q       | 15.....   | Item     |      |        |
| R       | Allow.....percent* of Subtotal for Contractor's overhead, profit, etc., in accordance with paragraph 3 (b) above. |          |      |        |
|         | * To be entered by the Tenderer.  | Item     |      |        |
|         | <b>Carried Forward to Summary of Section No. 10</b>   |          | KSHS |        |
|         | Section No. 10  |          |      |        |
|         | SECTION 10 - DAYWORK RATES  |          |      |        |
|         | Bill No. 1  |          |      |        |
|         | Schedule of Daywork Rates - Labour  |          |      |        |
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| Item No |   | Quantity | Rate | Amount |
|---------|---|----------|------|--------|
|         | <b>SECTION NO 10</b>  |          |      |        |
|         | <b>BILL NO 2</b>  |          |      |        |
|         | <b>Schedule of Daywork Rates - Materials</b>  |          |      |        |
| A       | 1.....  | Item     |      |        |
| B       | 2.....  | Item     |      |        |
| C       | 3.....  | Item     |      |        |
| D       | 4.....  | Item     |      |        |
| E       | 5.....  | Item     |      |        |
| F       | 6.....  | Item     |      |        |
| G       | 7.....  | Item     |      |        |
| H       | 8.....  | Item     |      |        |
| J       | 9.....  | Item     |      |        |
| K       | 10.....   | Item     |      |        |
| L       | 11.....   | Item     |      |        |
| M       | 12.....   | Item     |      |        |
| N       | 13.....   | Item     |      |        |
| P       | 14.....   | Item     |      |        |
| Q       | 15.....   | Item     |      |        |
| R       | Allow.....percent* of Subtotal for Contractor's overhead, profit, etc., in accordance with paragraph 3 (b) above. |          |      |        |
|         | * To be entered by the Tenderer.  | Item     |      |        |
|         | <b>Carried Forward to Summary of Section No. 10</b>   |          | KSHS |        |
|         | Section No. 10  |          |      |        |
|         | SECTION 10 - DAYWORK RATES  |          |      |        |
|         | Bill No. 2  |          |      |        |
|         | Schedule of Daywork Rates - Materials   |          |      |        |
|         | <b>177 - M&amp;A</b>  |          |      |        |

**MODERN OFFICE BLOCK  
FOR  
COUNTY ASSEMBLY OF KITUI**

| Item No |   | Quantity | Rate | Amount |
|---------|---|----------|------|--------|
|         | <b>SECTION NO 10</b>  |          |      |        |
|         | <b>BILL NO 3</b>  |          |      |        |
|         | <b>Schedule of Daywork Rates - Contractor's Equipment</b>   |          |      |        |
| A       | 1.....  | Item     |      |        |
| B       | 2.....  | Item     |      |        |
| C       | 3.....  | Item     |      |        |
| D       | 4.....  | Item     |      |        |
| E       | 5.....  | Item     |      |        |
| F       | 6.....  | Item     |      |        |
| G       | 7.....  | Item     |      |        |
| H       | 8.....  | Item     |      |        |
| J       | 9.....  | Item     |      |        |
| K       | 10.....   | Item     |      |        |
| L       | 11.....   | Item     |      |        |
| M       | 12.....   | Item     |      |        |
| N       | 13.....   | Item     |      |        |
| P       | 14.....   | Item     |      |        |
| Q       | 15.....   | Item     |      |        |
| R       | Allow.....percent* of Subtotal for Contractor's overhead, profit, etc., in accordance with paragraph 3 (b) above. |          |      |        |
|         | * To be entered by the Tenderer.  | Item     |      |        |
|         | <b>Carried Forward to Summary of Section No. 10</b>   |          | KSHS |        |
|         | Section No. 10  |          |      |        |
|         | SECTION 10 - DAYWORK RATES  |          |      |        |
|         | Bill No. 3  |          |      |        |
|         | Schedule of Daywork Rates - Contractor's Equipment  |          |      |        |
|         | <b>177 - M&amp;A</b>  |          |      |        |

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## **FINAL SUMMARY**

-11/1/1-