TECHNICAL SPECIFICATION

PRELIMINARIES AND PREAMBLE CLAUSES

"In interpreting the contract, in the event of discrepancies or conflicts:
A. Technical specification govern over plans
B. Plans drawn with largest scale govern, and figured dimensions govern over scaled dimensions"

1. These preliminary clauses apply to the whole of the work contained in these, bills of quantities, and to all variation, whether additions, omissions or alterations.

2. Methods of Measurements: -

Unless otherwise stated, all quantities are not measurements of the completed work do not include any allowance for laps, waste, change in volume etc.

The rates inserted by the tenderer against each item shall, unless otherwise stated in the item or unless there are separate items for extra work, include all labours, waste of materials in mixing, working or cutting etc, transport and everything else necessary for the proper completion of each item and for overhead expenses and profits.

NOTE:-

Each item includes for the provision of all local materials and labour (provide, manufacture and fix) unless described as FIX ONLY. Each item should therefore be properly priced on the understanding that the prices quoted should include for cost of local materials, labour, overhead expenses and profits and for obligation and liabilities of the Contractor in execution and completing the work. Where items are specified as FIX ONLY, the Contractor should allow for transportation of materials from the stores of the supplier, provided these stores are within the town boundary or as otherwise stated, to the sites of the work attending to supplier for insurance survey, fixing into brickwork or concrete in accordance to manufactures instructions and in position as shown on drawings; allowing for all matters as described under each item.

If any item in the preliminaries or in other parts of these bills is not priced, it will be deemed that the Contractor has made due allowance for it in the rates for the other.

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3. Dimensions: -

All dimensions whether on the drawings or in the Bill of Quantities, shall be checked on the site from the buildings as it progresses and where necessary amended to fit within actual size of the buildings.

Figured dimensions shall be preferred to scale measurements.

4. Definitions and Abbreviations: -

mm	Millimetre
m^3	Means meter cube
m^2	Means meter square
m	Indicates meter or linear meter
Nr.	Means number (No.)
Kg	Means Kilograms
Ditto	Means the same or do
PPR	Polypropylene Random Copolymer
POP	Plaster of Paris
PVC	Polyvinyl chloride
Contractor	Means the person, firm or company with whom the contract is made with Qatar Charity.
Engineer	Means the Qatar Charity Project Officer or person, and their properly authorized assistants and inspectors, designated by Qatar Charity to prepare plans and administer construction.

5. Provisional items:-

Will be the subject of decisions to be made during the progress of the work and therefore will be re-measured when completed. Therefore, no such work is to be covered up until measurements or levels have been taken, agreed by the Engineer and recorded. All alternative items are to be priced but not included in the total amount of the tender, unless otherwise stated.

6. Errors in Quantities: -

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Any approved error in the quantities given in these bills of quantities will be subject to an adjustment in the Final measurement in the same manner as alterations to plans.

The Contractor, will have no further claims what-so-ever, whether in respect of surplus or shortage of materials ordered, work incorrectly executed, loss of profit or any other matter.

7. Extra Charges: -

The Contractor shall be deemed to have satisfied himself with regard to roads and communications available to the site. No claims by the Contractor for additional payment will be allowed on the ground of any misunderstanding with respect to any such matter or otherwise on the grounds of any allegation or fact that incorrect information was given to him by any person on his parts to obtain correct information, nor shall the Contractor be relieved from any risks or obligations imposed on or undertaken by him under this contract on any such grounds or on the grounds that he did not, or could not foresee any matter which may in fact affect or have affected the execution of the Works.

8. Clean up: -

The Contractor shall at all times keep the site free from all rubbish and debris arising from the execution of the Works, on completion, the whole of the work shall left clean.

All debris, dirt splashes on works of all kinds, shall be removed and the buildings and site left to the satisfaction of the Engineer.

9. Errors in Contractor's Tender: -

Before the acceptance of a particular tender, the Contractor's price bills of quantities will be checked by the Engineer and all arithmetical errors will be corrected and agreed upon. Their tender will be increased or decreased before acceptance as necessitated by the above.

PREAMBLE

1. The Contractor shall read the specification clauses before he quotes his rates for the work and his rates shall include the cost of the materials to be used and the labour required for the execution of the Works as described in this specification, which is to be strictly observed except in so far as otherwise provided in the Bill of Quantities or the schedule of

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rates and prices. All materials used have to be previously approved by the Engineer.

1.1 The excavation dimensions have been taken net and perpendicular and no allowance has been made for any increase in bulk after the earth has been excavated or for sloping sides. The widths of the trenches is given as the actual width of the built foundation.

2. The rates of excavation shall include: -

a. Provision and maintenance of all tracks and roadways necessary for the proper execution of the work all such work to be approved, before being put in hand.

b. Allowance for the extra labour involved for excavating in the foundations of any existing buildings, for those of the new building, and for such shoring, planking or strutting as may be required.

c. Setting out the Works. The Contractor will be held responsible for the accuracy thereof.

d. Digging and carting away all vegetable earth from the site of the building or transporting and depositing where directed.

e. Keeping topsoil, relevelling or shaping to contoured gardens etc., as may be directed by the Engineer.

f. Allowance for pumping all excavations free of water as may be necessary and the provision of all necessary board, coverings etc. to protect excavations from flooding by rain as may be directed by the Engineer in charge of his representatives.

g. Back filling around foundations with soil, as specified below, paragraph 5.

h. Blasting: if blasting is considered necessary by the Contractor it shall be done on his own responsibility after taking all reasonable precautions for the safety of persons and property and obtaining any necessary permits.

3. The Contractor shall cover up and protect from injury all materials as directed by the Engineer, such as stone, brick, tiles etc., including the protection of columns, moulding, reveals etc.

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4. The Contractor shall arrange for a temporary water supply and for electric lighting power where required on the site, for the erection and completion of the Works and shall pay all charge for the installation, use and clearing away on completion, unless otherwise stated.

5. The Contractor shall provide a suitable toilet for the use of workmen all to the satisfaction of the sanitary authorities and the Engineer. The Contractor must keep it clean and clear away on completion. He shall also provide a first aid dressing case holding wound dressing etc, required for first aid.

EXCAVATOR

The Contractor on entering upon the site shall break down any old walls, or walling including foundation cut down trees or bushes, as may be required and either grub-up their roots or burn them with paraffin, as may be directed, remove all the resulting and other debris, fill in all holes and generally level and prepare the site for building operation.

The Contractor is advised to visit the site and ascertain for himself the nature of the soil to be excavated and the prices quoted for excavation are to include for excavation in any type of soil except rocks, (that need blasting).

The item `Soil` is to be deemed to include made up ground, bricks rubble or all other substance whether or not such substances are part of the natural formation.

1. The excavation shall proceed in such a manner as the Engineer or his representative may direct the Contractor, however, shall be solely responsible for the safety of any adjoining property and he must satisfy himself that the procedure directed by the Engineer or his representative will enable him to complete the foundations without damage.

2. Excavate for all walls, piers and other foundations to the depths, widths and inclinations shown on the drawings or to such other depths as may be direct by the Engineer or his representative and deposit sufficient soil for all refilling of trenches as may be necessary or demanded, removing any surplus.

3. No work shall be backfilled until approval has been obtained from the Engineer or his representative. The earth shall then be brought back from the place where it was temporarily deposited and the trenches or the excavations shall be filled up to the height of the original surface with earth in layers of not more than 25cm, in thickness. Each layer shall be

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well watered and rammed and consolidated as may be required, all to the directions and satisfaction of the Engineer or his representative.

4. Provide all materials and labour for making good all settlement and keeping in repair the surface of any road, footway or areas upon the site during the whole period of the Works are in his hand, and for a period six months after the completion of such works, and in case he neglects or refuses to make good and settlements in any trench, or other area whether public or private, the Engineer or his representative may have such works or necessary repairs carried out by other persons and the expenses thereof shall be paid by the Contractor, or deducted from any money that may be due to him or shall be paid by the sureties.

5. Remove all building debris and clear the whole of the site on completion, to the satisfaction of the Engineer or his representative.

6. No sand or any other materials found or excavated on the site may be used in the work unless written permission has been obtained from the Engineer if it is agreed to make use of any such materials for back filling around foundation, the material must be clear of rock and rubbish. The total price to be paid shall be agreed upon and the value deducted from sums due to the Contractor.

7.a. The filling under floors, where shown in the drawings shall be clean desert or drift sand, deposited in layer not exceeding 15cm in depth, each layer being well rammed, watered and compacted to a minimum of 90% Modified Proctor Test. The compaction shall be verified and approved by the Engineer.

b. Hard Core Filling: Hard core is to be formed or clean, hard broken stone that will pass in all directions through a 100mm diameter ring. Only sufficient sand is to be mixed with the hard core as will completely fill the interstices and aid in the work of consolidation. Hard core is to be well packed, rammed and, where possible rolled with a heavy roller.

CONCRETOR

10. Cement: -

Whatever is source, shall comply with the latest approved standard specification for ordinary Portland cement. It shall be delivered to the site in sealed bags as received from the supplier and shall be stored in such manner as to keep it dry, ventilated and sound. The cement shall not be stored higher than two meters. If the Engineer considers, a shed is necessary for this purpose, the Contractor shall provide and erect one at his expense.

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Cement shall be used in the order delivered. It shall be checked and tested before being used. Each bag, even partially set, has to be immediately removed from the site. Different kinds of cement should be stored in such a way that one should not be mistaken for the other.

11. Aggregates: -

Shall be obtained from an approved source and shall comply with the following:

a- Sand:-

Shall be natural sand or crushed gravel or stone clean sharp, coarse grift, pit or river sand free from silt, dust, clay, salt or any other matter, shall pass a 3/16'' (4.7 mm) square mesh and shall be the best reasonably obtainable for the work. All sand shall be washed and sieved as often as is required to make it conform to this specification.

b. Coarse aggregate: -

Shall be natural gravel, stone or other approved materials hard strong and durable, non porous free from adherent coating or other harmful matter and shall pass or be crushed to pass the meshes specified in the concrete mixes and be well graded by sieving and combination where necessary down to a minimum mesh of 3/16'' (4.7 mms) coarse aggregated shall be washed as often as is required to make it conform to specification.

c. Granite Chipping: -

Shall be approved tone graded from 3/8'' (9.4 mms) and otherwise in accordance with the above. As a aggregating shall be piled in approved positions selected to prevent contamination.

12. Water: -

Used in the Works shall be from a source approved by the Engineer free from oil, acid alkali vegetable and organic or from any matter harmful to any material with which it is used. If available, a drinking water pipe supply shall be used provided that it has no pronounced odour or taste.

13. Concrete Mixes: -

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The following mixes, which are normally used, are measured by volume using machine mixers. For hand - mixing the quantity of cement shall be increased by 10 percent. The volume of sand - the dry volume of sand if damp, the volume shall be adjusted as instructed by the Engineer, to allow for the greater volume of sand damp. Measuring shall be carried out accurately without consolidation in undamaged boxes or tins of approved shapes.

a. Mix "A" Concrete (Plain Concrete):-

For unreinforced concrete:
Minimum Concrete 28 days compressive Strength shall be 10(N/mm^2)
Maximum Slump is 11 cm
Maximum Water-Cement Ration is 0.50

1 Part Portland cement (but not less than 150 kg. per M^3 concrete)

3 Parts sand.

6 Parts coarse aggregate to pass 1 1/2 square mesh (40mm)

b. Mix "B" Concrete Reinforced Concrete :-

Minimum Concrete 28 days compressive Strength shall be 25(N/mm^2)
Maximum Slump is 10 cm
Maximum Water-Cement Ration is 0.50

1 Part Portland cement (but not less than 250 kg, M^3 concrete)

2 Parts sand

4 Parts coarse aggregate to pass 3/4" mesh (20 mms) well graded

14. Mixing: -

The concrete shall be mixed on the site in an approved efficient mechanical mixer, the materials shall be poured dry in the machine, a measured and approved quantity of water shall be accurately added from tested measuring tank attached to the machine and the mixing continued for at least two minutes after the addition of the water or longer if

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necessary, until the mass in uniform in colour and consistency. No more water shall be used than is necessary to produce a workable mix.

Hand Mixing: -

If approved, shall be carried out on a clean, raised close jointed platform of adequate size for each batch. The materials shall be turned over twice in the dry state to mix thoroughly water, shall be added through a rose, and the mass turned over at least twice in a wet state to produce a workable mix with the minimum of water, of uniform colour and consistency.

15. Placing: -

Concrete shall be transported and placed as near as possible to its final positions, in such a way as to prevent segregation of the ingredients. It is strictly forbidden to pour concrete from a higher fall than 1.00 meter without using hoppers, which will, be approved by the Engineer.

All concrete shall be well tapped and thoroughly worked into position to exclude all voids and air holes. Successive layers not exceeding 30cm, each shall follow rapidly to prevent distinct joints between them and the sum of previous layers shall be removed.

If concrete has been in position 30 minutes. The Engineer may require that no more concrete may be placed in contact there with until 24 hours have elapsed. Should the concrete has been laid 24 hours, the set surface shall be scrubbed with a hard steel wire brush dusted and saturated with water and the concrete shall be well rammed in contact when the concrete has been laid more than seventy two hours in addition to the above, the surface shall be chipped. In both cases thick slurry of neat cement must be applied first before the new concrete is to be poured allowed to pour concrete.

If necessary the concreting shall be completed in one operation. Where breaks cannot be avoided, these shall occur in positions approved by the Engineer and be of the form approved by him on resuming, the surface shall be treated as previously stated.
Concrete shall be mixed until there is a uniform distribution of materials and shall be discharged completely before the mixer is recharged.
Ready-mixed concrete: Shall be mixed and placed before the initial set has occurred, and in no event after it has contained its water content for more than for more than 30 minutes.
Placing: All concrete shall be placed upon clean, damp surfaces free from running water. Concrete shall not be placed in water nor shall water be allowed to rise over freshly-placed concrete until the concrete has

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obtained its final set. All concrete shall be deposited in approximately horizontal layers and concreting shall be carried on as a continuous operation, as far as practicable, until the placing in the section is completed. Concrete shall be internally vibrated during pouring operation to avoid honeycombs.
Concrete that has partially hardened or been contaminated by foreign materials shall not be deposited in the structure.
Construction Joints: Where construction joints are required, they shall comply with the following:
Surface cleaning, The surface of concrete construction joints shall be cleaned and laitance removed.
Joint treatment, immediately before new concrete is placed, construction joints shall be wetted and standing water removed.
Location in slabs, beams and girders, Construction joints in floors shall be located within the middle third of spans of slabs, beams and girders.
Vertical support, Beam, girders or slabs supported by columns or walls shall not be cast or erected until concrete in the vertical support member is no longer plastic.

16. Vibration of Concrete:-

All reinforced concrete shall be vibrated, by a mechanical `immersion` or `pocket` type vibrator of tubular form for pillars and beams and ` Pan Vibrator` for slabs floor or rafts. External vibrators may be used if it is impossible to insert an immersion vibrator (very narrow section, or very heavy reinforcement).

Vibration of concrete shall be carried out carefully and all form works should be properly reinforced with extra bracing and battens.

17. Curing: -

Concrete shall be kept wet 10 days wetted sacking or layer of dry sand minimum 4cm, thick which must be sprayed wet, after it has been laid on the concrete or in any other way as directed to protect it from drying effects of winds or sun and from all running water. It must also be protected from vibration and shocks for at least seven days and no further loads or any type shall be applied during this period, concrete surfaces to receive any paving must be made rough directly after laying.

18. Samples and Tests:-

1. The Contractor shall allow for taking samples of same concrete at any stage of the work, the Engineer or his representative shall take slump-test and cubes for crushing test, the Contractor shall be

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responsible for curing the cubes after removing them from the metal forms and for cleaning greasing and reassembly of metal forms.

2. Test on ingredients for concrete and cement mortar shall be carried out at the Contractor`s expense with such frequency as the Engineer or his representative may require. The frequency of test will be governed by the uniformity of materials subsequently delivered and type of structure in which the concrete is used.

19. Tests of Concrete :-

1. The strength of the concrete shall be tested in accordance with B.S. Code of Practice CP 114 (1948) or the IBC of 2003 and the latest version of the American Concrete Institute (ACI 318). Compressive strength tests shall be performed after 7 days and after 28 days curing. The 7 days concrete compressive strength shall achieve, as minimum, 60% of the 28 days design compressive strength value. Not more than one cube in every 50 tested shall fail to reach the minimum strength specified and in case more than one cube fail on any one day this respect.

2. In the event of the number of failures exceeding the limits specified the Engineer or his representative shall have the power to order the demolition of such parts of the Works which have been constructed with concrete shown to be deficient in strength and in that case the Contractor shall repair such works with satisfactory concrete; all at his own expense

   The Engineer or his representative may order tests to be made of the concrete in the finished structure in such manner as may be appropriate to the particular conditions or parts of the Works. The concrete may be loaded `in situ` or test sections may be ordered to be cut out or drilled with a diamond drill should such tests prove that concrete is satisfactory, they shall be paid for together with the making good to the structure. If however, the concrete shall have been found to fall short of the specified requirements, the Engineer or his representative may order the whole of the defective materials and work to be cut out and replaced by the Contractor without further charge.

20. Anchors:-

Where concrete is covered and /or jointed by brickwork in vertical position anchors of 1/4" rod reinforcement 50cm long shall be but into formwork at distance of 50cm in run or square.

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21. Formwork (Shuttering to concrete): -

a. **General :** The Contractor shall be responsible for the supply design, support, erection, welding, casing, striking and removal of formwork. The design and strength of formwork and supports shall be such as to ensure it to remain rigid; to preserve the concrete during laying, setting and curing and shall allow for all live and dead, self and superimposed loads. The timber shall be sound and seasoned and edges shall be shot and close-jointed to prevent undue loss liquid from the mix. The design and assembly shall be such that the formwork can be eased and struck without shock, vibration or damage to the concrete. Where concrete is to be plastered or rendered, a sufficient key shall be provided if necessary, by re-hacking.

b. **Cleaning:-** The interior of the formwork shall be cleaned of all rubbish and debris and thoroughly wetted or treated with an approved non-staining moulding oil before the concrete is poured. Guide-bars must be used to ensure the thickness of any concrete constructions.

c. **Striking :-** The formwork shall not be struck until the concrete is sufficiently set to take all loads without damage, and until the Engineer's permission has been obtained. It shall be carried out without damage or careless striking. The minimum periods of time shall elapse between the pouring of the concrete and striking or slackening the formwork on the various classes of work shall in the absence of particular requirement for special structures or conditions to be laid down from time to time by the Engineer be as follow:

Class of work for normal type of cement:

Walls	36 hours
Side of beams	48 hours
Short columns	48 hours
Long columns	5 days
Soffits of beams and Horizontal and inclined slabs	10 days

d. **Wrought Formwork:** Where the face of the concrete is to be left exposed and visible decorated, without the use of plaster, wrote formwork or approved steel formwork is to be used, such formwork shall be as before and shall also have a smooth and true face where in contact with the concrete, after striking and inspection.

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The faces shall be rubbed over the cleaned up all joints, grain and knot marks removed and left fair even and smooth.

Slurring over and patching will not be permitted and stopping must not be excessive.

e. **Re-use:** When re-used, formwork must be clean, free from old concrete and in accordance with the above requirements. Timber used as formwork shall not be incorporated in the Works as carpentry or joinery timber.

22. Reinforcement:-

Shall be designed and placed as shown on the drawing and bending schedule and in accordance with the following:

(A) (i) Rod reinforcement shall be of mild steel conforming to B.S 785. Mesh reinforcement shall comply with B.S.4483. Materials, which at any time show signs of brittleness of cracking shall be rejected and removed from the site.

The Contractor shall allow for taking three samples of every thickness of the reinforcement rods, at any stage of work and depositing them with the Engineer.

(ii) High Tensile (H.T.) steel reinforcement shall be either cold worked steel bars of circular or octagonal section complying with B.S. 1144 or hot rolled high tensile bars having a guaranteed minimum yield stress of 60.000 Ibs. per sq. inch and other physical properties in accordance with B.S. 1144 the overall size of any bar shall not exceed its nominal size by more than 10 percent. All reinforcements shall be in the ''diameter'' range and the substitution of `Square twisted` range shall not be allowed.

(iii) **Test:** if required by the Engineer, the Contractor shall submit that his own expense certified test data of the following characteristics:

a- Ultimate tensile stress

b- Yield point stress

c- Elongation

d- Cold bend test

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Should such certificates not be submitted by the manufacturers, the Contractor shall also have the requisite tests made at his own expense at approved testing laboratories.

(b) All reinforcements shall be stored in such a manner as to prevent deterioration. Before being placed in position and before the concrete is poured, it shall be clean and free from loose rust, scale, oil, grease, paint or other matters liable to weaken the bond of the concrete to the steel.

(c) Reinforcement shall be cut and bend cold. Hooks cranks overlaps etc. shall be as shown on the bending schedule or details. Hooks shall have an inner diameter of four times the rod diameter and the straight return beyond the bend shall be at least four times the rod diameter. All edges of rods in tension shall be hooked, and connected longitudinally shall have an overlap of at least 40 diameter in beams and slabs.

(d) Welding will not be permitted unless special approval is obtained.

(e) Reinforcement shall be accurately placed and maintained in position with precast concrete blocks while the concrete is poured and rammed.

Minimum Concrete Cover:
Concrete cast against and permanently exposed to earth: 75mm
Concrete exposed to earth or weather: 50mm
Concrete not exposed to weather or in contact with ground: 25 mm in beams and 20mm in slabs

(f) Rods, stirrups, etc. in contact shall be tightly wired with malleable soft iron wire not less than 16 S.W.C.

(g) Mesh reinforcement shall be laid with the long way of the mesh spanning from support and shall have laps equal to 40x the diameter of the bars, and where these are two layers of fabric the laps shall be staggered in both direction all laps shall be securely wired as above to prevent movement.

(h) Gang-boards and supports shall be laid over the reinforcement to prevent damage and heading down after it has been placed in position. Special attention should be given to cantilevers.

(i) The Contractor shall notify the Engineer when concreting is about to commence to each section of the work and no concrete shall be

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poured until the Engineer or his representative has approved the reinforcement and formwork.

23. Rates: -

The rates for concrete, reinforced or otherwise, shall include the full price concrete excluding reinforcement unless otherwise stated and allow for throats fillets etc. and also for careful striking cleaning of all faces rubbing them down and removing all projecting lips, splayed edges and notching.

BRICK LAYER AND MASONRY

24. Brick: -

Bricks shall be well burnt red-clay bricks of the best quality obtainable, hard square, sound and even in size containing no ungrounded particles of lime. Bricks laid below ground level shall be selected on the site for the greatest hardness and least porosity bricks to be left exposed shall be selected on the site as those of the best shape, regularity and appearance.

The Contractor shall allow for taking samples at every delivery of bricks on the site at any stage of the work and depositing them with the Engineer.

Hot Weather Construction: When the ambient temperature exceeds 46°C or 40°C with a wind velocity greater than 13 km/h, sand piles shall be maintained in a damp, loose conditions and the following requirements also apply:

1. Temperature of mortar shall be maintained below 49°C.

2. Mixers, mortar transport containers and mortar boards shall be flushed with cool water before they come into contact with mortar ingredients or mortar.
3. Mortar consistency shall be maintained by re-tempering with cool water. Mortar shall be used within 2 hours of initial mixing.

25. Workmanship:-

The concrete foundations or concrete floors shall be cleaned from earth, dust debris, etc, and wetted before bricks, blocks or stone are laid.

All bricks shall be thoroughly soaked by immersion under water until they are saturated and shall be laid wet and kept wet after bedding for at least seventy-two hours.

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Brickworks shall be thoroughly wetted before further brickwork is built from or bonded into the same. All joints shall be well flushed up at every course with full beds of mortar and the vertical joints completely filled.

Perpends shall be maintained and quoins, reveals and jambs shall be plumb and true. No portion of the walls shall be raised more than 1.5 meters above any other part at one time without the consent of the Engineer or his representative temporary changes of level occur, the work shall be racked back not toothed.

26. Course Heights: -

The Engineer's instructions are to be obtained and followed with regard to the height of course, but in general course heights shall be 7.5 cms, approx., and Mortar joints approx. 1 cm. thick. The course shall be set out so that bed joints occur in line with sills, Lintels and other feature and cut courses are to be avoided as far as possible, course heights shall not vary throughout the building, each course shall be level throughout the building.

27. Bond:-

The bond commonly used shall be English bond (alternated course of header and stretchers bricks) or Flemish bond (alternated headers and stretchers in each course). The prepends broken one-quarter brick length (6cm), half-brick walls shall be broken in stretcher bond the prepends broken one-half brick length (12cm).

Stretchers courses shall consist of whole bricks except where closer are necessary. Header course may include snap headers but these shall be separated by at least two whole bricks, no piece shall be less than 8cm long and the two pieces used to make one brick shall not require a joint less than 1cm nor more than 4cm. All corbels overstating etc. shall be in whole bricks except where closes are necessary.

28. Pointing:-

All external and internal brick work where left exposed, shall be finished to an even true fair-face with one of the selected types of joints:

a) Struck
b) Weathered
c) Stripped
d) Flush or plinth as stated in the Bills of Quantities pointing will be
e) V shaped carried out as the work proceeds

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f) Concave or roded
g) Flush and roded
k) Beaded

29. Horizontal Damp-Proof Course:-

The damp proof course shall be one layer of Ruberoid three ply rooting felt and on the required widths, fully lapped at angles; and breaking joints at least 30cm bedded in a level bed of special compound.
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30. Plaster Key:-

Shall be formed on brickwork to be plastered by raking out all vertical and horizontal joints to a depth of 2cm. While the walls being built.

31. Rate: -

The prices of brickwork shall include all materials labours, scaffolding, cutting to form bond, openings, holes etc. and for all templates and moulds of each and every kind that may be required, except those stated under separate extra items.

ROOFER

32. Water Proofing of Flat Roof with Ruberoid Roofing Felt:-

Coat concrete surface and part of parapet uniformly with ruberoid special bitumen (while hot), lay three plies asphalt roofing felt without wrinkles or buckles, lap each sheet 12" (or 18") over preceding sheet, mop with ruberoid special bitumen the full 12" (or 18") on each sheet so that in no places shall felt touch felt, roofing felt shall be raised on parapet and cut off as stated in Bills or as shown on drawing over entire surface pour one uniform coat of ruberoid special bitumen and spread over it a thin layer of clean sharp sand.

33. Water Proofing of Roof with Flintkote and Fibber Glass Veil:-

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a- Clean surface or R.C. slab and 10 or 20cm high skirting on parapet, and apply by brush on the whole surface with type 3 Flintkote Emulsion mixed with water at the rate of (0.25, of flintkote per square meter).

b- When this is dry apply neat coat of type 3 flintkote Emulsion at the rate of (0.50 kg) per square meter by brush.

c- Apply over previous coat and on the whole surface of slab and 10cm. high skirting on beams or parapet walls a neat coat of type 3 Flintkote Emulsion at the rate of (0.50 kg) per square meter and while still wet, lay over it Fibber - glass veil as membrane overlapping 10cm. well embedded in the coat of emulsion and allow to dry.

d- Apply a final coat over the whole surface and over 10cm high skirting of reversed beam or parapet walls Flintkote type 3 emulsion at the rate of 1 kg per square meter.

The whole work shall be carried out to the full satisfaction of the Engineer the ''Fibber glass veil shall be to the approval of the Engineer and of approved manufacturer.

34. Rates:-

The rates for all roofing materials shall include all laps cutting bedding, materials and labour, compound and all other items tabulated on the finished net surface areas without allowance for laps. The Contractor shall make allowance for extra quantities at the laps as described in bills.

35- Insulation to Roof with lime: - Concrete Gauged in Cement (Khafgy): -

a- Concrete with aggregate of broken red bricks composed as follows 1 part hydrated stone lime, 2 parts coarse sand and 4 parts approved broken red bricks to pass 1 1/2` mesh all mixed and watered for at least 4 days to mature. Then 8 parts of this mix gauged with 1: part cement laid in-situ, 7cm, minimum thickness, to falls on concrete roofs and left rough to receive a blending surface.

b- Lime concrete surface finishing on khafgy:-

Finishing khafgy surface with a blinding screed (2cm minimum thick) of gauge lime mortar composed of 1 part hydrated stone

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lime, 2 part sharp and 1 part hora (red bricks powder) all mixed and watered for at less 4 days to mature, then 8 parts of this mix gauged with 1 part cement are laid and spread well worked in lime concrete base (while green) with a steel trowel (smoothly finished) All mixing operations and curing are as concreter and or as directed by the Engineer.

36. The Steel Doors and Windows: -

Required, shall be obtainable from approved markers. The Contractor shall obtain the Engineer's written approval of the full specification of the illustration if required.

a. Painting of steel work:-

Preparation of surface and paints to be as specified in Painter and Decorator all steel work, except steel work which is to be embedded in concrete or on which welding is to be carried out on site, to be painted one coat of primer at works before dispatch: after erection one further coat of primer to be applied after touching up original coat where necessary. Steel work for welding on site is to be dispatched unpainted immediately after dislagging, inspection and approval, such steel work is to be coated one coat of primer on site before erection, and a further coat of primer immediately after erection.

All steel work to be painted one coat of undercoating paint and one coat of finishing paint in addition to priming. Meeting surfaces in permanent contact after assembly to be painted with red lead primer before riveting or bolting, the surfaces being brought together while the paint is still wet.

PLASTERER

37. Materials: -

Generally materials shall be as specified in `Contract` but the sand shall be sharp sand of the fineness required to produce the specified finish.

38. Lime: -

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For plaster work and specially for use with Portland cement, shall be hydrated lime and used in the form of a carefully slaked and matured putty perfectly free from slow slacking particulars.

39. Gypsum:-

Shall not be mixed with Portland cement for any building work and shall not be used in direct contact with metal.

40. All joints in brick work which have be plastered shall be raked out 1cm, deep as a key for the plaster, this is included in bricklaying.

41. Dubbing Out: -

The rates shall allow for all dubbing out to make up any uneven surface of walling before the first coat of plaster is applied and for horizontal guides out of the same mix as for the second coat. The thickness specified for plaster shall be in addition to any dubbing out.

42. Preparation:-

All surfaces to be plastered shall be clean, free from dust and thoroughly wetted immediately before the plaster is applied.

43. Mortar:-

Containing cement shall be used within one hour of cement being added, knocking up and re-tempering will not be allowed.

44. Sample Areas:-

May be required by the Engineer for his approval. They shall be hacked off and cleared away as required.

45. Cut out and making good all defective work and leave the whole to the satisfaction of the Engineer.

46. Internal Plaster:-

Shall be the mix and mortar specified. It shall be 2.5cm. Thick finished to a true and even surface with a wood float corners of building shall be finished true, vertical even and done together with the rest of the wall surfaces. All surfaces to be plastered shall be cleaned and left free from grease dirt loose or projecting mortar and should be well wetted before

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the work is executed. Finished plastered surfaces shall be left true, even and free from blemishes.

47. External Tyrolene Finish:-

All surfaces shall be treated as specified in previous paragraph; surfaces shall be properly raked out on all joints, surfaces plastered in the mix specified and in; the same way as stated in previous paragraph with keycomb marks left in the finished plastered surface to from key Tyrolene.

The finished coat shall be sprayed by Tyrolene machine with mix c (1.1) to the colour specified and with even thickness right through the whole work. Tapping shall be specified if desired in the mix and should be done in a proper and manlike manner. All exposed concrete surfaces should be hammer stricken before plastering. Samples should be provided and approved by the Engineer before commencing on the mass work required.

Discoloration shall be rejected.

48. Cement Render:-

Where specified shall be out of the mix required, 2cm thick finished with a steel trowel and wooden float where painted.

49. Measurements:-

Quantities are calculated net; openings are deducted, any plastered part of 30cm width or less is measured separately under narrow width.

50. Rates:-

Shall include of all scaffolding, dubbing out, sample areas making good up to a time all boundaries and around pipes etc. Rates shall also include internal angles and external corners where all are done in the same mix as the main plaster or in different mix. Prices shall also include to plaster richer mix to special arises.

For jambs, reveals and sills no extra items it allowed for labour and difference of materials, unless specially stated.

51. Plaster mixes:

Shall be as stated in Bill of Quantities or in drawings and as follow:-

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a) Mix "A" 3 coat external plaster:

First Coat: Tartacha rough cast. Mix 350 kg of cement to one M^3 of sand.

Second Coat: Undercoat minimum 1.0cm thick 2 parts lime 3 parts sand 150 kg cement to one M^3 of the above mix.

Third Coat: Tyrikene finish pressed with steel trowel after application:

1 Part hydrated lime
2 Parts marble powder
2 Parts clear sand

One part of the above mix, mixed with the same volume of coloured cement (1:1) to obtain the colour directed by the Engineer.

b) Mix `B`: As Mix `A` but left rough cast not pressed with a steel trowel.

c) Mix `C` : As mix `A` but finished to true and even surface with a wood float.

d) Mix`D`: 3 coats internal plaster

First Coat : Tartacha rough cast, Mix 350 kgs, of cement to one M^3 sand.

Second Coat: Under coat minimum 1.0cm 2 parts lime, 3 parts sand 150kg cement to one M^3 of the above mix.

Third Coat: Pure gypsum finishes with steel trowel

e) Mix `E`: Same as Mix `A` but with an addition of water proofing product (sulphricate, `Sika` or any other approved manufactured.

f) Mix `F` : Two coats plaster;

First Coat: Tartacha rough coat Mix 350 kg of cement to one M^3 sand.

Second Coat: Takhachine 3cm thick 1 part cement; 6 parts Sand, (250kg cement to one M^3 of sand)

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Note:

Second coat to be finished true and clean with wood float to receive painting.

g) **Mix `C`:** Same as Mix `F` but with the second coat 1 part cement (100kg) 8 parts sand.

h) **Mix `h`:** Three Coats plaster, cement render.

First Coat: Tartacha rough cast, mix 350kg, of cement to one M^3 of sand.

Second Coat: Under coat 1.0cm thick minimum, mix 200kg of cement to one M^3 of sand.

Third Coat: 1 Part sand 1 part Portland cement finished smooth with a steel trowel if left unpainted or with wooden float if finish to be oil paint.

i) **Mix `i`:** Same as Mix `H` but with an addition of water proofing product (sulphricate, Sika or any other approved manufacture.

j) **Mix `j` :** For painting

2 Parts lime
2 Parts sand
200kg cement to one M^3 of the above mix.

k) **Mix `k` :** For painting 2 parts lime 2 parts sand, 150kg, cement to one M^2 of the above mix.

52. Wall Lining:-

Glazed tiles shall be of first quality and of a colour approved by the Engineer, special round corner (inner and out beads) shall be used when necessary and top tiles shall have rounded edges. The tiles shall be laid over a bed of cement mortar (1: 4) and pointed afterwards with coloured cement to match the tiles; shall be laid with accurate and straight mortared joints.

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Plumber and Drain Layer

Note:

All the installation and fittings should conform to Abuja Municipal Council Drainage Local Order or as otherwise stated (if the work is not in Abuja).

53. Waste and Supply Pipes:

Shall be PVC pipes for waste & external supply and PPR pipes for internal supply with screwed joints conforming to British Standard specifications, if not otherwise stated.

54. Diameters:-

The Diameter of all pipes is the internal bores.

55. Joints:-

The threaded ends of the pipes shall be painted with white lead linseed or before jointing joints shall be made by winding a few threads of gasket; yarn around the threaded ends and screwing into the coupling to one half the coupling depth. Before and after jointing the interior shall be free of all burrs and obstructions.

56. Fittings:-

Shall be malleable iron for use with the piping used. All pipes inside the building are to be bedded in channels inside the walls below plaster or glazed tiles levels unless otherwise ordered by the Engineer and shall be of approved quality and jointed as described. No knuckles bends will be permitted.

57. Fixing Pipes:-

Pipes shall be embedded in walls and patched with cement sand mortar not less than 50cm thick between pipe and finishing surface. Supply pipes shall be laid and fixed to allow air escape naturally at big tap.

58. Rates:-

The Contractor shall allow for all connection and bends being made by the plumber in the length of the pipe jointing and fixing elbows bends and other ready-made fittings and shall include cutting, threading and making joints and connections.

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59. Sanitary Fittings:-

Shall be as shown in the drawing and of a manufacture approved by the Engineer. The manufacturer's reference number and the type of fittings which is proposed to be installed shall be submitted to the Engineer and his approval obtained before ordering.

60. Soil and Vent Pipes:-

Shall be PVC or another approved material, with spigot socket joints and shall comply with standard specifications. The pipe shall be embedded in walls and patched with cement sand mortar. Proper bends junctions, connectors, etc. shall be used as may be required. The vent or oil vent pipe shall continue up to its higher and above roof level of 100cm and finished with a galvanized wire balloon guard.

61. Excavation:-

Excavate all trenches for drains. Inspection chambers, gullies, to proper falls and levels, return filling and properly consolidate after completion of drain layer work and cast away surplus. The trenches are to be inspected by the Engineer before any back filling is started and after the pipes have been checked by air or water pressure.

62. Rain Water Pipes:-

Shall be in plastic (PVC or ABS), conforming to British Standard Specifications, they shall be jointed as stated for soil pipes and fixed with a galvanized ring clip below each socket; each pipe shall end with a bend and discharge into a concrete channel to convey the water away from the buildings; where chutes are to be provided to discharge from flat roof they shall be in A.C. pipe of dia. shown in digs or as otherwise stated in the bill.

63. Water Supply:-

The W.C. cisterns and lavatory basin are to be fed directly from the water supply with a stop cork. Provide the flushing cistern with an overflow pipe to discharge over the water closet.

64. Cold Water Service:-

The Contractor shall make arrangements with, and pay all charges to the water authority for the provision of 3/4 " water service or other size required by the authority and shall install a meter box as required. He

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shall provide a suitable stop cork at the boundary of the premises unless otherwise stated.

65. Stand Pipe:-

Supply and fix a 3/4" or 1/2" stand pipe with 3/4" or (1/2) tap for hose as required for use in the garden or as otherwise stated.

66. Stop Corks:-

The Contractor shall provide a 3/4" stop cork to control the supply to each bathroom and W.C. and a 1/2" stop cork to the kitchen sink or as otherwise stated in bills.

67. Concrete Bed and Hunching: -

Lay 10cm thick P.C.C. (Mix "B" bed under pipes to the required fall as shown; on drawings. Pipes to be laid on pad and tested before hunching, care to be taken during hunching to avoid pipe movement.

68. Drain Laid on Sand Bed:-

Under concrete bedding where the soil is of such a nature as clay or cotton soil the pipes should be laid over a bed of 40cm of clean and well rammed under the above mentioned P.C. bedding and after the test, the remaining of the excavated trench could be back filled with the excavated soil and properly watered and rammed to the satisfaction of the Engineer.

69. Concrete:-

For inspection chambers septic tanks, and soak away pit shall be as specified on drawing and as described in the concrete trade.

70. Bricklayer:-

For inspection chambers and septic tanks shall be in sandcrete blocks as specified on drawing and as described in Bricklayer trade.

71. Drain Pipes:-

Shall be in plastic (PVC or ABS), spigot and socket not coated, conforming to British Standard specification with flexible spigot and socket joint (with rubber and ring laid and jointed as specified by the manufacturer, the inside of the pipes shall be wiped clean at each joint

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as it is made to ensure a clear bore. The pipe shall be laid to a true fall as indicated on the drawing.

72. Cement:-

Shall be ordinary Portland cement as described in the concrete trade.

73. Bricks: -

Shall be as specified in the Bricklayer Trade and built in the manner therein specified but bricks bedded in a cement mortar of not less than 1:4 mix.

74. Manhole Covers: -

The manholes covers and frames shall be of an air tight in cast iron of approved; weight as stated in bills. The frames shall be bedded in cement mortar (1:4) over kerbing of inspection chamber.

75. Gullies:-

Shall be glazed stoneware or C.I trapped gullies with 4'' outlets and G.I. grills, bedded and surrounded with 15cm, P.C.C. connected to A.C. drain with easy bends and cement joints. Lay 10cm, kerbs round gully top; in brick on edge and render in cement mortar (1/4) internal and external surfaces, and fix 12'' x 12'' cast iron manholes cover and frames on top.

76. Interceptor and Septic Tank:-

Provide 4 S.G.W. intercepting trap and set in P.C.C. in wall in septic tank and inspection chambers, provide inlet and outlet pipes to septic tank in G.I. and connect to soakaway with A.C. pipes as below.

77. Provide and fix 4'' Mica-Flap Fresh Air outlet and connect to intercepting manholes with 4'' diam A.C. pipe with necessary ''diam 90'' A.C bends.

78. Testing:-

After laying in accordance with instruction and drawings the line of drains pipes shall be tested in the presence of the Engineer or his representative by blocking the lower end of each line with a plug and filling with water in order to have a minimum head of pressure of 10 ft. (3 meter) for 15 minutes; or by air through a pump up to a pressure of 10cm., in the ''U'' tube. The water shall be retained until such time as ordered by the

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Engineer and no loss shall permitted after the initial absorption of the pipes, if tested by air the maximum loss after 5 minutes shall not exceed 20 mms. Manholes, if required, shall be tested by blocking the pipes and filling them with, water. A smoke test shall be carried out on soil down pipes bent pipes and waste pipes as may be required by the Engineer. The Contractor shall provide all water, labour and apparatus for the tests.

After testing the pipes the concrete bed of hunching or sand filling around pipes can be proceeded with, followed by back filling with earth in layers not exceeding 25cm. watered and well rammed

79. Water Services in Polythene Tube:-

Shall be Marrleythene or Alkathene tubing, (low density black polythene tube) normal gauge, jointed with special brass "instautor" fitting as manufactured by I.C.I Ltd. The pipes and fitting shall be laid and jointed in accordance to manufacturer's instructions.

80. Glazier:-

The materials used for glazing work shall not be inferior to the sample approved by the Engineer, and shall be cut to allow 1/8" (3 mms), all round between the glass panel and the wood or metal sash.

81. Glass Sheets:-

Shall be manufactured by the flat or vertical drawn process and shall be double strength "B" quality colour clear and fire finished wave must be reduced to the minimum and run in straight line and horizontally. The thickness of glass sheets shall be 1/8" or 3/16 depending on the sizes of the panels and as may be stated in the bills. When specifying sizes, the width dimension is given first. Glass sizes in the schedules are given approximately.

82. Plate Glass:-

Shall be manufactured in continuous ribbon, both sides ground to two surfaces producing uniformity of thickness, then the glass is further polished giving a polished plate quality of glass.

83. Figures Rolled Glass:-

This is a rolled flat glass with impressed design on one or both sides accomplished during the rolling process. The design and thickness shall be as specified in bills and as approved by the Engineer.

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84. Putty for Wood Sash:-

Generally is a mixture of pigment and linseed oil; a good mix is given with 80 - 90, widening with 10 - 20% of linseed oil the putty should not adhere with too great tenacity to the putty knife or to glazier's hand yet it should not be too dry to apply to the sash. One of coat priming paint or boiled linseed oil should be applied to the sash before applying of putty. The putty should not painted until it is thoroughly set.

85. Putty for Metal Sash:-

This may be supplied together with the metal sash or may be supplies with glazing materials, as may be stated in the bill. The putty should be made in order to adhere to the non-porous surface of the metal sash either inside or outside and should be applied as recommended by the manufacturer.

86. The putty shall be painted when thoroughly set and hard panes of glass shall be well bedded in back putty. Springed by means of an approved metal sash spring or as directed, and front puttied. The putty shall finish the full depth of the glazing rebate and be left smooth and clean. The priming specified in the painter trade shall be applied on glazing rebates before glazing.

87. If wooden or metal beads are specified, they should be fixed according to windows, or door manufacture instructions and as shown on drawings. Panes of glass shall be well bedded in back putty as specified in item 125 above.

88. Leave all glazing clean and perfectly water tight on completion to the satisfaction of the Engineer.

89. Painter:-

The paints distemper etc. shall be of brands approved by the engineer. Under coat paint shall be as recommended by the manufacturer of the approved finishing coat. Mixing thinning and application shall be in accordance with the instructions and recommendations of the paint manufacturers and the Engineer.

The finishing coat shall be flat or glossy as directed or as specified in the bills.

90 Thinning:-

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On no account should paraffin be used for thinning paint. Turpentine thinner or an approved substitute shall be used.

91. The Colours:-

Small quantity shall be ordered as directed by the Engineer. Sample areas shall be prepared as required by the Engineer for purpose of ascertaining colour, finish and workmanship and such areas shall be removed as directed.

92. Workmanship:-

Unless otherwise ordered, all primers, paint, etc. shall be applied with approved brushes of sizes suited to each part of the work. Each coat shall be thoroughly dry and shall be well rubbed down with fine sand paper and dusted before the next coat is applied, paint etc. shall not be applies on a damp, dusty or dirty surface and not in dusty or wet weather. The finished work shall be smooth free from brush marks, tears blisters and other defects due to defective materials. Workman ship or the weather. No putty shall be painted until it has full set. Glazing rebates shall be primed before the glass is fixed.

93. Lime White:-

Is to freshly burnt hydrated lime, slacked and mixed with a suitable binder to prevent flaking, it shall be applied cold.

94.

a) Oil bound water paint (washable distemper may be thinned with water for internal use to the approval of the Engineer, if used externally, the first coat shall be thinned with petrifying liquid (colour as required by the Engineer).

b) Pamastic:-

Shall be of approved brand, clean all surfaces to be painted, putty and smooth down with sand paper so as to produce an even smooth surface, all as recommended by the manufacturers and directed by the Engineer i.e. then apply the recommended under coat and two coat pamastic in accordance with the instructions of the manufactures (colour as required by the Engineer).

95. Preparation of Walls Etc:-

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Brickwork, concrete, plaster and ceiling board etc, to be painted shall be brushed down and shall receive one coat of an approved under- coat plaster to receive oil paint shall receive one coat plaster sealer.

96. Clean Up:-

All paint spot and marks on glass and elsewhere not required shall be removed as the work proceeds and the whole left clean to the satisfaction of the Engineer on completion of the works.

97. Electrical: -

This chapter of the specification covers the following system.
Electric Power Lighting.
Telephone system (Instruments and FABX covered by prime Cost Item)
Bell system
Earthling System

Notes to Tenderers

For correct interpretation of measurement of quantities, tenderers are advised to read following notes carefully.

a- Rates

All quoted rates shall be understood as for supply, install, connect, test and commission.

b- Import licenses, duties and tariffs

Successful tenderer shall find his own ways and means to obtain necessary import licenses for materials required to be imported. The tender price shall include all duties, tariffs, taxes and any other rates applicable for materials either imported or locally manufactured.

c- Guarantee

The installation shall be guaranteed for a period of one year from the date of provisional acceptance for trouble free operation. During the guarantee period contractor shall replace free of cost all faulty materials and damages caused by bad manworkship.

d- Storage of materials and security

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The tenderer shall allow in his price for safe storage of all materials at site and shall also be responsible to provide necessary watch and ward.

e- Insurance

Tender shall allow for the following insurances during the validity of contract.

a- Workmen's compensation insurance.
b- Contractors all risk insurance.
c- Fire and burglary insurance.

f- Workers

Only qualified and experienced workers shall be employed on this installation and Engineer shall reserve the rights to test any worker working on this installation for competency.

g- Tools

Tenderer shall allow in this price for providing first class quality tools for skilled workmen.

h- Working conditions

Working conditions at site shall be governed by the local labour regulations and tender rates shall include for gratuity, leave, travelling expenses and any other privileges allowed to the workers as per employer and employed persons regulations.

i- Cable joints and terminations

PILC cable joints shall be done by experienced jointers only. All joints shall be tested according to IEE regulations and test certificates shall be provided duly signed by the contractor.

PVC, SWA, PVC cables shall terminate using compression type glands. Mineral insulated copper covered cables shall be terminated with proper glands, seals, compound fillings and neoprene sleeving.

j- Measurements

All measurements given in these schedules are approximate and tenderer is advised to check all quantities with relevant drawings.

k- Cable Spreader Boxes

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Air-conditioning feeder circuit breakers shall be fitted with appropriate cable spreader boxes and glands for to take desired size of incoming and out going cables.

m- Lightening protection

A PC sum of is allowed to cover the cost of lightening protection system. The successful tenderer shall request Messrs. W.J Furse and Co. LTD. Traffic Street, Nottingham, England for design and estimate of price of equipment.

n- Installation notes

n-1 Standard lighting points shall be connected not more than 7 points in any one 5 amp circuit. Cable size used shall be 1.5mm.

n-2 5 amp sockets shall be connected not more than 3 sockets, in any one 15amp circuit. The cable size used shall be 2.5mm.

n-3 15 amp sockets shall be connected separately to a 15 amp circuit. Cable size used shall be 2.5mm or 4.0mm.

n-4 13 amp sockets shall be wired in ring main system but not more than 10 sockets in one 30 amp circuit. Cable size shall be 2.5mm.

n-5 Water heater up to 20 gallons capacity shall be connected to a separate 20 amp circuit. Water heaters must be thermostatically controlled. Cable size used shall be 4.0mm.

n-6 Cooker, loading up to 6 k. w. shall be connected to a separate amp circuit. Cable size used shall be 6.0mm.

n-7 Exhaust fans are recommended to be wired in separate circuit but fan sizes up to 15 inch 4 Nos. may be wired to one 10 amp circuit using 1.5mm cables.

n-8 All other circuit cable sizes shall be specified separately.

n-9 Conduit extra low voltage circuits such as bells, telephones, Radio diffusion system, television aerials etc. shall be run separately and runs shall keep a distance not less than one meter from normal medium and low voltage power or lighting circuits.

n-10 Draw wire shall be left in for all telephone and television aerials conduits.

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n-11 For any other item not covered in this notes, the tenderer are advised to seek clarifications from the Architect.

All electrical work shall conform to the requirements of the installation of electrical Engineers (UK). Wiring Regulations, Fifteenth Edition 1981 amended to and including June 1987. Where not in contradiction of the local Electricity Authority`s requirements.

The electrical power system will be supplied from 415/240 volt 3 phase 4 wire 50 Hz National Electricity Corporation mains.

The Contractor shall attend on and afford all facilities to the local Electricity Authorities and shall provide all terminal cable pits, terminal boxes for cables and underground ducts to facilitate all main feeder work.

The Contractor shall provide shop drawing and details of the installation and shall complete application forms as may be required by the AEDC for providing a connection from the mains.

The Drawings indicate the approximate location of electrical devices and Equipment. The exact location may be varied, with the prior approval of the Engineer, to simplify and improve the installation (e.g. to avoid having lighting interrupted by fans).

All materials shall be new and in accordance with the relevant British Standard (listed Appendix 1 of the I.E.E. Wiring Regulations).

The Contractor shall on completion of the Works provide two complete sets of instructions or manuals covering the operation, maintenances and the ordering of spare parts of all the electrical Equipment. There shall also be provided a list showing the local agents for each item.

Name plates in Arabic and English shall be fixed on or adjoining all panel boards, switches and pieces of Equipment for which the use or identification may not be readily apparent. Name plates shall be of laminated sheet plastic show white letters on a black background.

The conductor of all cables shall be of copper.

The minimum conductor size used shall be not less than 1.50mm^2 except for flexible cords to BS6500 for which the minimum conductor size shall be not less than 1mm^2. Cables in conduits shall be single core non-sheathed general purpose to BS6004 or BS6346.

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Armoured cables shall be multicore PVC insulated and sheathed, galvanized steel wire armoured and overall black PVC extruded sheathing type TMI of BS6746.

Indoor cables shall be solid tinned copper 0.6 mm diameter, PVC insulated, polyester tape overall and; PVC sheathed. An additional 0.7 mm diameter earth wire shall be provided.

Underground cables shall be galvanized steel tape armoured and overall black polythene sheeted.

The number of conductors shall be as shown on the Drawings.

Cables for bells shall be rated for a minimum 250 volts service. Cables shall be tinned, annealed, single strand copper with a minimum cross section area of 0.7 mm2 PVC insulated.

Wherever underground cables pass under walls or enter or leave building there shall be a plaques in concrete mounted on the external wall 150 mm x 200 mm with a recessed laminated plastic sheet showing in white letters on black in Arabic and English details of the type and location of the cable.

Markers 600 mm x 400 mm x 100 mm of Class A concrete shall be located along cable trench routes and flush with the ground at not more than 50 m intervals and each change of direction. Such markers shall have details of the cable impressed on them.

Steel conduit shall be heavy gauge screwed welded conduit galvanized internally and externally and free from all internal roughness all to BS4568. The minimum conduit size shall be 20mm.

Exposed screw threads shall be painted with a zinc rich paint after assembly.

Fittings shall be screwed malleable cast-iron or steel to BS4568 and shall be galvanized. Fittings to BS 820 will not be accepted.

Flexible metal conduit to BS 731 part 1 shall be galvanized and at the junction with conduit and fittings shall have a protective plastic sleeve prevent stress concentration

15 non - metallic conduit and fittings:

Non- metallic conduit and fittings shall be to BS4607. The minimum conduit size shall be 20 mm.

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All conduits embedded in ceiling slabs and walls shall be non-metallic. Exposed conduits shall be screwed steel.

All conduit work and plastering shall be completed and conduit shall be swabbed through before drawing in cables.

Conduit in slabs shall be installed as close to the middle of the slab as practicable and should run parallel to the main reinforcement.

Exposed conduit shall be screwed steel and shall be installed parallel or at right angles to walls and ceiling beams or clipped in line with structural steel work. All changes in direction shall be made as far as in possible with approved bends and pull boxes. The spacing between parallel runs shall be uniform throughout.

Conduit shall be supported by purpose made saddles fixed in accordance with Table Lic of LEE Wiring Regulations with, supports on each side of fittings other than straight couplings and each end of bends. When fixing to steelwork clips shall be used instead of saddles and holes shall not be drilled in structural steelwork to carry the clips.

Sleeves shall be provided for cables passing through floor slabs and walls. All openings shall be sealed with mastic compound. Sleeves shall be flush at the bottom of slabs and shall project 30 mm above floor surfaces.

The number of cables and the sizes of conduits indicated on the Drawings are for guidance only. The Contractor shall install cables and conduits as necessary for the complete electrical system.

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